Intrahousehold Analysis Using Household Consumption Data: Would the Potential Benefit of Collecting Individual-Level Consumption Data Justify Its Cost?

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Introduction

In the last few decades, household-level survey data on consumption expenditure, production and labor market activities, household demographics and so on have become increasingly available in developing countries. Data on household consumption expenditures constitute a major portion of the majority

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of such survey data. Furthermore, much more recently, issues related to intrahousehold resource allocation have drawn increasing attention in theoretical, empirical and policy discussions (e.g., Alderman et al. [1995], Fuwa et al. [2000]). This paper examines the usefulness and limits of household consumption expenditure data for understanding intrahousehold resource allocation issues. It also examines alternative data collection methods for obtaining household consumption information to be used for addressing such issues.

The paper is organized as follows: After a brief review of alternative uses of household consumption data (in Section 1), we will discuss potential benefit and costs involved in collecting individual-level, rather than household aggregate-level, consumption data in Section 2. Section 3 will consider specific circumstances under which such an attempt may be worthwhile. Section 4 concludes the paper.

I Uses of Consumption Data

Household consumption expenditure are widely available in many developing countries and can serve many purposes. Some of the major (potential) uses of consumption data include the following.

Welfare measure: Consumption data can serve as a primary measure of welfare level of the household and its members. According to the permanent income hypothesis, consumption data can be seen as a proxy for the permanent income. Apart from the interest in such 'permanent' income, if we are interested in measuring living standards of household over a period of one to a few years, consumption measures better reflect their welfare level than income measures do on the ground that people in developing countries can smooth their consumption over a year or more despite their uneven income flows, as well as on more practical reasons regarding data collection.*[1]

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*[1] See Deaton and Grosh [1998] for a more detailed discussion of 'consumption versus income' as a measure of household welfare.

Estimating preference: Consumption is a primary argument in the household (or individual) utility function. Household consumption data, combined with other variables entering the household modeling, are among the essential information required for the estimation of preference parameters of individuals or of the household.

Linkages with other aspects of household behavior: Consumption decisions are closely linked with human capital related decisions and outcomes such as health and anthropometric outcomes, education and time use. Furthermore, within the household in developing country settings, consumption decisions and production decisions (such as labor supply, agricultural production, non-agricultural enterprises) are likely to be interdependent*[2]. Thus consumption data is potentially important for understanding production activities of the household and vice versa.

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*[2] Theoretically, if complete set of markets exists and if complete information is available then consumption decisions are 'separable' from production decisions. See Singh, Squire and Strauss [1986].

Savings: Since total household income is either consumed or saved, if income and consumption are measured with a reasonable accuracy they could potentially (implicitly) give information about savings. It should be noted, however, that given the serious measurement problems associated with household income data, the practical use of estimated savings thus derived could be questioned.

These are but a few examples of uses of household consumption data. Other potential uses include: evaluation of the effects of potential policy alternatives such as price and tax reform, estimation of nutritional status, calculation of poverty lines and identification of poverty, estimation of income distribution, and so on.*[3] Finally, consumption data could shed some light on the household behavior of resource allocation among its members: i.e., intrahousehold resource allocation. It is this aspect of the analysis of consumption data that we will focus on in this paper.

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*[3] See Deaton and Grosh [1998] for a fuller discussion of various uses of consumption data.

II Benefits and Costs of Collecting Individual-Level Consumption Data

II.1. Collecting household consumption data: aggregate vs. individual-level?

A major issue in the collection of consumption data is the choice of the unit of analysis. Consumption data can potentially be collected either at the household aggregate level or at the individual level. The kind of policy questions that can be addressed partially depends on what type of data is available. Ideally, we would like to obtain consumption data of high reliability at the individual level for understanding intrahousehold resource allocation behavior. Collection of consumption data at the *fully* individual-level, however, entails various difficulties and thus such data are not widely collected. Consequently, there have been a few methodologies proposed in the literature that allow us to infer some aspects of intrahousehold resource allocation with aggregate household-level consumption data alone. Generally, these methodologies infer intrahousehold allocation processes by relating observed variations in the household consumption patterns, on the one hand, and in the

household characteristics, on the other; they analyze the effects of household composition (e.g., Ahmed and Morduch [1993], Burgess and Zhuang [1996], Deaton et al. [1989], Deaton [1989], Rudd [1993], Subramanian [1994], Subramanian and Deaton [1991]) or of relative degree of resource control by individual members (e.g., Browning et al. [1994], Bourguignon et al. [1995], Chiappori [1988] [1992], Haddad and Hoddinot [1992], Thomas [1990] [1993] [1997], Thomas and Chen [1994], Schultz 1990]) on the patterns of household consumption.*[4]

All of these methodologies for inferring intrahousehold resource allocations, however, are indirect measures in the sense that none requires direct observation of individual-level consumption; therefore, the power of the test of gender biases using such methodologies appears to be generally weak. For example, the fact that several studies using the "adult goods" method have generally failed to detect gender biases in the areas of low female-male sex ratios (such as North India and Bangladesh; see Ahmad and Morduch [1993], Deaton [1997], Subramanian [1994]) is troubling. The issue will not be likely to be resolved in the absence of direct evidence obtained from consumption

*[4] Fuwa and Vishwanath [1998] review this literature in detail.

data at the individual-level.*[5] As another empirical question, little is yet known about the degree of underestimation of individual-level poverty or inequality due to household aggregation of consumption information. Its quantification requires individual-level data (*a la* Haddad and Kanbur [1990]). In addition, while some aspects of gender inequality in consumption could be detected and some potential target population for policy intervention identified, indirect measures do not usually reveal much about underlying behavioral mechanisms through which such inequality results. Addressing the issue of whether observed gender differential outcomes are due to gender-biased preferences or due to differential needs, for example, would require structural model estimation, which in turn would require individual food (as well as other) consumption data as key inputs for household production functions.

On the other hand, however, not all the consumption items can be collected at the individual level, since many consumption items have public good elements. Among the consumption expenditure items typically covered by the World Bank's LSMS surveys, for example, public goods include: housing, electricity, water, energy use, transportation, radio and TV, and

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*[5] Subramanian, personal communication.

furniture. Major private good items are: schooling expenses, medical expenses, food items, clothes and footwear, and personal care items (such as soap). Consumption of some of the private goods, such as food and personal care, may not be easily observable or recallable at the individual level. As a result, unless all the consumption items are collected at the household level, careful selection needs to be made as to which goods are collected at the household level and which goods at the individual level.

For example, LSMS typically collects individual-level expenditure data on such items as education and health but not food. For a nationally representative and multipurpose survey, such an approach seems to be a quite sensible practice. Under certain circumstances, however, such as for other types of more specialized surveys, or for rotating modules of LSMS type surveys, consumption data collection other than this typical LSMS practice might potentially be considered. In particular, among the attempts to collect consumption data at individual level, the most contentious appears to be the consumption of food. Food consumption often represents the largest potion of total consumption expenditure in developing countries, especially among the poor; in low income countries, such as India and Pakistan, a substantial proportion of the population spend three-quarters or more of their total budget

on food expenditures (Deaton [1997: 206]). In addition, food intake is one of the important 'inputs' to 'household productions' leading to such outcomes as health and nutritional status, educational achievement, labor market participation and farm and non-farm enterprises.

The merits of collecting food intake data at the individual-level for the purpose of understanding intrahousehold resource allocation issues has been debated and remains contentious. Whether or not food consumption data can and should be collected at the individual or at the household aggregate level would depend on the policy priority and specific circumstances of the survey and the country in question. In the rest of this section, we will focus on the issues involved in the collection of individual-level vis-à-vis household-level food intake data and examine the additional benefits and costs, that is, the additional information that such data can provide and major difficulties involved in collecting such data.

II. 2. Empirical findings from individual-level food intake data

First we will review the literature and identify what kind of information individual-level (as opposed to household aggregate level) food intake data can

provide.*[6] Although there have been relatively a small number of data sets used in the literature (most notably in the Philippines, India and Bangladesh) we highlight the kind of findings that individual-level data can offer with a focus on policy implications, such as evidence on gender biases in intrahousehold allocation; poverty monitoring; and effects of policy interventions.

II. 2.a. Evidence on gender biases in intrahousehold food allocation and welfare outcomes

Individual-level data on consumption, when it is available, can address directly the questions regarding who gets what and how much within the household. A review by Haddad et al. [1996] identified 43 studies using individual food intake data. Such data were found in 11 developing

*[6] For more detailed review of empirical studies using individual-level data, see Behrman [1992] and Haddad *et al*. [1996].

countries,*[7] but a large number of studies were concentrated on India, Bangladesh and the Philippines. Based on such data base, Haddad et al. [1996] conclude that there is some evidence indicating pro-male and pro-adult 'bias' in food allocation in South Asia. There is also some indication of pro-male 'bias' in food allocation in the Philippines and in Guatemala but not in other countries in the sample. These comparisons are made based on food intake data without any adjustment regarding differential energy requirements among individuals due to differences in body weight and activity levels. As we will discuss below, however, examination of gender and age 'biases' in food allocation would need to incorporate such differential 'needs' among different individuals (incorporating them is a no easy task and the question of how it should be done is an controversial issue). Based on the studies incorporating such adjustments in one way or another, they conclude that the evidence for pro-male 'bias' still persists (though with a weaker basis than the un-adjusted comparisons) in South Asia but that gender 'bias' disappears in other areas (i.e., Philippines and

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*[7] They are (with the number of studies identified by Haddad *et al.* 1996 in parentheses): Bangladesh (10), India (9), Philippines (9), Nepal (3), Mexico (2), Guatemala (2), Pakistan (1), Chile (1), Peru (1), Madagascar (1), and Chad (1). Another two studies are surveys and one is based on data from UK.

Guatemala). Studies using food intake data with such 'needs' adjustments also indicate some pro-child 'bias' in the Philippines and Guatemala.

Furthermore, since individual-level food intake is a key input for many welfare outcomes of the household members, such data enables structural estimation of utility and production functions. *[8] For example, estimation of parameters of health production functions and household preference functions makes it possible to identify sources of differences in food intake among household members (along gender, siblings and ages) through structural estimation of household models. Such sources include 'productivity effects' in health production function (some members with better 'health endowment' are more efficient in converting food into health outcomes), activity levels (some members consume more energy by working more, which arguments total household income) and household preferences (household as a whole, in the unitary model framework, may exhibit some preference toward more or less inequality among its members in health outcomes or toward one gender or the other). We should note, however, that estimation of structural models has to encounter major challenges such as: to have sufficient number of exogenous

*[8] The rest of this sub-section draws heavily on Behrman [1992]'s survey.

variables to control for the endogeneity of the right hand side (RHS) variables in the structural relationships; unobserved variables, most notably endowments, that may cause omitted variable bias; our insufficient knowledge about the relationships with time lag, which could be critical (Behrman [1992: 298-299]). Behrman [1988], for example, estimated structural parameters under the unitary household preference framework using ICRISAT data from India and found: that during surplus season households exhibit strong 'inequality aversion' so relatively less endowed children are compensated in food allocation; that during lean season, on the other hand, households' 'inequality aversion' is much reduced so food allocation favors better endowed children and favors boys against girls; that such gender bias in lean season is stronger among lower caste households; and that there is no evidence of gender bias operating through differential returns from labor market. Behrman [1988b] conducts a similar analysis regarding differential preferences toward children of different age and birth order using the same data set, finding a similar seasonal patterns but now finding pro-earlier-born child bias. Another structural estimation with the unitary model framework using Bangladesh data by Pitt, Rosenzweig and Hassan [1990] find evidence of gender inequality-reinforcing effects of food allocation through differential returns to labor effort and of 'inequality

aversion' by households so food allocation compensates less endowed members and of *female* preference in health outcomes so adult male endowment is 'taxed' at higher rate than adult female. Although these analyses require rather strong assumptions for identification, individual food intake data, together with many other required variables, allow us to start disentangling the complicated relationships resulting in gender differential welfare outcomes of household members, such as health outcomes and nutritional status. Apart from these effects of 'preferences,' structural estimation of 'production functions' of welfare outcomes, such as health, schooling and returns on labor can examine gender or age differentiated effects of food intake on these outcomes. A review by Behrman [1992] conclude, however, that there are very few studies in terms of health outcomes and that the existing studies "do not indicate much in the way of gender differences" (Behrman [1992: 308]). *[9]

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*[9] One exception Behrman notes, however, is an unpublished paper using data on Jordanian infants indicating stronger impact of mother's breast-feeding length on the reduction of male than female child mortality, although this particular estimate possibly suffers simultaneity bias. A study by Behrman and Deolalikar [1990] estimates health production function using (again) ICRISAT India data and find positive effects of nutrient inputs but no gender differential effects. Behrman and Deolalikar [1989], with the same

In addition to empirical results from structural estimation, individual-level data allow us to estimate reduced form models of measuring the gender or age differentiated effects of changes in policy variables and other variables that are exogenous to household decisions (such as prices and availability of infrastructure and social services) on the level of food consumption of individual household members. While reduced form estimation may not reveal much about the sources (i.e., the question of 'why?') of such gender differential responses, such approach has the advantage of relative (to structural estimation) simplicity of estimation due to the absence of endogeneity issues among the RHS variables. Behrman [1992] identified two studies, both of which

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ICRISAT data, also estimates the effects of nutrient intake (calories) on wages and find no gender differential effects (they do find significant gender differential effects of weight-for-height, however) while Sahn and Alderman [1988], based on Sri Lankan data, find significant gender differential effects of nutrients on wages. Finally, based on Behrman [1992]'s review, there is relatively little known about the relationships between nutrient intake and schooling outcomes although there are several studies investigating the relationships between anthropometric measures and schooling outcomes, generally indicating a positive association.

unpublished, examining the effects of prices on nutrient intake.*[10] Furthermore, reduced form estimation of individual food intake demand can also examine the effects of predetermined household characteristics, such as the household head's and his spouse's education, on nutrient demand; some studies (data coming from the Philippines, Nicaragua and Jamaica) have found significantly positive effects of women's schooling on nutrient demand and others find no such effects (data coming from Gujarat-India, Thailand, and Brazil),*[11] but no differential effects by gender of nutrient recipients appears identified.

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*[10] According to Behrman and Deolalikar [1988] using India-ICRISAT data, estimated patterns of price elasticities of nutrient demand indicate that girl's nutrient intakes are treated as relative 'necessities' with respect to changes in the basic staple price while there is no gender differential income effects on nutrient demand. A reduced form estimate of individual nutrient demand by Garcia and Pinstrup-Andersen [1987], based on a Philippine data set, indicates additive gender effects with boy bias but does not examine gender differential price elasticities.

*[11] Behrman [1992: 313-315].

II.2.b. Implications for poverty monitoring

Since consumption is a major welfare indicator, when individual-level consumption data are available, we could examine poverty (and inequality) at the individual-level. Haddad and Kanbur [1990] found potentially substantial difference in the levels (but not so much in the patterns) of poverty and inequality between the household and the individual-level data from the Bukidnon Province in the Philippines. Similar study has not been replicated with other individual-level consumption data, to our knowledge. In addition, some of the above cited studies appear to have some implication regarding poverty monitoring. For example, Behrman and Deolalikar's [1988] estimation of gender differentiated price elasticities of nutrient demand from Indian data (see the footnote in the previous subsection above) imply that girls may be less vulnerable than boys to food price increase. On the other hand, Behrman [1988a]'s results, based on his structural estimation of household preference parameters based on the same Indian data, indicate greater risks for girls during the lean season in India.

II.2.c. Implications for the design of policy interventions

One of the classic examples of household behavior off-setting the intended effects of policy interventions comes from the school feeding programs. Nutrition literature documents some compensating behavior of the household in response to school feeding programs by re-allocating food away from the targeted children toward other household members at home (e.g., Beaton and Ghassemi []). Another example of potential household responses to policy interventions concerns price and wage policies; food price and wage policies may have differential gender impacts due to differential food intake elasticity with respect to prices and wages, obtained from reduced form estimation of individual nutrient demand functions (Behrman and Deolalikar [1988]). The structural estimation by Pitt, Rosenzweig and Hassan [1990] from Bangladesh shows that the labor market returns can have direct impact on the allocation of food among household members and even survival probability of

girls and boys*[12]; this implies that policies to increase the labor market participation and its return for women may have positive impacts on women's food intake. The finding by a somewhat similar structural estimation by Behrman [1988a] [1988b] with Indian data, on the other hand, find little evidence of labor market effects resulting in gender differential food allocation within the households, implying a different policy implication; namely, intervention in labor market may not be effective in addressing intrahousehold inequality, but rather may indicate the potentials for direct intervention targeted to girls (esp. of higher birth order?) during lean season.

II.2.d. Tests of indirect methodologies:

Finally, while we have not seen an example in the existing literature, one potential use of individual consumption data is to check the power of the indirect methodologies to detect gender bias in intrahousehold allocations, such

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*[12] While using reduced form estimation of the relationship between employment rates and survival probability, and without using nutrient intake data, Rosenzweig and Schultz's [1982] reached the same inference.

as the Deaton [1987]'s 'adult goods' approach. When both individual-level and household level consumption data are available, it would be possible to implement indirect methodologies of detecting differential consumption allocation patterns by gender and age groups using the aggregated household consumption data and compare their patterns to those directly observed with the individual-level consumption data. Such comparison would indicate the reliability of indirect approaches before its being replicated widely with aggregate-level data sets.

II.3. Alternative methods of individual food intake data collection

A major issue in collecting food consumption data is the choice between food *availability* (amount of food purchased or home produced) and food *intake*(amount of food actually eaten). Since food availability or expenditure data typically can be collected only at the aggregate household-level (because in most cases food is purchased for the entire household rather than by each individual member separately) data collection at the level of individual household members usually takes the form of food intake. Food intake data, in turn, can be collected by various methods; the methods of collecting food intake

data typically found in the literature are respondent recall and direct observation or direct weighing by trained enumerators. *[13]

II.3.a. Respondent recall

One way of collecting food intake data is to rely on respondent recall, typically for the past 24 hour period.*[14] This is the least time-intensive method available of collecting food intake information.*[15] Reliability of memory, however, becomes a major issue in terms of the reliability of this data collection method. Interviews can be conducted either with each member for her/his own food consumption or with the household wife for all the members, as appropriate, depending on the eating habit of each locality. Respondent recall was used for data collection for the Village Level Studies (VLS) by

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*[13] In addition to these methods described below, diary and hidden camera are other alternative methods in developed country contexts mentioned in literature [e.g., Garcia and Senauer]. However no case of data collection using these methods in developing countries is known to us.

*[14] For detailed discussion of food intake recall data collection, see Swindale and Rogers [1997]

*[15] Garcia and Senauer [1992].

International Crop Research Institute for Semi-Arid Tropics (ICRISAT) in India, and by International Food Policy Research Institute (IFPRI) in Bukidnon province in the Philippines (Bouis and Haddad [1990]). In the ICRISAT data collection, the food preparer in each household was issued standard-sized bowls and spoons, which were then used to serve food to each member in the household. The investigators obtained information on the number of servings of each type of food to individual members from the food preparer on the basis of 24-hour recall. (See Behrman and Deolalikar [1988], Ryan et al. [1984]).

II.3.b. Direct observation at meals or direct weighing

The alternative to respondent recall is to have an enumerator present at the meal time and record individual food intake. This method is much more time-consuming than recall. It is also said to be more intrusive and thus potentially subject to systematic measurement error due to behavioral change by household members compared to respondent recall. The enumerator can either observe the behavior of household members and record food intake, or directly weigh the food being consumed and record the quantity. The former method is relatively less intrusive than the latter, but less accurate as well.

Conversely, the direct weighing is more accurate than interviews or observation but may also be more intrusive. This method is therefore possibly more likely to be subject to the potential eating habit change due to the presence of the survey.

Direct weighing method was used for Bangladesh Nutrition Survey, a survey by the National Nutrition Council and the Ministry of Agriculture in the Philippines, and the Estudo Nacional da Despesa Familiar (ENDEF) in Brazil. In the Bangladesh survey, for example, "specially trained female dietary investigators . . . measured dietary intake by weighing each individual's intake in the home over a 24-hour period" (Pitt, Rosenzweig and Hassan [1990]). In the Philippine survey, following measures were taken in order to minimize measurement errors and the potential behavioral change: food intake survey was conducted exclusively by team supervisors (dietitians or nutritionists); extensive training and "warm up" period for the respondents were included; and investigators were from the same locality (Garcia and Senauer [1992]). Although collected at the household aggregate level and not at the individual level, the ENDEF survey in Brazil collected food intake data by seven daily visits to the household in order to smooth the consumption patterns. On each daily visit, the enumerator measured the quantity of daily food consumption at

the household aggregate level, recorded wastage from the previous day and recorded all the household members and guests present at every meal during the seven day period.*[16] A comparison of ENDEF, ICRISAT and Bukidnon data suggests that the difference in the observation period (i. e., 7 days in ENDEF, 24 hours in ICRISAT and Bukidnon) could make a major difference in the amount of 'noise' in data (Strauss and Thomas [1995]).

There is a rich literature by nutritionists (though mostly based on data from developed countries) about the reliability of various methods of data collection on food intake. For example, it appears that the 24 hour recall method tends to underestimate energy intake compared to more direct recording methods (Black et al. [1991]). Furthermore, the degree of underreporting may be correlated with characteristics of interviewees, such as gender, age and weight (Beaton et al. [1997], Briefel et al. [1997]).*[17] In addition, the choice of alternative methods can also depend on the eating habit of the locality; for example, recall may be less reliable if the entire household members share a

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*[16] Strauss and Thomas [1995]. Strauss (personal communication) says that ENDEF is "arguably the best large scale food consumption survey ever fielded in a low income country."

*[17] We owe Howarth Bouis and John Strauss for the reference in the nutrition literature.

single plate or a bowl.*[18] Additional practical issues, common for all the methods above, include: differential dietary patterns according to the day of the week in some cultures, need for making sure snacks be included (this is particularly important for small children for whom frequency of eating is crucial due to their limited capacity), etc.

II. 4. Additional Costs of Collecting Individual-level Consumption Data*[19]

Individual-level consumption data could potentially enhance intrahousehold analysis for some particular policy purposes. However, collection of individual-level data involves substantial difficulties and additional costs. We discuss such issues here. There are both fundamental difficulties and more practical difficulties. We will discuss these in turn.

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*[18] A personal communication with Agnes Quisumbing.

*[19] On some of practical aspects of individual-level data collection, we benefited from conversations with Harold Alderman, Howarth Bouis and Agnes Quisumbing.

II.4.a. Conceptual issues

At the fundamental level, there is a conceptual difficulty of a completely individualized consumption questionnaire. That is, many of non-food consumption goods (housing, utility, energy, etc.) have strong public good element, and thus are unable to be 'assigned' to any individual-level. Food, on the other hand, is a private good for which the public good concern does not apply. However, individual food intake data, even if available, may be no panacea for detecting gender bias or measuring individual welfare. The interpretation of individual-level food intake information, even when available, is difficult because of the complex relationships between nutritional intake and health and other outcomes (Behrman [1992]). One controversial issue among nutritionists is the reference standards of nutritional 'adequacy' or 'needs' by age and gender (Osmani [1992], Srinivasan [1992]). Since, even controlling for age, sex, body weight, and other conditions such as pregnancy and lactation, there is substantial inter-individual variability, some would argue that "nutrients requirements based on averages for populations are abused by the user if applied to individuals" (Harris-White [1997: 195]). Furthermore, the

controversial notion of metabolic adaptation*[20] may cast doubt over the notion of 'adequacy' or 'requirement' itself. In practice, adjustment by activity levels requires information on individual activity levels which is often derived from time use or from individual occupation data. For example, the Philippine-Bukidnon (Bouis and Haddad [1990]) data use four-category time use data and Bangladesh-NSRB data (Pitt, Rosenzweig and Hassan [1990]) use 14 occupational categories (but no time use data) for adjustment of individual calorie requirements. Other studies typically use national standards (recommended daily allowances: RDA) by demographic categories, without taking into account differential activity levels among individuals. As we have seen above, there are cases where the conclusion about the existence or absence of gender or age 'biases' in intrahousehold food allocation can differ significantly between the studies with and without adjustments of differential energy requirements among different individuals.

Finally among the issues related to the methods of adjusting individual food requirements, some could raise a doubt that there might be a potential for

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*[20] "[T]he concept that the human body may have the capacity benignly to regulate the efficiency with which energy is metabolized over a range of intakes." [Harris-White 1997: 195]

gender biases even in the derivation of standards themselves. Often standardized nutrition requirements by age and gender are obtained based on the nutrient intakes for some relatively wealthy and healthy population; if there is gender bias in nutrient allocation among such reference populations, the derived standards may also contain gender 'bias' (Behrman [1992: 302]).

In the interest of searching for the causes of skewed sex ratios as observed in certain parts of the world, such as South Asia and North Africa, use of consumption data of a population of a particular point in time, whether at the household aggregate-level or at the individual-level, could potentially suffer sample selectivity biases. That is, among the household members of our interest the only individuals observed at a particular point in time are those who have survived to that particular time point. If, for example, nutrient allocation and other health care-related interventions in early stages of child development, i.e., before some girls become 'missing' (*a la* Sen [1990]), are directed more toward male children and also toward the better endowed of both sexes, then the surviving pool of female children may be only those with relatively better (unobserved) health endowments (Behrman [1992: 302]). This problem, again, however, is not particular to the consumption data at the individual-level.

II.4.b. Practical difficulties in collecting individual-level food consumption data: Measurement Errors and Time/Money Costs

Measurement Errors: Perhaps the most important reason held among the skeptics of collecting individual consumption data is the potentials for very serious measurement errors in obtaining individual food intake data, either through direct observation or through weighing. One major source of systematic measurement errors is the possible behavioral change of survey respondents, leading to systematic biases, due to the relatively 'intrusive' nature of these survey methods. Respondents may deviate from their 'normal' eating behavior toward 'what the respondents consider appropriate 'norms' (Behrman [1992]). Some ways of reducing this potential may be extensive 'worm-up' period for the respondent and a longer reference period than the typical 24 hours, such as 7 days. (because people perhaps can deviate from their 'normal' behavior for only so long). Furthermore, as mentioned above, there is an empirical literature among nutritionists finding that use of recall, rather than direct observation or weighing, may lead to systematic underreporting, which may be correlated with characteristics of the respondent. In addition, there are

potentially additional sources of systematic error or biases, such as understatement or miss-measurement of food eaten outside of regular meals.

In addition to the potentials for systematic measurement errors, there are potentials for random measurement errors as well. For example, data can pick up large intra-individual variation in (food) consumption due to the short time span covered by recall or by direct observation, which is typically a 24 hour period. Therefore, there potentially is a trade-off between memory reliability and smoothing of intra-individual variation in data. In most of the cases where individual food intake is collected, repeated observations (typically 4 times during a one year period) are obtained. In the case of ENDEF in Brazil, collected at the household aggregate level, food intake data were collected by direct weighing over a period of 7 consecutive days.*[21]

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*[21] In addition, John Strauss (personal communication] points out other potential issues leading to measurement errors, such as the issue of whether food intake be measured by raw ingredients or by cooked food, with the latter option leading to further questions of differences in recipes and in the watering down, especially by poor households, of their sauces, with large inter-household variations.

Time costs: Generally, collection of individual-level food consumption data, either through recall interviews or through direct observation or weighing, is inherently more time consuming than collection of household-aggregate level consumption data. In addition, because of the various potentials for measurement errors, such data collection would need to incorporate survey techniques to reduce such potential errors, such as multiple visits or a long observation period, which further increase time costs. For the same reason, often individual-food intake data are collected by well trained nutritionists or survey supervisors rather than a usual set of survey enumerators typically employed for a multi-topic household surveys, contributing to additional costs.

The additional time required for individual-level food consumption survey may lead to respondent fatigue. In the case of IFPRI-Bukidnon study in the Philippines, for example, collection of individual-level food intake data (based on 24 hour recall by household wives) required about one hour of interview. Therefore, we need to take into account the trade offs between individual consumption data and other potentially useful information to be collected in the household questionnaire. Survey design will need to make sure that enough time on the part of respondents (mainly household wives, perhaps) will be available. For example, this may be relatively easier in rural settings

than in urban settings. As a consequence, in some cases, practical consideration may have to be traded-off against national representativeness of the sample (see below). Most of the existing data sets with individual-level food intake from developing countries in the past are not nationally representative samples.

Additional time for enumerator training and data cleaning should also be considered. Since eliciting accurate information on individual food intake is a complex task, extra time for training for enumerators (and some warm-up time for the respondents as well) will be necessary. In addition, collection of individual-level food consumption data requires not only additional time for interview but also additional time for data checking and 'cleaning' in order to process this potentially noisy data.

Monetary Costs: Apart from the problem of possible respondent fatigue, such additional time required for individual-consumption data collection as well as the need for specially trained personnel would translate into higher monetary costs of survey implementation. For example, 24 hour food weighing has been found to be about 4 times the cost of the collection of food acquisition data at the aggregate household-level with 7-day recall period (Pinstrup-Andersen, quoted in Garcia and Senauer [1992]). About a quarter to

a third of the total cost of US$125,000 in IFPRI's Philippine-Bukidnon survey (covering 450 households for four rounds) in 1984-5 was spent for the individual level data collection. The additional costs of 24 hour recall food intake survey in their case was US$50-75 per household (vis-à-vis the total cost of roughly US$280 per household) with one hour of additional time for interview*[22]. Compared to this additional cost, the per household cost of LSMS surveys range between US$78~US$700 (typically US$200 ~ US$300).

II.4.c. Other Practical Considerations:

Depending on specific country and cultural contexts as well as availability of resources, collection of individual food intake data may or may not be practical. The kind of issues that we should consider include the following.

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*[22] A personal conversation with Howarth Bouis. Per household cost appears to be the same between the Philippine survey (with 450 households) and the Bangladesh survey (with 950 households). That is, no economies of scale seems to be observed. The same may not necessarily apply in other contexts such as in Africa (due to personal communication with John Strauss).

Eating Habits: Eating habits vary widely among countries, regions and cultures, and collection of individual food consumption data can be much more difficult in certain cultures than in others. For example, in some cultures individual members eat with own bowls/plates served by the household wife; under such circumstances, relying on recall by the server (usually the wife) or on direct weighing using individual bowls could produce reasonably reliable data. On the other hand, in other cultural settings, all the members share common bowls; under such circumstances, recall methods (or, perhaps, any attempt at collecting individual food intake data) might not be at all practical.

Sample size and locations: Since collection of individual-level food consumption data is costly, usually requiring multiple observations over time per individual (due to a large intra-individual variability of food consumption) and since the welfare monitoring (at the individual level) objective of nationally representative surveys can be better met by outcome based measures such as anthropometric data, there may be some room for compromising the size and national representativeness of the sample when individual-level food consumption date are really required for addressing specific policy issues. At

the same time, repeated visits on continuous days, for a week for example, at the expense of sample size might also be worth considering. While the sample size of a typical LSMS by the World Bank ranges between 1,600 to 3,200, the sample size of the existing data sets with individual-level food intake is typically well below 1,000*[23].

Required manpower for the survey: Interviews for 24 hour recall or direct weighing of foods requires interviewers of relatively high quality, such as highly motivated graduate students or trained nutritionists. Furthermore, with such personnel initial training specifically for this purpose will also be required. In some cultural contexts where women are not supposed to converse with male strangers freely (or vice versa), both male and female enumerators may be

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*[23] For example, IFPRI's Bukidnon-Philippines study covers 450 households (surveyed four times) and their more recent Bangladesh study, also by IFPRI, covers 950 households (surveyed four times); the Philippine National Nutrition Council-Ministry of Agriculture-IFPRI survey covered about 800 households [Senauer and Garcia 1992]; ICRISAT food intake data covered 240 households [Behrman 1988]; in the Nutrition Survey of Rural Bangladesh, 50 households were covered four times over a year and additional 335 households were covered once [Pitt, Rosenzweig and Hassan 1990].

needed to interview both husbands and wives, respectively, while in other contexts female enumerators might suffice to interview both female and male respondents.

Time use data collection: When individual-level food intake data are analyzed in search for potential 'biases' along gender or age, it is essential to take into account differential energy requirements among individuals due to age, sex, body weights and activity levels. In order to adjust for the differential activity levels (thus calorie requirements) among individuals, it would be desirable to collect individual *time use* data as well as food intake data, as has been done with IFPRI's Bukidnon (the Philippines) and Bangladesh data collection. While activity levels among individuals could be estimated with more crude information of individual occupational categories (as was done in Pitt, Rosenzweig and Hassan [1990]), in order to take full advantage of the individual food intake information time use information would likely provide better data base for adjusting activity levels. Collecting time use data, however, just like the individual food intake data, is full of potential measurement error issues and is very time consuming. This could further complicate the already

very demanding data collection burden of individual-consumption data collection.

III When Does it Make Sense to Collect Individual-Level Food Consumption Data?

III.1. Individual-consumption data collection in multi-purpose, nationally representative household surveys

Despite the growning importance of understanding intrahousehold allocation behavior in some policy contexts, there is still a great deal to be learned empirically about the 'black box' of household decision making and behavior regarding the allocation of resources among its members, and there are limitations to intrahousehold analysis without fully individual-level data on allocation of private goods within the household. On the other hand, however, because of the general time cost and potential measurement problems as well as of the competing demand for collecting different aspects of household welfare and behavior, it appears difficult to justify the inclusion of fully individualized consumption 'module' in the kind of multi-purpose household surveys intended

for a nationally representative sample. For such a type of surveys, the current set of practices in the consumption module of the prototype type LSMS surveys appears a quite sensible one, including:

- collecting individual-level consumption expenditures on some key items that are related to human capital development but still relatively easily assignable to individual beneficiaries, such as education expenditures and health expenditures,
- collecting some major consumption items by major age and sex categories when such assignment to groups are not difficult, such as clothes and footwear assigned to adult male, adult female, male child and female child,
- collecting food consumption at the household aggregate level, rather than at the individual level, and
- for the purpose of poverty monitoring, collecting individual welfare outcome measures such as anthropometric measures, rather than food intake, as the indicator of nutritional status of individuals.

The reliance on anthropometric and health outcomes, rather than food intake, for monitoring changes in welfare levels has some advantages: that such

outcome measures are important non-income dimensions of well-being of our interest by themselves; that such measures are inherently individual-level information, unlike consumption expenditure; that, relatively speaking, the measurement problems involved are not as great as those with the food intake data; and that issues regarding the adjustments in 'energy requirements' do not arise, although anthropometric measures do have a similar issue of norming when such measures are interpreted. Thus, in terms of improving the capacity to monitor the change in the welfare level of individuals, rather than households (which is typically done through data on household consumption expenditure levels), cost effective investment could be made in improving anthropometric and health or morbidity information in the LSMS type surveys. (On this, see 'anthropometrics' and 'health' chapters in Grosh and Glewwe [2000].)

III. 2. Exploring potential criteria for individual-level food consumption data collection

While it is difficult to justify individual-level food consumption data collection in the contexts of large-scale, nationally representative household surveys, there might be some specific circumstances when such data collection

might be worth considering. In this final section, we will explore some potential criteria for such consideration. Such consideration might potentially arise in the contexts of household surveys with specified policy questions, usually fielded in some selected portions of countries (majority of the data collection by CGIAR centers, such as IFPRI (International Food Policy Research Institute), ICRISAT (International Crop Research Institute for the Semi-Arid Tropics) and IRRI (International Rice Research Institute), falls into this category), of household surveys for the purpose of evaluating the impact of particular policy interventions, or (possibly) of a smaller module within a multi-year general purpose household survey of the LSMS type with rotating modules. Consideration of individual-level food consumption data collection that goes beyond what is done in typical LSMS may arise with the combination of specific research issues of high priority and specific characteristics of the country or regions within countries.

III.2.a. Regional characteristics

There are some portions of the world where the female-to-male sex ratios are out of balance and the precise causes of such 'missing women' are not

well understood; such regions include northern parts of India and other South Asian countries and North Africa (e.g., Sen [1990], Bardhan [], Subramanian[], Ahmad and Morduch []). In such regions, several studies using household aggregate level consumption data have not found any substantial evidence of 'bias' in consumption good allocation between girls and boys; whether such findings should indeed be interpreted as the indication of lack of gender bias, at least, in consumption good allocation between girls and boys even in these areas, or they should rather be seen as an indication of the lack of power of the methodology itself, seems to be still controversial. (See, Ahmad and Morduch [1993], Deaton [1997], Subramanian [1994].) Some would argue*[24] that, in such a circumstance, it may be worth while to consider a small scale and specialized survey including individual-level food intake data collection in some selected areas where population sex ratios are skewed in order to settle the debate as to whether or not intrahousehold inequality in consumption allocation is a contributing factor to the 'missing women.' A similar survey possibility might also be worth considering in an area where undernutrition or chronic hunger is the top policy priority.

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*[24] As does Shankar Subramanian (personal communication].

In addition to such issues of potentially vulnerable groups that may exist in particular geographical areas, at a more practical level, another significance of considering regional specific characteristics is the variation of eating habit and general availability of time for interviews that could critically affect practical feasibility of individual-level food consumption data collection. Even if policy priority dictates that such data collection is desirable, if reliable data are not collected, resources and efforts put into data collection could potentially be wasted. In certain areas where eating habit is such that observation of individual food intake is extremely difficult (e. g., household members share a common bowl*[25]), collection of individual food intake might not be feasible. In addition, time availability and willingness to corporate with survey data collection might vary between rural and urban areas; it may be the case that in urban areas people may not have time or patience for such lengthy and cumbersome survey interviews.*[26]

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*[25] Example due to Agnes Quisumbing (personal communication].

*[26] According to Howarth Bouis (personal communication], during the design stage of a recent study on Egypt, IFPRI decided that that was exactly the case.

III.2.b. Research foci and policy priorities

Since collection of individual consumption is extremely time consuming, and there is a certain limit as to how long a household questionnaire can be without compromising the obtained data quality (because of possible respondent fatigue), there is a trade-off between additional information obtained from individual-level food consumption data and other information that needs to be given up in order to make the time available for interviews (or direct observation) for individual consumption. Thus collection of individual-level food consumption data can be justified only when the research and policy agenda are such that the kind of findings coming from individual consumption data constitute the critical inputs to policy formulation of top priorities and that availability of other potentially useful aspects of household information might be compromised for that purpose. Also, as we discussed earlier, such survey may not possibly be conducted on a nationally representative sample.

Cases where some region specific policy issues as discussed above, including the skewed sex ratio and chronic hunger or malnutrition, are among the top policy priority may be one such circumstance. In such situations, policy makers might want to determine subgroups within household members, by

gender and by age groups, who may be more vulnerable than others under the condition of food scarcity (e. g., as shown by Behrman [1988a] [1988b]). Also, policy makers might also want to understand the household behavior regarding intrahousehold allocation of food in order to evaluate the potential responses of the household to alternative interventions with intended 'target populations' (e. g., the example of school feeding). Given the practical circumstances of survey areas and resource availability are also compatible, then collecting individual-level food consumption might well be worth considering in such cases. Another possible circumstance may be in the context of conducting rigorous evaluation of household and intrahousehold impact of specific intervention programs. For example, a recent study of Grameen Bank and other microcredit programs in Bangladesh is such an example of data collection focusing on a specific program evaluation with detailed information including food intake at the individual-level. [see, Pitt and Khandker 1996; Khandker, 2000]

When such specific circumstances justify collection of individual-level food intake data it could fill some of the gaps identified in the literature regarding our understanding of the household resource allocation behavior and outcomes. For example, Behrman [1992]'s review finds as one of such gaps the (structural) relationship between nutrient intake and health outcomes; "[f]urther

empirical work on health production functions, therefore, may have significant payoffs in improving our understanding of gender effects and intra-household nutrient allocation"*[27] (Behrman [1992: 319]).

III.2.c. Prudent practices for reliable data on food intake

When the combination of both policy priority, more practical considerations such as eating habits of locality and resource availability justifies collection of individual-level food consumption data, our earlier discussion of various sources of measurement errors suggests that various precautionary measures need to be taken in order to minimize such errors. Such measures will include: selection of specialized enumerators and training of them; a specially designed 'warm up' period with the survey households in order to reduce the

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*[27] At the same time, however, he hasten to add subsequently that "to the extent that there is substantial fungibility within the household, successful targeting of policies for specific types of individuals (e. g., females) may be quite difficult. It is not clear, therefore, that greater knowledge of the empirical structural and reduced-form relations pertaining to intra-household nutrient allocations and gender effects is likely substantially to improve policy formation." [Behrman 1992: 320]

sense of intrusiveness of the inherently intrusive survey methods (e. g., NNC-MA in the Philippines); revisiting the households across seasons because of possible behavioral differences between lean and surplus seasons in terms of food availability (e. g., ICRISAT, Behrman 1988a); extra care to be taken for capturing food eaten outside home and snacks taken between usual meal times; possibly considering use of direct weighing rather than recall interview because of the reported underestimation due to recall error (e. g., Bangladesh Nutrition Survey, NNC-MA in the Philippines and ENDEF in Brazil); possibly, also, considering an extended period of observation beyond the typical 24 hour period in order to smooth intra-individual variability and to reduce the deviation of eating behavior (toward what is considered as a 'norm') from their normal patterns (e. g., ENDEF in Brazil); and considering data collection other than food intake, including taking of blood sample for the analysis of micronutrients (IFPRI) and using labeled water.*[28]

*[28] We owe this suggestion to Duncan Thomas [personal communication].

Conclusions

The issues related to intrahousehold resource allocation have become increasingly recognized as an important aspect in devising poverty reduction policies, and there are empirically (as well as theoretically) unresolved questions regarding how household members allocate their resources (e. g., income, use of assets, labor and leisure time) among themselves, whether and to what extent there exist gender biases in such processes and how/why such biases arise. On the other hand, however, collection of fully individual-level consumption data is very costly and, in particular, the case for collecting individual-level food intake data is controversial at best. This paper has discussed the costs/difficulties and potential benefits of collecting consumption data at the individual level within the household. While the high cost involved in the collection of *fully* individual-level data collection, particularly of food intake data, is generally likely to exceed potential benefit in the context of large-scale and nationally representative household surveys, *partially* individualized consumption data collection (e. g., education and health), as typically practiced in LSMSs, is highly desirable and relatively inexpensive. Furthermore, we have explored possible conditions under which collecting

individual-level food intake data could be worthwhile. Such conditions are mainly determined in terms of both research foci/policy priorities at hand, and the characteristics of the study areas.

REFRENCES

Ahmad, Asif and Jonathan Morduch [1993], "Identifying Sex Bias in the Allocation of Household Resources: Evidence from Linked Household Surveys from Bangladesh," *Development Discussion Paper No. 463*. Harvard Institute for International Development. July.

Alderman, Harold, Pierre-Andre Chiappori, Lawrence Haddad, John Hoddinott and Ravi Kanbur [1995], "Unitary versus Collective Models of the Household: Is it Time to Shift the Burden of Proof?" *World Bank Research Observer*. Vol. 10. No. 1. (February): 1-19.

Alderman, Harold and Paul Gertler [1989], "The Substitutability of public and Private Health Care for the Treatment of Children in Pakistan." *The*

World Bank LSMS Working Paper No. 57. Washington, DC, World Bank.

Apps, P. F. and R. Rees [1996], "Labour Supply, Household Production and Intra-family Welfare Distribution," *Journal of Public Economics.* Vol. 60: 199-219.

_____ and _____ [1997], "Collective Labor Supply and Household Production." *Journal of Political Economy.* Vol. 105, No. 1. (February): 178-190.

Beaton, G. H. and H. Ghassemi [1979], "Supplementary Feeding Programmes for Developing Countries." a report prepared for UNICEF and ACC Sub-committee on Nutrition of the United Nations.

Beaton, G. H., J. Burema, and C. Ritenbaugh [1997], "Errors in the Interpretation of Dietary Assessments." *American Journal of Clinical Nutrition Supplement*. Vol. 65: 1100A-1107S.

Becker, Gary [1991], *A Treatise on the Family*. Cambridge: Harvard University Press.

Behrman, Jere [1988a], "Intrahousehold Allocation of Nutrients in Rural India: Are Boys Favored? Do Parents Exhibit Inequality Aversion?" *Oxford Economic Papers*. Vol. 40: 32-54.

_____ [1988b], "Nutrition, Health, Birth Order and Seasonality: Intrahousehold Allocation in Rural India." *Journal of Development Economics*. Vol. 28, No. 1: 43-63.

_____ [1992], "Intra-Household Allocation of Nutrients and Gender Effects: A Survey of Structural and Reduced-Form Estimates." in Osmani, S. R. (ed.) *Nutrition and Policy*.

_____ [1997], "Intrahousehold Distribution and the Family." in Rosenzweig, Mark R. and Oded Stark (eds.) *Handbook of Population and Family Economics*. North Holland: Elsevier Science B. V.

Behrman, Jere and Anil Deolalikar [1988], "How Do Food Prices Affect Individual Nutritional and Health Status? A Latent Variable Fixed-effects Analysis." mimeo. University of Pennsylvania.

_____ and _____ [1989], "The Intra-household Demand for Nutrients in Rural South India." *Journal of Human Resources*. Vol. 25. No. 4: 665-696.

Black, A. E, G. R. Goldberg, S. A. Jebo, M.B.E. Livingstone, I. J. Cole and A. M. Prentice [1991], "Critical Evaluation of Energy Intake Data using Fundamental Principles of Energy Physiology: 2." *European Journal of Clinical Nutrition*. Vol. 45: 583-599.

Bouis, Howarth [1992], "Adolescents in Farm Households: Their Nutrition, Education, and Contributions to Family Welfare," Paper presented at the International Food Policy Research Institute-World Bank Conference on Intra-household Resource Allocation: Policy Issues and Research Methods. Washington, D. C.

_____ [1994], "The Effect of Income on Demand for Food in Poor Countries: Are our food consumption databases giving us reliable estimates?" *Journal of Development Economics*. Vol. 44: 199-226.

Bouis, Howarth, and Lawrence Haddad [1990], *Agricultural Commercialization, Nutrition, and the Rural Poor: A Study of Philippine Farm Households*. Boulder and London: Lynne Rienner Publishers.

_____ and _____ [1991], "Are Estimates of Calorie Income Elasticities too High?: A recalibration of the plausible range." *Journals of Development Economics*. Vol. 39, No. 4: 333-364.

Bouis, Howarth and Christine Pena [1997], "Inequality in the Intrafamily Distribution of Food: the dilemma of defining and individual's 'fair share.'" in Alderman, et al. (eds.) Johns Hopkins University Press.

Bourguignon, Francois, Martin Browning and Pierre-Andre Chiappori [1995], "The Collective Approach to Household Behavior." Queen Elizabeth House Development Studies Working Papers. No. 79.

Bourguignon, Francois , Martin Browning, Pierre-Andre Chiappori and Valerie Lechene [1993], "Intrahousehold Allocation of Consumption: Some Evidence on French Data." *Annales d'Economie et de Statistique*. Vol. 29: 137-56.

Briefel, R. R., C. T. Sempos, M. A. McDowell, S. Chien, and K. Alaimo [1997], "Dietary Methods Research in the Third National Health and Nutrition Examination Survey." *American Journal of Clinical Nutrition Supplement*. Vol. 65: 1203A-1209S.

Browning, Martin [1992], "Children and Household Economic Behavior," *Journal of Economic Literature*. Vol. 30: 1434-1475.

Browning, Martin, Francois Bourguignon, Pierre-Andre Chiappori and Valerie Lechene [1994], "Income and Outcomes: A Structural Model

of Intra-household Allocation." *Journal of Political Economy*. Vol. 102., No. 6: 1067-1096

Burgess, Robin and Juzhong Zhuang [1996], "Dimensions of Gender Bias in Intrahousehold Allocation in Rural China." mimeo. STICERD, LSE.

Chiappori, Pierre-Andre [1988], "Rational Household Labor Supply." *Econometrica.* Vol. 56, No. 1. (January): 63-89.

_____ [1992], "'Traditional' versus 'Collective' Models of Household Behavior: What can data tell us?" Paper presented at the International Food Policy Research Institute-World Bank Conference on Intra-household Resource Allocation: Policy Issues and Research Methods. Washington, D. C.

_____ [1992], "Collective Labor Supply and Welfare." *Journal of Political Economy.* Vol. 100. No. 3: 437-467.

_____ [1997], "Introducing Household Production in Collective Models of Labor Supply." *Journal of Political Economy.* Vol. 105, No. 1. (February): 191-209.

Deaton, Angus [1987], "The Allocation of Goods within the Household: Adults, Children, and Gender." Living Standards Measurement Study Working Paper No. 39.

_____ [1989], "Looking for Boy-Girl Discrimination in Household Expenditure Data." *World Bank Economic Review*. Vol. 3., No. 1: 1-15.

_____ [1997], *The Analysis of Household Surveys: A Microeconometric Approach to Development Policy*. Baltimore: Johns Hopkins University Press.

Deaton, Angus and Eric Edmonds [1996], "Measuring Consumption and Price in LSMS Surveys." Mimeo. Princeton University.

Deaton, Angus and Margaret Grosh [2000], "The Consumption Module in the Living Standards Measurement Study." in *Designing Household Survey Questionnaires for Developing Countries: Lessons from Ten Years of LSMS Experience.* (eds.) Margaret Grosh and Paul Glewwe. Oxford University Press.

Deaton, Angus and John Muellbauer [1980], *Economics of Consumer Behavior*. Cambridge: Cambridge University Press.

Deaton, Angus, Javier Ruiz-Castillo and Duncan Thomas [1989], "The Influence of Household Composition on Household Expenditure Patterns: Theory and Spanish Evidence." *Journal of Political Economy*. Vol. 97.

Deolalikar, Anil and Eliana Rose [1998], "Gender, Savings and Production in Rural India." mimeo. University of Washington.

Doss, Cheryl R [1996], "Testing among Models of Intrahousehold Resource Allocation." *World Development*. Vol. 24, No. 10: 1597-1609.

Fuwa, Nobuhiko and Tara Vishwanath [1998], "Intrahousehold Analysis using Consumption Data: A Survey of Policy Issues, analytical methodologies, and data requirements." Mimeographed. Washington, D.C.: Poverty Reduction and Economic Management Network, World Bank.

Fuwa, Nobuhiko, Shahidur R. Khandker, Andrew D. Mason and Tara Vishwanath [2000], "Intrahousehold Analysis." in Grosh, Margaret and Paul Glewwe. (eds.) *Designing Household Survey Questionnaires for Developing Countries: Lessons from Ten Years of LSMS Experience.* New York: Oxford University Press.

Garcia, Marito and Ben Senauer [1992], "Implications of Intra-household Data Analysis for the Evaluation of a Food Subsidy Program." Paper presented at the International Food Policy Research Institute-World Bank Conference on Intra-household Resource Allocation: Policy Issues and Research Methods. February, 1992. Washington, D. C.

Grosh, Margaret and Paul Glewwe [2000], *Designing Household Survey Questionnaires for Developing Countries: Lessons from Ten Years of LSMS Experience.* New York: Oxford University Press.

Haddad, Lawrence and John Hoddinott [1992], "Household Resource Allocation in the Cote d'Ivoire: Inferences from Expenditure Data" T. A. Lloyd and W. O. Morrissey (eds.) *Poverty and Rural Development*. London: MacMillan.

Haddad, Lawrence and Ravi Kanbur [1990], "How Serious is the Neglect of Intra-household Inequality?" *Economic Journal*. Vol. 100: 866-881.

_____ and _____ [1992], "Intrahousehold Inequality and the Theory of Targeting." *European Economic Review*. Vol. 36, No. 2-3: 372-378.

Haddad, Lawrence, Ravi Kanbur and Howarth Bouis [1995], "Intra-household Inequality at Different Welfare Levels: Energy Intake and

Energy Expenditure Data from the Philippines." *Oxford Bulletin of Economics and Statistics*: 389-409.

Haddad, Lawrence and Thomas Reardon [1993], "Gender Bias in the Allocation of Resources within Household in Burkina Faso: A Disaggregated Outlay Equivalent Analysis." *Journal of Development Studies*.

Haddad, Lawrence, Christine Pena, Chizuru Nishida, Agnes Quisumbing, and Alison Slack [1996], "Food Security and Nutrition Implications of Intrahousehold Bias: A Review of Literature." Food Consumption and Nutrition Division Discussion Paper No. 19. International Food Policy Research Institute.

Harris-White, Barbara [1997], "Gender Bias in Intrahousehold Nutrition in South India: Unpacking Households and the Policy Process." Lawrence Haddad, John Hoddinott and Harold Alderman (eds.) *Intrahousehold Resource Allocation in Developing Countries: Methods, Models, and Policy*. Baltimore: Johns Hopkins University Press.

Hoddinott, John, Harold Alderman and Lawrence Haddad [1997], "Testing Competing Models of Intrahousehold Allocation." Lawrence Haddad, John Hoddinott and Harold Alderman (eds.) *Intrahousehold Resource Allocation in Developing Countries: Methods, Models, and Policy*. Baltimore: Johns Hopkins University Press.

International Food Policy Research Institute [198], *Survey Questionnaire Philippine Cash Cropping Project: Southern Bukidnon Province*. Washington, D. C.: International Food Policy Research Institute.

_____ [1996]. Bangladesh survey, 1996.

Kapteyn, Arie and Peter Kooreman [1992], "Household labor supply: What kind of data can tell us how many decision makers there are?" *European Economic Review*. Vol. 36: 365-371.

Khandker, Shahidur R. [2000], *Fighting Poverty with Microcredit*. Oxford: Oxford University Press for the World Bank.

Lundberg, Shelly and Robert Pollack [1993], "Separate Spheres Bargaining and the Marriage Market." *Journal of Political Economy*. Vol. 101, No. 6: 988-1010.

Lundberg, Shelly, Robert A. Pollack and Terence J. Wales [1997], "Do Husbands and Wives Pool Their Resources?" *Journal of Human Resources*. Vol. 32, No. 3: 463-480.

McElroy, Marjorie [1990], "The Empirical Content of Nash-Bargained Household Behavior." *Journal of Human Resources*. Vol. 15, No. 4: 559-583.

_____ [1992], "The Policy Implications of Family Bargaining and Marriage Markets" Paper presented at the International Food Policy Research Institute-World Bank Conference on Intrahousehold Resource Allocation: Policy Issues and Research Methods. Washington, D. C.

Osmani, S. R. [1992], *Nutrition and Policy*. Oxford: Clarendon Press.

Patton, Jessica [1993], "The Intra-Household Allocation of Resources in the Cote d'Ivoire: Is There Evidence of Gender Bias?" Queen Elizabeth House Development Studies Working Papers. No. 58.

Pitt, Mark M. and Shahidur R. Khandker [1996], "Household and Intrahousehold Impact of the Grameen Bank and Similar Targeted Credit Programs in Bangladesh." World Bank Discussion Paper No. 320.

Pitt, Mark, Mark. R. Rosenzweig and Md. Nazmul Hassan [1990], "Productivity, Health and Inequality in the Intra-household Distribution of Food in Low-Income Countries." *American Economic Review*. Vol. 80, No. 5: 1139-1156.

Ryan, J. G., P. D. Bidinger, N. Prahlad Rao and P. Pushpamma [1984], *The Determinants of Individual Diets and Nutritional Status in Six Villages of Southern India*. ICRISAT Research Bulletin No. 7. Andhra Pradesh, India: International Crops Research Institute for the Semi-Arid Tropics.

Quisumbing, Agnes R. et al. [1995], "Strengthening Food Policy Through Intrahousehold Analysis: Issues and Methodology." International Food Research Institute Multicountry Program (MP) 17. mimeo.

Rosenzweig, Mark and T. Paul Schultz [1982], "Market Opportunities, Genetic Endowments, and Intrafamily Resource Distribution: Child Survival in Rural India." *American Economic Review*. Vol. 72, No. 4 (September): 803-815.

Samuelson, Paul [1956], "Social Indifference Curves," *Quarterly Journal of Economics*, Vol. 70: 1-22.

Sen, Amartya [1990], "More Than 100 Million Women are Missing." *New York Review of Books*. Vol. 37, No. 20 (December): 61-66.

Senauer, Benjamin and Marito Garcia [1991], "Determinants of the Nutrition and Health Status of Preschool Children: An Analysis with Longitudinal Data." *Economic Development and Cultural Change* Vol. 39, No. 2 (January): 371-389.

Singh, I., L. Squire and J. Strauss [1986], *Agricultural Household Models: Extensions, Applications and Policy*. Baltimore: Johns Hopkins University Press..

Srinivasan, T. N. [1992], "Undernutrition: Concepts, Measurements, and Policy Implications." in Osmani, S. R. (ed.) *Nutrition and Policy*.

Strauss, John and Kathleen Beegle [1996], "Intrahousehold Allocations: A Review of Theories, Empirical Evidence and Policy." MSU International Development Working Paper No. 62.

Subramanian, Shankar [1994], "Gender Discrimination in Intra-Household Allocation in India," Cornell University. mimeo.

Subramanian, Shankar and Angus Deaton [1996], "The Demand for Food and Calories." *Journal of Political Economy*. Vol. 104. No. 1: 133-162.

_____ and _____ [1991], "Gender Effects in Indian Consumption Patterns." *Sarvekshana*, Vol. 14: 1-12.

Subramaniam, Ramesh [1996], "Gender-bias in India: The Importance of Household Fixed-effects." *Oxford Economic Papers* Vol. 48: 280-299.

Swindale, Ann J. and Beatrice Lorge Rogers [1997], Methodology for Collection of Food Intake Recall Data. mimeo.

Thomas, Duncan [1990], "Intra-household Resource Allocation: An Inferential Approach." *Journal of Human Resources*. Vol. 25, No. 4: 635-664.

_____ [1991], "Gender Differences in Household Resource Allocations." Living Standards Measurement Study Working Paper No. 79.

_____ [1992], "The Distribution of Income and Expenditure Within the Household." Paper presented at the International Food Policy Research Institute-World Bank Conference on Intra-household Resource Allocation: Policy Issues and Research Methods. Washington, D. C.

_____ [1993], "The Distribution of Income and Expenditure within the Household," *Annales de Economie et de Statistique*. 29:109-136.

_____ [1994], "Like Father Like Son, or Like Mother, Like Daughter: Parental Education and Child Health." *Journal of Human Resources*. Vol. 29. No. 4: 950-988.

Thomas, Duncan and Chien-Liang Chen [1994], "Income Shares and Shares of Income: Empirical Tests of Models of Household Resource Allocations." RAND Labor and Population Program Working Paper Series 94-08.

Van Praag, Bernard M. S. and Marcel F. Warnaar [1997], "The Cost of Children and the Use of Demographic Variables in Consumer Demand." Mark R. Rosenzweig and Oded Stark (eds.) *Handbook of Population and Family Economics*. North Holland: Elsevier Science B. V.