

## The Hunger of Old Women: How sensitive are poverty measures?

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## The Hunger of Old Women: How sensitive are poverty measures?

In empirical work on poverty, researchers typically compare poverty statistics computed from household data. Almost invariably, an introductory note acknowledges the potential importance of inequality within the household to poverty measurement, sometimes with citations such as 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<sup>1</sup> However, the author then typically proceeds to assume away intra-household inequality by calculating poverty statistics predicated on an equal per capita flow of resources to all household<sup>2</sup> members, because data is unavailable to gauge the extent of intra-household inequality in consumption. As Ravallion (1996:1332) put it, 15 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 – Ferreira and Ravallion (2009: 601) are concise: “we ignore intra-household inequality. Following common practice, such inequality is simply assumed away from our computations”.

How much error might this introduce into measures of poverty in a low-income country?

Specifically, in Tanzania the “calorie-counter” methodology now used in drawing official national poverty lines uses presumed physiological equivalence scales to impute the relative food needs of household members, and assumes equal sharing within households. Using this methodology, the National Bureau of Statistics concluded 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 is no particular reason to assign priority to anti-poverty initiatives (like pensions) for the elderly and no reason to think women are disadvantaged. However, older rural women were much more likely to report “always/often” not having enough food to eat compared to younger Tanzanians, or compared to older rural men.

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 – specifically, the disadvantaged status of older rural women – for poverty

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<sup>1</sup> 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. By contrast, when Haddad and Kanbur (1990) used individual estimates of food intake in the Philippines and assumed food requirements to calculate inequality in nutritional adequacy, they found no consistent pattern of over or under estimate of levels of poverty and little implication for the ranking of groups. However, that paper did not test for the possibility of measurement error in either or both of food intake or food requirements.

<sup>2</sup> 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.

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 rural Tanzania are particularly likely to report “always/often not having enough food to eat” – a 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.<sup>3</sup> 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 intra-household inequality. Section 5 discusses possible implications.

### 1. The Hunger of Old Women in Rural Tanzania

By international criteria of poverty, two thirds of Tanzanians are poor – the poverty headcount ratio at \$1.25 a day (PPP) was 67.9 % in 2007, with an associated poverty gap of 28.1%<sup>4</sup>. However, public debates within Tanzania focus mainly on the “Basic Needs Poverty Line” of the National Bureau of Statistics, which the WDI refers to as the “national poverty line”. The poverty headcount ratio by this standard was 33.4% of population, with a 9.9% Poverty gap in 2007. In all the above calculations “equal sharing” within the household is assumed, and the Household Budget Survey on which official poverty estimates are based collects data on total household consumption from a single respondent in each household, so no issue of within-household gender disadvantage can be discussed.

Unlike many other surveys which report the responses of the ‘Head of Household’, REPOA’s “Views of the People Survey” of 2007 (VoP2007) randomly selected a primary respondent from among adults over age 25 within sampled households. This methodology implies direct questioning of women, as well as men. A representative sample of 4,987 Tanzanian adults over age 25 was 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<sup>5</sup>.

<sup>3</sup> In drawing the “food poverty line”, Tanzania’s National Bureau of Statistics makes the assumption that consumption needs of older women are 0.72 that of prime age men .

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

<sup>5</sup> 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”).

As Table 1 reports, among all women in mainland Tanzania, 12.9 % report such deprivation, compared to 14.5 % of all men<sup>6</sup>. However, the age pattern for men and women is very different. 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. Nevertheless, the magnitude of the ratio of the relative probability of being ‘always/often’ without enough food is dramatic – an incidence of 17.1% outside Dar es Salaam compared to 4.6% in Dar es Salaam or 3.7 times greater (=17.1/4.6)!

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) that a randomly selected Tanzanian adult will answer similarly. 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.

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 somewhat *lower* chances of “always/often” not having enough food compared to the male elderly – but the male/female differences in probability in Dar es Salaam are mostly not large and are 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 per cent more likely than the national average to report being “always/often” hungry. Living within the multi-generation extended family does not seem to prevent hunger among such women. Within the extended family, each person may have access to consumption enabled by the total earnings of all household members, but that access may be very unequal.

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

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  
Relative Probability of "always/often  
without enough food to eat"

	Dar es Salaam	Outside Dar es Salaam	Tanzania – pooled sample
Persons aged 60 or more	always/often without enough	always/often without enough	always/often without enough
Living alone: Male	**	2.22	2.08
- Female	**	3.00	2.53
Living with spouse only	**	1.24	1.19
Living with kids (under 18) only: Male	**	1.12	1.41
- Female	**	1.62	1.24
Living with young adults (age 18-24 yrs):			
- Male	**	0.84	0.73
- Female	**	0.77	0.91
- Male & Female	**	0.81	0.81
Living with adults (age 25-59 yrs)			
- Male	0.61	1.06	0.97
- Female	0.57	1.65	1.35
All elderly: 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	0.14	0.14	0.14

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

\*\*Insufficient number of observations

What explains the gendered nature of elderly disadvantage – that although younger women are somewhat less likely than average to report food deprivation, older women are much more likely? 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.

One hypothesis is that the intra-family division of consumption is the result of a power dynamic in which older women are particularly disadvantaged. An alternative hypothesis is self-deprivation in which old women ‘eat last from the pot’ because of internalized social norms about caring for others. Either way, the result can be the same – less food for old women. However, in ‘skip-generation’ households where 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 control of the female elderly over the family kitchen has not been surrendered 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 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 certainly not conclusive.

Even given unequal sharing within extended families, living alone is clearly much worse. 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<sup>77</sup>. 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 most of Tanzania, food deprivation among the elderly appears to be disproportionately a female phenomenon.

Dar es Salaam appears to be very different from the rest of the country. Within Dar es Salaam, male/female differences are small, and the over-all probability of ‘always/often’ food

<sup>77</sup> In the Data Appendix, Table A1 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.

deprivation is much higher among the elderly (both male and female) than among the non-elderly. Outside Dar es Salaam, both the elderly and the non-elderly are much more likely to be food-deprived than in Dar es Salaam. However, given that difference, older men are better off than younger men, but elderly women are much worse off than non-elderly women.

Unequal access to food within households is one form of disadvantage for elderly women, but there is also other evidence of disadvantage. In a recent paper, Miguel 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<sup>8</sup>. Miguel is unable to state clearly whether extreme scarcity or scapegoating is a better explanatory hypothesis – but either way, his results are consistent with our data on the relative food deprivation of older women.<sup>9</sup>

## 2. Official Poverty in Tanzania

In analyzing both the 2001 and 2007 Household Budget Surveys, Tanzania’s National Bureau of Statistics followed essentially the same poverty line methodology. Most discussion of poverty within Tanzania refers to the “Basic Needs Poverty Line”, but since this was calculated as 1.37 times the “Food Poverty Line,”<sup>10</sup> the key calculation is clearly the latter. In 2007, the NBS arrived at an estimate of approximately 10,000 Tshs<sup>11</sup> per equivalent adult per month as the

<sup>8</sup> 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.

<sup>9</sup> The VoP survey also had a supplementary sample of 853 respondents over age 60 who were asked whether, “Looking to the future,” they were very, somewhat or not concerned about “being accused of practicing witchcraft”. Although one would think that the objective frequency of witch killing would drive such concerns, an unresolved puzzle in our data is the lack of a gender dimension to concerns about future witchcraft accusations. Among women over 60, 22.5% were ‘very’ concerned and 6.9% were ‘somewhat’ concerned – which is not very different from men over 60 (20.2% were ‘very’, and 6.7% were ‘somewhat’ concerned).

<sup>10</sup> The NBS notes (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)

<sup>11</sup> 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.



“food poverty line” (about \$7.68 US at 2010 nominal exchange rates, \$19.59 per month at PPP<sup>12</sup>) – by this criterion 16.4% of mainland Tanzanians were ‘food-poor’ in 2007.

However, the NBS assumes that consumption expenditure is equally allocated among “adult equivalent” household members and uses an equivalence scale calculation which systematically assigns lower expenditure needs to women and the elderly in general and elderly women in particular. Where men aged 19-59 get a weight of 1.0 and men over 60 are weighted 0.80, women aged 19-59 are counted as being 0.88 Equivalent Adults and women over age 60 as 0.72 EA units<sup>13</sup>. A rural woman over 60 living alone in 2007 would therefore be counted as being below the food poverty line if her total expenditures after medical and education costs were below 6,893 Tshs per month while a comparable man would be counted as food poor if his expenditures were less than 7,660 Tshs. However, a rural man aged 19 to 59 living alone would be counted as food poor if expenditures were less than 9,574 Tshs. Clearly, the poverty rate for the elderly will be calculated to be lower, whenever the poverty line for the elderly is set lower.

There is a large literature on the calculation of equivalence scales, much of which relies on econometric analysis of observed household expenditure data. One approach (ascribed to Engel) to estimating the total consumption expenditure corresponding to equal levels of utility for households with different characteristics is to assume that the food share of total expenditure is the same at the same level of household utility. If so, then one can use the increment in total household expenditure when household membership changes, holding constant the food share, to impute the ‘adult equivalent’ cost of each demographic type. Alternatively, the Rothbarth approach assumes that the adult goods share of total expenditure is constant at similar levels of household utility. However, all this literature starts from the prior assumption of equal sharing of utility within households. Although econometric analysis of observed expenditure patterns can, for example, reveal how much actual household expenditure on food does change, on average, when a household includes an elderly woman, it cannot reveal if that simply embodies a general pattern of systematic disadvantage – i.e. family food spending patterns may just reflect the fact that older women are, on average, hungrier than other household members<sup>14</sup>.

When people live in larger households, the differences between men, women, children and the elderly in individual equivalence scale assumption are averaged across household members

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<sup>12</sup> WDI: PA.NUS.PRVT.PP

<sup>13</sup> Children under age 8 receive lower equivalent adult weight than the elderly – e.g. boys under 4 count as 0.4 EA. See Data Appendix (2) or HBS2007 Appendix A.

<sup>14</sup> For example, Seebens (2008) has 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 a systematic under-counting of women in equivalent adult units.

in calculating the total number of adult equivalents in each household. Hence, the equivalence scale assumption will affect poverty calculations most strongly for one and two person elderly households. 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%). However, although Table 1 showed the elderly living alone to be particularly likely to report “always/often without enough food to eat”, the official poverty rate calculations imply this household type had half the food poverty line poverty rate of the general population, as Table 3 shows.

**Table 3**  
**Living Arrangements**  
**& Official “Food Poverty” Poverty Rate**  
**Mainland Tanzanians over 60 – 2007\***

	<u>Percentage elderly Living:</u>			<u>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>	3.9	3.3	3.4			
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>	5.3	4.7	4.9			
with other Adults (25-59)	64.8	56.1	60.3	0.17	0.17	0.17
<i>(Average household size)</i>	6.7	7	6.8			

How then should one assess the relative income or expenditure ‘needs’ of individuals? This paper uses the information about subjective food adequacy contained in the VoP2007 and HBS2007 surveys and combines it with the assumption 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. It then asks how far up the distribution one has to go before respondents stop reporting that they “always/often” or “sometimes” do not have enough food – one could call these consumption levels 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 question<sup>15</sup> is asked, but 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 “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 19<sup>th</sup> 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).<sup>16</sup> If medical expenses, rent, school tuition, etc are excluded<sup>17</sup>, the 19<sup>th</sup> percentile is at 18,187 Tshs. By either calculation, the “Always/Often Hungry Borderline” is somewhat under twice as high as the food poverty line of NBS for rural areas (9,574 Tshs).

The NBS calculations omit the cost of cooking fuel and ignore the percentage of purchased food which is lost to spoilage or other waste. As well, even when it means going hungry, people need to spend money on non-food items – e.g. shelter and clothing. However, the discrepancy between the “Always Hungry Borderline” and the Food Poverty Line is much too large to be explicable solely by such issues. A more direct reason is likely the inadequacy of the NBS criterion of 2,200 calories as a daily standard in a country in which most people work hard physically to make a living.

Recommended calorie intake varies with height, weight, age, gender and 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)<sup>18</sup>. 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

<sup>15</sup> “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 B2 illustrates, the wording differences are not very important for the ‘always/often’ response, but do make quite a large difference for the ‘sometimes’ response.

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

<sup>17</sup> Variable expadeqx\* adulteql1 in HBS2007

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

“always/often” not enough food, even at household income levels much higher than the ‘food poverty line’.

The current poverty line methodology of the NBS attempts to account for differences in food prices (prices in Dar es Salaam / other urban areas / rural areas are assumed to be in the ratio 1.069 / 0.941 / 0.787). However, the NBS makes no attempt to account for differences in calorie needs due to physical labour. Arguably, this methodology discriminates particularly against rural areas, where so many people engage in physically demanding agricultural labour.

Table 4

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

	<u>VoP2007</u>		<u>HBS 2007</u>	
	% "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

### 3. Imputing Consumption within Households – Methodology and Results

To estimate the command over resources of people who may not share equally in total family resources we use the fact that the VoP2007 and HBS2007 data both contain an indicator of individual deprivation (those who report “always/often” and “sometimes” not having enough food) and have many other variables in common. However, the money value of income or consumption is not in the VoP2007 data. Hence, we 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 of the probability of always/often “not having enough food” and we use the coefficients from those regressions (as reported in Table 5 - see appendix) to predict the probability of food constraint for individuals sampled in the HBS2007<sup>19</sup>.

Table 5 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 presented in Table 5, we compute for each person the calculated probability  $P^*$  of ‘always/often’ not having enough food to eat<sup>20</sup>. We can then order all elderly persons in sequence of the calculated probability  $P^*$  of ‘always/often’ not having enough food to eat, and we can do this separately for those living in Dar es Salaam or not.

For how many elderly individuals is the probability ( $P^*$ ) of ‘always/often’ not having enough food to eat an operative constraint on their well-being? 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. To model the consumption, within households, of non-DSM elderly individuals 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. Hence we assign the worst off 19% of the elderly (as ordered by  $P^*$ ) a consumption level (which can be called  $C^*$ ) corresponding to the consumption level of the equivalent rank of the 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 10<sup>th</sup> percentile.

<sup>19</sup>In doing so, we are not answering the substantive question: “What causes food scarcity for individuals?” Rather, our procedure addresses the 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.

<sup>20</sup> 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 Table 4.

However, food deprivation may happen either because all persons in the household share equally in a very low income or because the elderly person shares unequally in household resources. 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  $C^* > E^*$ , we assign the elderly person  $E^*$  (this is the case where the elderly are hungry because everyone in the family is hungry). If  $C^* < E^*$ , 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.

In making these calculations, we start with the simplest case – each person counts 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. Alternatively, if the number of adult equivalents in a household depends only on the number of household members<sup>21</sup>, it is also possible to separate total household equivalent income from the distribution of income within a household.

However, an age/gender based methodology for calculating the number of equivalent adults in a household (as used in the NBS poverty calculations) has the implication that total household equivalent income depends on the distribution of resources within households. When, for example, 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. Hence, 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 NBS methodology assumes that some types of individuals are more efficient than others in producing equivalent income from income. Maximization would require allocating all resources to those household members with the largest value of  $(1 / EA)$  – i.e. for the NBS scale, infants 0 to 2, for whom  $EA = 0.4$ .

How much difference does unequal sharing with the elderly make to estimates of the level of poverty?

Assuming equal sharing and also assuming that unequal shares within the family can be modelled as described above, Table 6 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).

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<sup>21</sup> As in the LIS equivalence scale, which calculates the number of equivalent adults in a household as the square root of household size.

The results of Table 6 can be fairly succinctly summarized – in Tanzania in 2007, the assumption of equal sharing within households makes relatively little difference to estimates of poverty indices for the population as a whole, for either equivalence scale assumption. Table 6 also indicates 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.

Table 6

## Poverty Impacts and equivalence scales

	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

#### 4. Discussion and Conclusion

This paper provides some more evidence that gender-based disadvantage is far from simple. In Tanzania, rural women over 60 report being more often deprived, but, as already noted, in aggregate women are less likely than men (12.9% compared to 14.5%) to report in VoP2007 “always/often” not having enough food to eat<sup>22</sup>. Food access within Tanzanian families is clearly a more complex issue than a simple story of gender disadvantage might imply. In focussing attention on the food deprivation of elderly rural women in Tanzania, this paper does not have a simple message of gender disadvantage<sup>23</sup>.

Inequality in access to resources within the family or household is difficult to measure directly, so researchers have turned to indirect inferences – e.g. anthropomorphic data (e.g. height for age or weight for height), consumption pattern analysis or time use data<sup>24</sup>. Self-reports of food deprivation cannot replace these methods as indicators of intra-family inequality – but this paper has tried to demonstrate a methodology to illustrate that they can be a useful supplement.

When equivalence scales are sensitive to personal individual characteristics (i.e. not just to total household size), the assumption that sharing within households is unequal or equal *on a per equivalent adult basis* introduces into poverty measurement a simultaneous dependency between the equivalence scale chosen, the intra-household distribution of equivalent incomes, household composition and the level of total household equivalent income. The nature, and the importance, of equivalence scale assumptions to poverty measurement in a developing country context is therefore an issue which deserves more research. Specifically, the casual practice of using ‘calorie-counter’ equivalence scales and simultaneously assuming equal sharing per equivalent adult appears highly dubious.

This paper started by asking how much error might be introduced into measures of poverty in a low-income country by neglect of intra-household inequality. The answer appears to be not much in aggregate, but enough to affect important social policies.

Currently, Tanzania has no system of old age pensions or other public policy to deal with elderly poverty. A highly relevant issue for the possible priority of such public policy is the prevalence of poverty among the elderly. In the Tanzanian case, self-reports of food deprivation imply a greater incidence of deprivation among the single elderly than the official calculation of

<sup>22</sup> 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%).

<sup>23</sup> Motiram and Osberg (2010a) note that within Indian families, younger women have substantially less personal and leisure time than the household matriarch. The power and status of the mother-in-law clearly varies substantially across cultures.

<sup>24</sup> 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).



“food poverty line” poverty rates in Tanzania. The NBS ‘food poverty line’ equivalence scale, caloric needs and equal sharing per equivalence unit methodology implies that deprivation among the elderly is about average for Tanzania, while subjective food deprivation latter implies that it is greater, particularly for women. Given the potential importance for public policy priorities of these findings, it is disquieting that the difference in findings depends crucially on ‘technical’ equivalence scale assumptions and the *ad hoc* assumption of equal sharing.

However, although poverty estimates for specific demographic groups may be influenced by the equal sharing assumption, in Tanzania the elderly are too few in number for mis-estimates of their poverty to make much difference to aggregate totals. In Tanzania, as in other sub-Saharan African nations, the birth rate has fallen relatively little over the past half century, and the consequence is a young and rapidly growing population – in HBS2007 the median age was 19 and only 6.1 % of the population were 60 years of age or more<sup>25</sup>. Hence, one cannot expect that estimates of poverty for the entire population will be affected much by alternative assumptions about the income of the elderly. 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<sup>26</sup>, but this also implies that estimates of the magnitude of elderly poverty are swamped, in aggregate data, by the level of poverty among younger cohorts.

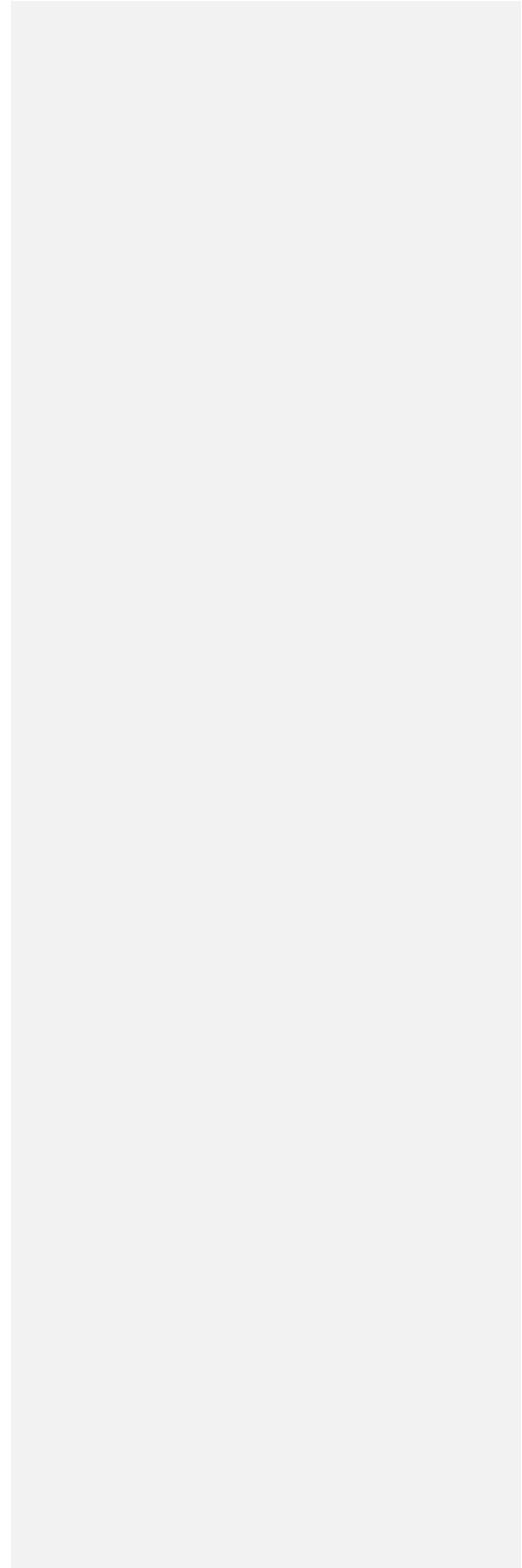
Nevertheless, since the alternative to growing old is dying young, in some sense everyone hopes someday to be old. Although actual poverty among the elderly affects the current reality of only 6% of the Tanzanian population, perceptions of elderly poverty also influence the expectations of the other 94%. The hunger of old rural women is now felt directly by less than 1% of Tanzanians, but a majority of the population are female, and about three quarters of them are rural, so a much larger number now know that this is the life they can look forward to, in the long term.

The objective of this paper has been to assess how often estimates of elderly poverty in Tanzania – and in particular, the deprivation of older women – are driven by “technical” methodological choices. The conclusion is “sometimes quite significantly” – so the implication is that poverty analysts should routinely check the robustness of their conclusions to alternative data bases, income/expenditure concepts and assumptions about equivalence scale and intra-family sharing.

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<sup>25</sup>The UN estimate of the over 60 population is substantially 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>

<sup>26</sup> see Mboghoina and Osberg (2010)



## Data Appendix.

Table 5  
The Probability of Food Deprivation

Dependent variable: Dummy = 1 if “always/often not enough food to eat”; VoP2007 data

(P value in italics)

	OLS		Logit	
	Dar es Salaam	Non-Dar	Dar es Salaam	Non-Dar
Older women dummy	<b>-0.005</b> <i>(0.213)</i>	<b>0.009</b> <i>(0.004)</i>	<b>-0.063</b> <i>(0.333)</i>	<b>0.051</b> <i>(0.021)</i>
Age in years	<b>-0.002</b> <i>(0.534)</i>	<b>0.005</b> <i>(0.094)</i>	<b>0.014</b> <i>(0.812)</i>	<b>0.033</b> <i>(0.124)</i>
live alone	<b>0.0003</b> <i>(0.989)</i>	<b>0.01</b> <i>(0.748)</i>	<b>-0.108</b> <i>(0.85)</i>	<b>0.104</b> <i>(0.672)</i>
Number meals/day	<b>-0.084</b> <i>(0.000)</i>	<b>-0.038</b> <i>(0.001)</i>	<b>-1.195</b> <i>(0.000)</i>	<b>-0.292</b> <i>(0.000)</i>
Days fish/meat per week	<b>-0.003</b> <i>(0.243)</i>	<b>-0.02</b> <i>(0.000)</i>	<b>-0.088</b> <i>(0.261)</i>	<b>-0.188</b> <i>(0.000)</i>
Years education	<b>-0.004</b> <i>(0.311)</i>	<b>-0.016</b> <i>(0.001)</i>	<b>-0.118</b> <i>(0.22)</i>	<b>-0.131</b> <i>(0.000)</i>
Own table	<b>0.045</b>	<b>0.07</b>	<b>0.723</b>	<b>0.442</b>

	(0.013)	(0.000)	(0.035)	(0.000)
Own radio	<b>0.004</b>	<b>0.034</b>	<b>0.044</b>	<b>0.244</b>
	(0.765)	(0.018)	(0.888)	(0.023)
Own lamp	<b>0.017</b>	<b>-0.162</b>	<b>0.275</b>	<b>-1.66</b>
	(0.328)	(0.000)	(0.47)	(0.000)
Own bicycle	<b>0.011</b>	<b>-0.044</b>	<b>0.457</b>	<b>-0.366</b>
	(0.474)	(0.001)	(0.353)	(0.000)
House cement/brick	<b>0.017</b>	<b>-0.08</b>	<b>0.309</b>	<b>-0.722</b>
	(0.503)	(0.000)	(0.59)	(0.000)
constant	<b>0.203</b>	<b>0.409</b>	<b>-2.377</b>	<b>0.828</b>
	(0.023)	(0.000)	(0.232)	(0.202)
Sample size	1342	3640	1347	3640
R <sup>2</sup> (pseudo R <sup>2</sup> )	.06	.09	(.13)	(.10)

## Data Appendix (2)

## 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; URT

## Bibliography

Alderman, Harold, Pierre-André 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?* [The World Bank Research Observer](#), Vol. 10, No. 1 (Feb., 1995), pp. 1-19

Cantillon, Sara and Brian Nolan (2001) *Poverty within households: measuring gender differences using nonmonetary indicators* [Feminist Economics](#) vol. 7:1 pg:5

Ferreira, Fransisco and Martin Ravallion (2009) *Poverty and Inequality: The Global Context* Chapter 24 (pages 599 – 636) in [The Oxford Handbook of Economic Inequality](#) Wiemer Salverda, Brian Nolan and Tim Smeeding (Editors) Oxford University Press, Oxford 2009

Findlay, Jeanette and Robert Wright (1996) *Gender, poverty and the intra-household distribution of resources* [The Review of Income and Wealth](#) 1996 vol:42 issue:3 pg:335

Haddad, Lawrence and Ravi Kanbur (1990) *How Serious is the Neglect of Intra-Household Inequality?* [The Economic Journal](#), Vol. 100, No. 402 (Sep., 1990), pp. 866-881

Lloyd, Cynthia B and Anastasia J. Gage-Brandon (1993) *Women's Role in Maintaining Households: Family Welfare and Sexual Inequality in Ghana* [Population Studies](#), Vol. 47, No. 1 (Mar., 1993), pp. 115-131

Mboghoina, Thadeus and Lars Osberg (2010) *Social Protection of the Elderly in Tanzania: Current Realities and Future Implications*, Special Paper 10/5, REPOA, Dar es Salaam, 2010

Motiram, Sripad and Lars Osberg (2010a) “Gender Inequalities in Tasks and Instruction Opportunities within Indian Families” [Feminist Economics](#) – Vol. 16(3), July 2010, 141–167

Motiram, Sripad and Lars Osberg (2010b) “Social Capital and Basic Goods: The Cautionary Tale of Drinking Water in India” with Sripad Motiram –, [Economic Development and Cultural Change](#) October 2010, Vol. 59, No. 1: pp. 63-94

Miguel, Edward (2005) *Poverty and Witch Killing* [The Review of Economic Studies](#), Vol. 72, No. 4 (Oct., 2005), pp. 1153-1172

Lars Osberg, Jiaping Shao and Kuan Xu (2009) “The Growth of Poor Children in China 1991 - 2000: Why Food Subsidies May Matter”, [Health Economics](#), April 2009; Vol. 18 Suppl 1:S89-108.

Phipps, Shelley A. and Peter S. Burton (1995) *Sharing within Families: Implications for the Measurement of Poverty among Individuals in Canada* [The Canadian Journal of Economics](#) Vol. 28, No. 1 (Feb., 1995), pp.

Ravallion, Martin (1996) *Issues in Measuring and Modelling Poverty* [The Economic Journal](#), Vol. 106, No. 438 (Sep., 1996), pp. 1328-1343

Holger Seebens (2008) *Household food expenditure, female headed households, and the estimation of equivalence scales* University of Gottingen 2008

Define:

$EA_i$  = equivalence scale used for person of age / gender type i

$N_i$  = number of persons in household of age / gender type i

$EA^* = \sum_i EA_i * N_i$  = total number of equivalent adults in household

$Y_i$  = total income of persons of age / gender type i within household

$Y^* =$  total income of household =  $\sum_i Y_i$

$Y^{EA} =$  equal adult equivalent income =  $Y^* / EA^*$

$= \sum (Y_i / N_i)$