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How subjective data could improve poverty
measurement**

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Abstract

Although women in Tanzania are, on average, slightly less likely than men to say that they are "always/often without enough food to eat", this masks a much higher rate of self-reported food deprivation among elderly rural women. However, official Tanzanian poverty statistics use a "food energy intake" methodology which assumes "equal sharing" within the household, and equivalence scales which imply that poverty among both male and female elderly is similar to the general population. This paper combines subjective and objective micro-data from Tanzania's 2007 Household Budget Survey and 2007 Views of the People Survey. By imputing individual consumption based on the relative probability of food deprivation, we assess the importance of intra-household inequality – i.e. the hunger of old women – for poverty measurement. The general implications are the complexity of gendered intra-household inequality and the importance of 'technical' poverty measurement choices for public policy issues like the relative priority of old age pensions.

Keywords: Poverty Measurement; Intra-household Inequality; Elderly poverty; Gendered Disadvantage; Subjective Deprivation

JEL codes: I32, O15, J16, J12, J14

The Hunger of Old Women in rural Tanzania: How subjective data could improve poverty measurement

When researchers try to estimate the level of poverty, they typically calculate poverty statistics computed from data on total household income or consumption. Almost invariably, an introductory note acknowledges the potential importance of inequality within the household to poverty measurement¹ but the author then typically proceeds to assume it away, and calculates poverty statistics predicated on an equal flow of resources to all household² members, because data is unavailable to gauge the extent of intra-household inequality in consumption. As Ravallion (1996:1332) noted, 16 years ago: “Standard practice has been to assume that all family members are equal within a unitary-decision-maker model. The inadequacy of this has long been recognized. But our data are typically for the household’s total consumptions.” There has been little change since then – as Ferreira and Ravallion (2009: 601) put it: “we ignore intra-household inequality. Following common practice, such inequality is simply assumed away from our computations.”

Such discussions of poverty also typically have no place for the voices of the poor – subjective data on individual deprivation is usually not considered, at all. This paper therefore asks whether one can usefully combine subjective survey data with objective measures of consumption to improve estimates of poverty by allowing for intra-household inequality. When we do this in the Tanzanian context, we observe an important nuance in gendered inequality within the family – on average, Tanzanian women, as a group, appear not to be disadvantaged in access to food relative to men, but that average masks the substantial disadvantage of elderly women outside Dar es Salaam. The implication is that improving the measurement of poverty may be important for some policy issues (e.g. the priority of establishing a pension system) even if aggregate poverty statistics are less affected.

Specifically, this paper combines subjective and objective micro-data from two representative surveys of Tanzanian households in 2007 to assess the possible importance of one type of intra-household inequality – the hunger of older rural women – for poverty measurement. Section 1 uses data from the Views of the People 2007 (henceforth VoP2007) Survey of REPOA (Research on Poverty Alleviation) to show that old women in Tanzania outside Dar es Salaam

¹ Sometimes reference is made to Phipps and Burton (1995), Findlay and Wright (1996), Haddad and Kanbur (1990) or Cantillon and Nolan (2001), who demonstrated its potential importance in Canada, Italy, the Philippines, the USA and Ireland. Note that the first two papers used simulations based on assumed hypothetical variations from an equal-sharing rule to establish a range of possible variation in poverty measures – which at least simplified the interpretation of results. Haddad and Kanbur (1990) used individual estimates of food intake and assumed food requirements to calculate inequality in nutritional adequacy in the Philippines, but did not test for measurement error in either or both of food intake or food requirements.

² In both our Tanzanian data sets, the household concept is based on “eating together.” Interviewers were explicitly instructed to include domestic workers who fit this criterion, as well as co-resident family members.

are particularly likely to report “always/often not having enough food to eat” – deprivation that is not disproportionately acute among comparable old men, or among younger women. Section 2 contrasts this evidence with the official methodology for construction of a “food poverty line” in Tanzania, which assumes “equal sharing” in the sense of equal expenditure per equivalent adult.³ Section 3 takes advantage of the commonly defined variables in the VoP2007 survey and the Household Budget Survey (HBS2007) of Tanzania’s National Bureau of Statistics to estimate the probability of such hunger and uses that probability to calculate an imputed share of consumption within households which contain older women. Section 4 then calculates, using the HBS micro data, the implications for measured poverty of imputed intra-household inequality. Section 5 discusses possible implications.

1. The Hunger of Old Women in Rural Tanzania

By the \$1.25 a day (PPP) international criterion of poverty, two-thirds of Tanzanians were poor in 2007– the poverty headcount ratio was 67.9 %, with an associated poverty gap of 28.1%.⁴ However, public debates within Tanzania on poverty focus mainly on the “Basic Needs Poverty Line” of the National Bureau of Statistics – the poverty headcount ratio in 2007 by this standard was 33.4% of population, with a 9.9% Poverty gap.

Because the Household Budget Survey on which official poverty estimates are based collects data on total household consumption from a single respondent in each household, issues of within-household gender disadvantage cannot be addressed with that data. However, REPOA’s “Views of the People Survey” of 2007 (VoP2007) randomly selected a primary respondent from among the adults over age 25 in a representative sample of 4,987 Tanzanian households. This implies direct questioning of women, as well as men. Respondents were asked: “Have there been times during the last year when you didn’t have enough food to eat?” In Tanzania as a whole, 13.7% answered “Always/Often” and for the population as a whole, there is no evidence of female disadvantage.⁵

As Table 1 reports, among all women in mainland Tanzania, 12.9 % report such deprivation, compared to 14.5 % of all men – a difference that is statistically significant.⁶

³ Note that this is quite different from “equal sharing per person” or “equal sharing per adult.” The equivalence scale used by Tanzania’s National Bureau of Statistics assumes, for example, that the consumption needs of women aged 19-59 are 0.88 that of similarly aged men – see Appendix B.

⁴ See World Development Indicators <http://data.worldbank.org/data-catalog>

⁵ The other response categories were “sometimes” (37.97% of women, 40.09% of men) and “never.” We do not analyze the percentage of the population who report “sometimes” not having enough food to eat because it can change at either margin and its interpretation is therefore ambiguous. (Both a decline in the fraction of the population that is food-secure and answer “never” and a decline in the fraction that are extremely deprived (i.e. answering “always/often”) will tend to increase the proportion who answer “sometimes”).

⁶ The 95% confidence interval for males was 13.14% to 15.95%, and for women 11.63% to 14.23%.

However, the age pattern for men and women does provide evidence of gendered inequality. Among men, the frequency of food deprivation is essentially constant by age group, whereas the probability that a woman over 60 is “always/often” without enough food to eat is twice as high as the comparable chances of a woman aged 25 to 45. Given the concentration of Tanzania’s economic growth in Dar es Salaam region in recent years, it is not a surprise that the frequency of hunger is greater in other areas – but the magnitude of the discrepancy in relative probability of being ‘always/often’ without enough food is dramatic. An incidence of 17.1% outside Dar es Salaam contrasts with 4.6% in Dar es Salaam (i.e. 3.7 times greater).

Table 1

Percentage reporting "always/often without enough food to eat"

	Age 25 to 45	Age 46 to 59	Age 60 or more	ALL
Male	14.4	14.9	14.6	14.5
Female	11.2	16.2	23.0	12.9
Male & Female	12.6	15.5	17.3	13.7
Dar es Salaam	4.0	5.0	9.9	4.6
Non Dar es Salaam*	16.2	18.4	19.2	17.1
All Tanzania	12.6	15.5	17.3	13.7

* Arusha, Tanga, Lindi, Mtwara, Iringa, Singida, Rukwa, Shinyanga and Mwanza regions

Source: Authors’ calculations, VoP 2007 micro-data

Table 2 probes a bit deeper along the dimensions of gender, location, age, and living arrangement. It reports the relative frequency of ‘always/often’ not enough food to eat, for respondents aged 60 or more, compared to the base probability (0.137) for a randomly selected Tanzanian adult. The bottom left corner entry for “All Respondents in Dar es Salaam,” for example, indicates that such respondents have much less chance of being “always/often” hungry than average (i.e. about 0.34 of the average probability). This contrasts sharply with the relative

probability for all elderly non-DSM women, whose chances of “always/often” not having enough food to eat are over two thirds (1.72) higher than the national average.

Table 2

Relative Probability of “always/often without enough food to eat”

	Dar es Salaam	Outside Dar es Salaam	Tanzania – pooled sample
60+ living alone:			
- Male	**	2.22	2.08
- Female	**	3.00	2.53
60+ living with spouse only	**	1.24	1.19
60+ living with under 18s only:			
- Male	**	1.12	1.41
- Female	**	1.62	1.24
60+ living with youth (age 18-24 yrs):			
- Male	**	0.84	0.73
- Female	**	0.77	0.91
60+ living with adults (age 25-59 yrs)			
- Male	0.61	1.06	0.97
- Female	0.57	1.65	1.35
All 60+: Male	0.71	1.12	1.04
- Female	0.61	1.72	1.44
- Male & Female	0.66	1.34	1.19
Non-Elderly: Male	0.26	1.26	1.05
Non-Elderly: Female	0.30	1.18	0.88
All respondents	0.34	1.25	1
Base probability: All survey respondents			0.137

²Non-Dar es Salaam: Arusha, Tanga, Lindi, Mtwara, Iringa, Singida, Rukwa, Shinyanga and Mwanza regions

**Insufficient number of observations

Reading down the columns of Table 2 shows the influence of gender and living arrangement, within a given location, on the chances of deprivation of the elderly. The first column shows that within Dar es Salaam the female elderly have gender parity, compared to the

male elderly, in their chances of “always/often” not having enough food – the male/female differences in relative probability in Dar es Salaam are not large and not statistically significant.

However, gender parity for the elderly is most definitely not the case in most of Tanzania (i.e. outside Dar es Salaam), where (considered all together) the female elderly are 72 percent more likely than the national average to report being “always/often” hungry. Since most elderly Tanzanians live in a household with other adults aged 25-59 (see Table 3), this is largely because the multi-generation extended family has very different implications for older men and for older women. The relative probability of “always/often” hunger is about two thirds higher than the national average (1.65) among older women outside Dar es Salaam who live with other adults aged 25 to 59, but is virtually the same as the national average (1.06) among elderly men living in the same type of extended family situation. In fact, it is only when they live alone that older men have a higher chance than younger men in rural Tanzania of being ‘always/often’ without enough food. Over-all, women under 60 outside Dar es Salaam have lower chances than men (relative probability of 1.18 compared to 1.26) of reporting ‘always/often’ being without enough food. Evidently the extended family may enable some access to consumption by all household members, but that access is very unequal – and gendered inequality is sharply differentiated by age.

One possible explanation of the intra-family division of consumption is a power dynamic in which older women are disadvantaged by younger women when they lose control of the family cooking pot. An alternative hypothesis is that deprivation is voluntary – i.e. that old women ‘eat last from the pot’ because of internalized social norms about caring for others. Either way, the result would be less food for old women.

In Tanzania it is common (see Table 3) to observe households in which grandparents are caring for their grandchildren. In ‘skip-generation’ households where the elderly live with children all of whom are under 18, both male and female elderly are relatively likely to report ‘always/often’ being without enough food (women especially so) and the lack of family earning power is a plausible explanation. However, when the elderly live with young adults aged 18 to 24 (but with no adults 25 to 59 present), the family unit can presumably share in the income earning potential of young adult household members, but the elderly are also more likely to retain relative authority within the family. In this context, when the female elderly have not surrendered control of the family cooking pot to a daughter-in-law or other woman of the next generation, both male and female rural elderly have less chance than the national average of being “always/often” without enough food (0.84 and 0.77 respectively – the male/female difference is not statistically significant). This compares with a relative probability of food deprivation of 1.65 – over twice as great – when the female elderly live with other adults aged 25 to 59. The fact that the relative well-being of female elderly within households is so much less when other older adults are present would seem to be more consistent with a ‘power dynamic’ than a ‘self-denial’ hypothesis – but it is not conclusive.

Even given unequal sharing within extended families, living alone is clearly much worse for the elderly. The 7% of elderly women who live alone outside Dar es Salaam report a probability of “always/often” hunger that is three times the national average – elderly men living alone are twice the national average.⁷ More than any other demographic characteristic, living alone predicts deprivation – but being female and over 60 in Tanzania outside Dar es Salaam is also strongly correlated with higher chances of ‘always/often’ not having enough food to eat. In short, in most of Tanzania, self-reported food deprivation appears to be disproportionately a female phenomenon among the elderly⁸, although the same gender disadvantage is not observed among the non-elderly.

2. Official Poverty in Tanzania

Tanzania’s National Bureau of Statistics is one of many statistical agencies⁹ in sub-Saharan Africa which use a similar “food energy intake” methodology to draw the official poverty line. Most discussions of poverty within Tanzania refer to their “Basic Needs Poverty Line,” which is calculated as 1.37 times the “Food Poverty Line.”¹⁰ In 2007, the NBS estimated

⁷⁷ Table 3 reports the percentage of the elderly living alone or with their extended family. Because women tend to marry men who are a few years older, in Tanzania as elsewhere, the percentage of older women living just with their spouse is far smaller than the percentage of older men in such a living arrangement – which unfortunately also implies a sample size insufficiently large to compare male and female hunger probabilities in such family units.

⁸ There is also other evidence of disadvantage. Miguel (2005) has argued that the pattern of witch-killings in Meatu district, Shinyanga Region is consistent with the hypothesis that: “income shocks are a key underlying cause of the murder of elderly women as “witches” in Tanzania: extreme rainfall leads to large income drops and a doubling of witch murders (2005:1170)”. He reports government data suggesting that, on a national basis, 80% of the victims were women and their median age was between 50 and 60. In his sample of villages, 96% of victims were female, with median age over 50. Concerns about “being accused of practicing witchcraft” are not rare – in our REPOA data, among women over 60, 22.5% were ‘very’ concerned and 6.9% were ‘somewhat’ concerned. However, an unresolved puzzle in our data is that men over 60 were similarly concerned about possible future witchcraft accusations (20.2% were ‘very’, and 6.7% were ‘somewhat’ concerned). Miguel notes that over two thirds of reported witch killings (which averaged 170 per year between 1970 and 1988) occurred in one region (Sukumaland). The number of witch killings nationally is not large enough, given the current population of approximately 40 million, to distort the results of this paper.

⁹ See, for example, Chibuye (2011) for Zambia; Kabubo-Mariara and Ndeng’e (2004) for Kenya; Development Planning and Research Directorate (2012) for Ethiopia.

¹⁰ The poverty line methodology of the 2007 Household Budget Survey updated the 2001 HBS (see HBS2007; Appendix A). “The 2000/01 poverty line was based on the food basket consumed by the poorest 50 percent of Tanzanians. Median quantities consumed per adult equivalent were estimated for every food item, excluding alcohol and those that could not be assigned a calorific value. Median unit prices were also calculated. The calorific values of these foods were calculated. The food basket gives the *share* of consumption accounted for by each item. The *level* is set so that the sum of calories is 2,200 per day, the minimum necessary for survival. The food basket defined by these two parameters is then priced to give the food poverty line.”

“The food poverty line was then adjusted to allow for non-food consumption, giving the basic needs poverty line. This was done by calculating the share of expenditure that goes on food in the poorest 25 percent of households. Multiplying the food poverty line by the inverse of this share inflates it to allow for non-food consumption. The food share was 73 percent in 2000/01.” ($1/0.73 = 1.37$)

the “food poverty line” to be approximately 10,000 Tanzania shillings (Tshs)¹¹ per equivalent adult per month (about \$7.68 US at 2010 nominal exchange rates, \$19.59 per month at PPP¹²) – by this criterion 16.4% of mainland Tanzanians were ‘food-poor’ in 2007.

Basic to this methodology is the assumption that consumption is equally allocated among “adult equivalent” household members. The equivalence scale used (see Appendix B) systematically assigns lower expenditure needs to women and the elderly in general and elderly women in particular. For example, Tanzanian men aged 19-59 get a weight of 1.0 while women over age 60 are counted as 0.72 EA units.¹³ Hence, a rural woman over 60 living alone in 2007¹⁴ was only counted as being below the food poverty line if her total expenditures were below 6,893 Tshs per month while a rural man aged 19 to 59 living alone was counted as food poor if expenditures were less than 9,574 Tshs.

When people live in larger households, the total number of adult equivalents in each household averages the differences between men, women, children and the elderly in individual equivalence scale assumption. Equivalence scale assumptions thus affect most strongly the household poverty status of one and two person elderly households. Although Table 1 showed the elderly living alone to be particularly likely to report “always/often without enough food to eat,” the official “food poverty” rate calculations imply this household type had half the food poverty line poverty rate of the general population, as Table 3 shows. For couples, Table 1 showed the frequency of reporting “always/often without enough food to eat,” to be about a fifth greater than average, but the official calculations of Table 3 put the “food poverty” rate at about one-eighth that of the general population. The method of measurement of food deprivation evidently makes a major difference.

When elderly Tanzanians live with other adults aged 25-59, their official “food poverty line” poverty rate (17.0%) is very close to the population average (16.4%) – which is not surprising, since everyone living in the same household is assigned the same official poverty status. Three fifths of the elderly live in such extended families and another fifth live alone or in a couple and have official food poverty rates well below the population average. Should one believe the official poverty numbers and conclude that poverty among elderly Tanzanians is not an especially pressing issue?

¹¹ The 2007 estimate for mainland Tanzania was 10,219 Tshs for total expenditures after rent, medical and education costs – for Dar es Salaam 13,098, other urban 10,875 and rural 9,574. See HBS2007 Chapter 7 page 1.

¹² WDI: PA.NUS.PRVT.PP

¹³ See Appendix B or HBS2007 Appendix A.

¹⁴ Seebens (2008) used the 2001 HBS expenditure data to show that female-headed households in Tanzania spend a significantly higher percentage of total expenditures on food than male-headed households. The interpretation he stresses is the likelihood that female-headed households spend more on children’s food than male households and his general point is the infeasibility of inferring equivalence scales in Tanzania from observed food expenditure patterns in a defensible way. His results are also very hard to reconcile with the NBS weighting of women in equivalent adult units.

Table 3

Living Arrangements & Official “Food Poverty” Poverty Rate**Mainland Tanzanians over 60 – 2007***

<u>Percentage of elderly Living:</u>				<u>Official “Food Poverty” Rate</u>		
	<u>Male</u>	<u>Female</u>	<u>Total</u>	<u>Male</u>	<u>Female</u>	<u>All</u>
Alone	7.3	9.1	8.2	0.10	0.07	0.08
with Spouse Only	14.6	8.4	11.4	0.02	0.01	0.02
with children age < 18 & no adults 25-59	6.7	14.4	10.7	0.20	0.20	0.2
<i>(Average household size)</i>	<i>3.9</i>	<i>3.3</i>	<i>3.4</i>			
with young adults (18-24 & no adults aged 25-59)	6.1	9.9	8.1	0.23	0.19	0.20
<i>(Average household size)</i>	<i>5.3</i>	<i>4.7</i>	<i>4.9</i>			
with other Adults (25-59)	64.8	56.1	60.3	0.17	0.17	0.17
<i>(Average household size)</i>	<i>6.7</i>	<i>7</i>	<i>6.8</i>			

Suppose that one instead assumes that people who report “always/often” and “sometimes” not having enough food to eat will be found at the bottom of the income/expenditure distribution. One can then ask how far up the distribution one has to go before respondents stop reporting that they “always/often” or “sometimes” do not have enough food – i.e. one can ask what consumption levels are the “Always/Often Hungry Borderline” and the “Sometimes Hungry Borderline.”

In the VoP2007, individual respondents are asked “Have there been times in the last year when you didn’t have enough food to eat?” In HBS2007, a somewhat similar question¹⁵ is asked with reference to the household. Hence, the referent in these two surveys is identical for one person households. As Table 4 shows, in the VoP2007 data, 19% of all Tanzanians living alone outside Dar es Salaam report “always/often” not having enough food to eat. In the HBS2007 data, the comparable fraction is 15.1%. If we use the VoP estimate and assume those

¹⁵ “How often in the last year did you have problems of satisfying the food needs of the household?” In the HBS2007, always and often are separately identified as response categories, but not in the VoP2007. As Table 4 illustrates, the wording differences are not very important for the ‘always/often’ response, but do matter for the ‘sometimes’ response.

“always/often” without enough food are the bottom 19% of the distribution of total expenditure of all single-person households outside Dar es Salaam, the 19th percentile of the distribution of total expenditure of non-DSM one person households is at 19,876 Tshs per month (about \$ 14.94 US at March 2010 exchange rates).¹⁶ If medical expenses, rent, school tuition, etc. are excluded¹⁷, the 19th percentile is at 18,187 Tshs. By either calculation, the “Always/Often Hungry Borderline” is just under twice as high as the food poverty line of NBS for rural areas (9,574 Tshs).

One reason for the discrepancy could be the fact that the NBS calculations omit the cost of cooking fuel and ignore the percentage of purchased food which is lost to spoilage or other waste and the need to spend money on non-food items such as shelter and clothing. As well, the NBS criterion of 2,200 calories does not reflect the calorific demands of physical activity. For a 66 inch (168 cm) tall, 140 pound (63.5 Kilo) 30 year old male who is “rarely” physically active, the US National Academy of Sciences recommends 2291 calories as sufficient – but physical activity for more than an hour a day would raise his required calories to 3210. A physically active female of the same size and age is estimated to need 2773 calories, while a 60 year old male the same size needs 2924 calories – if active for an hour or more (but 2005 calories if rarely active).¹⁸ The differential in calorie needs associated with even an hour of physical activity is far larger than that associated with age or gender – and agricultural work typically occupies much more than an hour a day. For the vast majority of Tanzanians, particularly in rural areas, calorie needs reflect the mode of production – predominantly hand labour, with few inputs of machinery or motive energy. It is not therefore surprising that so many report “always/often” not enough food, even at household income levels much higher than the ‘food poverty line.’

However, the NBS makes no attempt to account for differences in calorie needs due to physical labour. Arguably, this methodology is particularly important in rural areas, where so many people necessarily engage in physically demanding agricultural labour.

¹⁶ The 15th percentile of total expenditure of non-DSM one person households is at 17,865 Tshs per month.

¹⁷ Variable expadeqx* adulteql in HBS2007

¹⁸ For a calorie calculator see <http://www.bcm.edu/cnrc/caloriesneed.htm>

Table 4

Single person households "always/often" and "sometimes" without enough food

	VoP2007		HBS 2007	
	% "always/often"	% "sometimes"	% "always/often"	% "sometimes"
Tanzania				
- Male	13.3	45.8	16.7	7.1
- Female	14.8	28.4	13.4	7.5
- Male & Female	13.9	38.5	15.1	7.3
Dar es Salaam				
- Male & Female	5.2	33.8	14.2	8.4
Non Dar es Salaam*				
- Male	15.7	50.6	16.7	7.2
- Female	25.0	25.0	13.4	7.5
- Male & Female	19.0	41.2	15.1	7.3

*Vop2007: Arusha, Tanga, Lindi, Mtwara, Iringa, Singida, Rukwa, Shinyanga and Mwanza regions

HBS2007: = VoP2007 plus Dodoma, Kilimanjaro, Morogoro, Pwani, Ruvuma, Mbeya, Tabora, Kigoma, Kagera, Mara, Manyara

Parenthetically, we note that when statistical agencies, such as the NBS, draw the poverty line using a "food energy intake" methodology (see Ravallion, 2010), they adjust the calories households require based on their age/gender composition, which implies they must impose the assumption that consumption is equally shared among equivalent adults. If this assumption were not made, total household equivalent income would depend on the distribution of resources within households. When, as in Appendix B, each infant under 2 is counted as 0.4 EA, while prime age males count as 1.0 EA and women over 60 are counted as 0.72 EA, the assumption is that elderly women need less food than prime age males, but substantially more than infants. If so, transferring a shilling's worth of resources from the elderly to infants would increase total household equivalent income, while transferring that same shilling to a prime age male would decrease total household equivalent income. Equal sharing, per equivalent adult, is not consistent with maximization of total household equivalent income, because the "food energy intake" methodology assumes that some types of individuals are more efficient than others in producing equivalent income from income. Maximization of total equivalent household income would imply allocating all resources to those household members with the largest value of $(1 / EA)$ –

i.e. for the Tanzanian scale, infants 0 to 2, for whom $EA = 0.4$ ¹⁹. In short, the “equal sharing per equivalent adult” assumption is inconsistent with maximization of total household equivalent income.

3. Imputing Consumption within Households – Methodology and Results

Our objective is to estimate the command over resources of the elderly who live in multi-person households but who may not share equally in total family resources. Because the VoP2007 and HBS2007 data have many variables in common, we can use the “always/often” indicator of individual food deprivation to impute a money value of consumption in HBS data. Specifically, we use the variables measured in both data sets to estimate, using the VoP2007 microdata, regression models for both men and women of the probability of always/often not having enough food. We then use the coefficients from those regressions (as reported in Appendix A) to predict the probability of food constraint for individuals sampled in the HBS2007.²⁰

Appendix A presents the results of linear probability and logit regression models using VoP2007 microdata to predict the probability of “always/often” not having enough food. In each panel, separate columns compare the regression results obtained for Dar es Salaam and for other regions. Using the coefficient estimates for the linear probability model, we compute for each person the calculated probability P^* of ‘always/often’ not having enough food to eat.²¹ We then order all elderly persons in sequence of the calculated probability P^* of ‘always/often’ not having enough food to eat, and we do this separately for those living in Dar es Salaam or not.

As Table 1 reported, 9.9 % of those aged 60 or over in Dar es Salaam, and 19.2% of those aged 60 or over outside Dar es Salaam, reported “always/often” not having enough food to eat. We assume that the distribution of consumption of the worst off elderly is the same as the distribution of consumption of the worst off single person households observed in HBS2007. Hence, we assign the worst off 19% of the rural elderly (as ordered by P^*) a consumption level (which can be called C^*) corresponding to the consumption level of the equivalent rank of the

¹⁹ Note the LIS equivalence scale (widely used in affluent nations) calculates the number of equivalent adults in a household as the square root of household size - since the number of adult equivalents depends only on the number of household members, total household equivalent income is separated from the distribution of income within the household.

²⁰ In doing so, we are not answering the substantive question: “What causes food scarcity for individuals?” Rather, our procedure addresses the estimation question: “What variables contained in both the VoP and HBS data sets best predict the probability of “not having enough food to eat” in the VoP?” Because our purpose is imputation, we do not need to distinguish between correlation and causation – nor is it a disadvantage if a variable (like number of meals eaten per day) arguably captures a linked dimension of the same issue.

²¹ For the linear probability model, $P^* = XB + e$, where X = vector of personal characteristics, B = coefficient estimates, e = random draw from normal distribution with mean zero and variance equal to unexplained variance in regression reported in Appendix A.

distribution of consumption spending of non-DSM single person households. We then repeat the same procedure for the elderly in Dar es Salaam up to the 10th percentile.

However, food deprivation does not necessarily indicate inequality within the household – sometimes everybody just shares equally in a very low household income. Hence, we compare, for each elderly person, C^* with the equally distributed expenditure level $[E^*]$ obtained when total expenditure is simply divided equally among all adult equivalents in the household they live in. If $C^* > E^*$, this is the case where the elderly are hungry because everyone in the family is hungry, so we assign the elderly person E^* . If $C^* < E^*$ (the unequal intra family distribution case), the elderly person is assigned C^* and income corresponding to the difference $(E^* - C^*)$ is divided equally among all other household members and added to their consumption level.²²

How much difference does unequal sharing with the elderly make to estimates of the level of poverty? Table 5 compares estimates of the ‘basic needs’ poverty rate, poverty gap and ‘normalized poverty gap’ (also known as the Foster-Greer-Thorbecke Index of order 1) under the alternative assumptions of equal sharing and assuming that unequal shares within the family can be modelled as described above. It reports poverty statistics using both per capita consumption and consumption per equivalent adult. It shows that the equal sharing assumption does matter for both males and females over 60 – with larger proportionate impacts for the poverty gap and ‘normalized poverty gap’ than for the simple head count ratio. However, Tanzania has a relatively young population – in the HBS data, only 6.1% of the population were over 60 in 2007.²³ Hence, in Tanzania in 2007, the assumption of equal sharing within households for the elderly makes relatively little difference to estimates of poverty indices for the population as a whole, for either equivalence scale assumption.

²² In making these calculations, we count each person as one adult equivalent. Calculating impacts in this way enables us to separate each household’s total consumption utility from the distribution of income within households.

²³ UN Demographic data estimates the percentage of Tanzanians over 60 to be significantly lower – 4.9%. See Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, *World Population Prospects: The 2008 Revision*, <http://esa.un.org/unpp>

Table 5

"Basic Needs" Poverty in Tanzania in 2007

Impacts of sharing and equivalence scale assumptions

	Poverty rate		Poverty Gap		FGT $\alpha=1$	
	per capita	NBS EA*	per capita	NBS EA*	per capita	NBS EA*
All						
Equal shares	0.488	0.333	0.167	0.098	0.078	0.043
Unequal shares	0.490	0.335	0.169	0.100	0.080	0.044
Under 18						
Equal shares	0.543	0.367	0.190	0.11	0.090	0.048
Unequal shares	0.543	0.367	0.190	0.11	0.090	0.048
Age 18-59: Male						
Equal shares	0.409	0.283	0.132	0.081	0.060	0.034
Unequal shares	0.409	0.282	0.132	0.081	0.060	0.034
Age 18-59: Female						
Equal shares	0.448	0.304	0.150	0.089	0.070	0.038
Unequal shares	0.448	0.303	0.14	0.089	0.070	0.038
Age 60+: Male						
Equal shares	0.442	0.331	0.153	0.098	0.075	0.045
Unequal shares	0.468	0.364	0.183	0.131	0.100	0.071
Age 60+: Female						
Equal shares	0.460	0.327	0.164	0.100	0.080	0.046
Unequal shares	0.495	0.367	0.192	0.130	0.101	0.067

*NBS EA = adult equivalents calculated as per Appendix B

4. Discussion and Conclusion

In the poverty measurement literature, some authors (e.g. Ravallion and Lokshin, 2002) have compared the incidence of self-assessed poverty with the incidence of poverty according to an objective consumption or income poverty line criterion. The long-established “Leyden tradition”²⁴ has also used the income at which the typical survey respondent assesses themselves to be poor to define the poverty line. In both these approaches, surveys which ask respondents whether they subjectively feel poor in an overall sense are used to assess the poverty status of individuals. More holistically, the participatory qualitative assessment tradition questions the use of survey methodologies at all (see Ravallion (2005) and other essays in Kanbur (2005)).

This paper has had less ambitious objectives. It has tried to demonstrate how a particular subjective survey response (being “often/always without enough food”) can be used to recognize a dimension of intra-household inequality and thereby augment objective household consumption data. The issue arises because the “food energy intake” methodology now used in many African countries to draw official national poverty lines uses presumed physiological equivalence scales to impute the relative food needs of household members, and assumes equal sharing per adult equivalent within households. Using this methodology, the official poverty estimates in Tanzania conclude that the poverty rate among the elderly in 2007 was about the same as in the general population (by assumption, male and female poverty in the same household is always identical). If this were really so, there would be no particular reason to assign priority to anti-poverty initiatives (like a universal basic old age pension) which primarily benefit the elderly²⁵ and no reason to think that women are disadvantaged at any age.

This paper started from the observation that in Tanzania, even though women are, over all, less likely than men (12.9% compared to 14.5%) to report “always/often” not having enough food to eat²⁶, older women outside Dar es Salaam were much more likely to report such deprivation compared to younger Tanzanians, or compared to older rural men. It has shown that although estimates of total poverty for the nation as a whole are little affected by adjustments to individual consumption which correct for such intra-household inequality, estimates of elderly poverty are changed.

²⁴ See Goedhart et al (1977); Van Praag et al (1982); Hagenaars (1986, 1991)

²⁵ Since most elderly persons live in extended families and share consumption, the non-elderly members of poor households are major beneficiaries of a basic pension system - see Case and Deaton (1998), Duflo (2003) and others for analysis of the South African case.

²⁶ Among under 60 women, 12.2% reported “always/often” not enough food with a 95% confidence interval of (10.94% to 13.57%), compared to 14.5% of under 60 men (95% confidence interval 13.01% to 16.04%).

One general lesson to be drawn is the complexity of gender-based disadvantage, and the importance of culturally specific norms of inequality within households.²⁷ When norms of inequality within households vary across cultures, neither the uniform assumption of zero intra-household inequality nor the simplistic assumption of uniform disadvantage will fit all cases. Since direct measurement of the actual degree of inequality in access to resources within the household is not feasible, indirect inferences are necessary. Researchers have turned to anthropomorphic data (e.g. height for age or weight for height), consumption pattern analysis or time use data.²⁸ This paper has tried to demonstrate that self-reports of food deprivation can also be a useful source of inference for intra-household inequality.

Although Table 5 showed that aggregate measures of poverty in Tanzania were not much affected by neglect of intra-household inequality, it also showed significant impacts for a particular social group (the elderly). We conclude that this is a measurement issue that does not matter much for some purposes (like assessment of aggregate poverty trends) but does matter considerably for other issues (like the relative priority of old age pensions).

Currently, Tanzania has no system of old age pensions or other public policy to deal with elderly poverty. The possible priority of such public policy depends heavily on perceptions of the prevalence of poverty among the elderly. This paper has shown that although the NBS methodology has assumptions of equivalence scale, caloric needs and equal sharing per equivalence unit which imply that deprivation among the elderly is about average for Tanzania, the subjective food deprivation data implies that poverty is greater, particularly for women. Given the potential importance for public policy priorities of these findings, and the absolutely low incomes of the people involved, it is disquieting that so much depends on ‘technical’ equivalence scale assumptions and the *ad hoc* assumption of equal sharing.

In Tanzania, the elderly are too small a fraction of the population for mis-estimates of their poverty to make much difference to aggregate poverty totals. Nevertheless, because 80% of Tanzania’s elderly live in households which contain younger people, the benefit of policies aimed at the elderly (e.g. old age pension payments) would be widely shared.²⁹

Furthermore, cross-sectional estimates of the magnitude of elderly and non-elderly poverty at a point in time do not reveal the impact on well-being of expectations of poverty.

²⁷ Motiram and Osberg (2010a), for example, noted that within Indian families, younger women have substantially less personal and leisure time than the household matriarch. The power and status of older women within the household clearly varies substantially across cultures.

²⁸ For examples of how time use data can be used to examine intra-household inequalities see Motiram, and Osberg (2010a, 2010b) and associated references. For an anthropomorphic example see Osberg, Shao and Xu (2009).

²⁹ Mboghoina and Osberg (2010:8,10) estimate that a universal old age pension for all persons over 60 set at the food poverty line would decrease the Basic Needs poverty rate by 7.7 percentage points and that approximately 49% of those lifted out of poverty would actually be under 18 years old, at a cost 1.7% of GDP in 2010, declining to 1.3% by 2020.

Since the alternative to growing old is dying young, in some sense everyone hopes someday to be old – which implies that the current well-being of the elderly presents a concrete image to the young of what their own future might well be like. Although actual poverty among the elderly affects the current reality of only about 6% of the Tanzanian population, perceptions of elderly poverty influence the expectations of the other 94%. The hunger of old rural women is now felt directly by less than 1% of Tanzanians, but a majority of the population are actually female, and over 90% of them live outside Dar es Salaam. Many people in Tanzania therefore now have good reason to worry about whether old rural women “often/always” do not have enough food to eat – and about whether the official “food energy intake” methodology for measuring poverty systematically underestimates their deprivation.

Appendix A

The Probability of Food Deprivation

Dependent variable: Dummy = 1 if “always/often not enough food to eat”; = 0 otherwise

	<u>OLS</u>		<u>Logit</u>	
	<u>Dar es Salaam</u>	<u>Non-Dar</u>	<u>Dar es Salaam</u>	<u>Non-Dar</u>
Older women dummy	-0.005 <i>(0.213)</i>	0.009 <i>(0.004)</i>	-0.063 <i>(0.333)</i>	0.051 <i>(0.021)</i>
Age in years	-0.002 <i>(0.534)</i>	0.005 <i>(0.094)</i>	0.014 <i>(0.812)</i>	0.033 <i>(0.124)</i>
Live alone	0.0003 <i>(0.989)</i>	0.01 <i>(0.748)</i>	-0.108 <i>(0.85)</i>	0.104 <i>(0.672)</i>
Number meals/day	-0.084 <i>(0.000)</i>	-0.038 <i>(0.001)</i>	-1.195 <i>(0.000)</i>	-0.292 <i>(0.000)</i>
Days fish/meat per week	-0.003 <i>(0.243)</i>	-0.02 <i>(0.000)</i>	-0.088 <i>(0.261)</i>	-0.188 <i>(0.000)</i>
Years education	-0.004 <i>(0.311)</i>	-0.016 <i>(0.001)</i>	-0.118 <i>(0.22)</i>	-0.131 <i>(0.000)</i>
Own table	0.045 <i>(0.013)</i>	0.07 <i>(0.000)</i>	0.723 <i>(0.035)</i>	0.442 <i>(0.000)</i>
Own radio	0.004 <i>(0.765)</i>	0.034 <i>(0.018)</i>	0.044 <i>(0.888)</i>	0.244 <i>(0.023)</i>
Own lamp	0.017 <i>(0.328)</i>	-0.162 <i>(0.000)</i>	0.275 <i>(0.47)</i>	-1.66 <i>(0.000)</i>
Own bicycle	0.011 <i>(0.474)</i>	-0.044 <i>(0.001)</i>	0.457 <i>(0.353)</i>	-0.366 <i>(0.000)</i>
House cement/brick	0.017 <i>(0.503)</i>	-0.08 <i>(0.000)</i>	0.309 <i>(0.59)</i>	-0.722 <i>(0.000)</i>
Constant	0.203 <i>(0.023)</i>	0.409 <i>(0.000)</i>	-2.377 <i>(0.232)</i>	0.828 <i>(0.202)</i>
Sample size	<i>1342</i>	<i>3640</i>	<i>1347</i>	<i>3640</i>
R ² (pseudo R ²)	<i>.06</i>	<i>.09</i>	<i>(.13)</i>	<i>(.10)</i>

Data: VoP2007 Micro-data
(P value in brackets and italicized)

Appendix B

Adult equivalence scale

Age groups	Sex	
	Male	Female
0-2	0.4	0.4
3 -4	0.4	0.48
5 -6	0.56	0.56
7 - 8	0.64	0.64
9 - 10	0.76	0.76
11 -12	0.8	0.88
13 - 14	1	1
15 - 18	1.2	1
19 - 59	1	0.88
60+	0.8	0.72

Source: HBS 2007, pp 82; United Republic of Tanzania

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