The more the merrier? Fertility and food insecurity among older Senegalese women

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ABSTRACT
The number of children women have is a critical determinant of their future well-being. Often, adult children confer some protection against adverse conditions in their older ages. In many sub-Saharan African societies, it is expected that older women who typically have had many children, will benefit from their investment in children. Yet it is unclear if this is really the case. Using data from the 10 per cent micro-sample of the 2002 Senegalese Population and Housing Census, this study investigates the effect of the childbearing histories of older women (aged 60–85) on the likelihood that their households experienced food insecurity in the past year. Women who had had no children and those who had ever had two or more, were not significantly different from those who had had five or more – only those who had had one child were adversely affected. Based on principles of inter-generational altruism and moral obligation, I expected that food insecurity would decrease with increases in the number of surviving children. This pattern was generally found. However, among women in the bottom 40 per cent of the wealth distribution, the relationship was, at best, weak with respect to all of the fertility variables (children ever had, living, co-resident). The benefits of high fertility seem to accrue to relatively richer women – those in the top 60 per cent of the wealth distribution. Yet among these richer women, having fewer than three children and co-resident adult children were significant risk factors of food insecurity.

KEY WORDS – food security, fertility, older women, sub-Saharan Africa, Senegal.

Introduction

Parenthood is normative in all societies mainly because of the emotional and cultural benefits. Children not only provide parents with friendship and affection, but they also provide instrumental, and economic support, to varying degrees throughout the relationship. The costs and benefits of having and raising them are, however, valued differently in traditional

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and modern societies. A case in point is the benefit of relying on children for some form of care in the older ages, especially after parents retire from income-generating work. While all societies support such expectations, it has been suggested that in developing societies, this expectation may be valued quite highly and may itself fuel personal desires to have many children or to have a particular sex composition (Caldwell 1977; De Vos 1985; Jellal and Wolff 2002; Nugent 1985). The problem with such high valuations is that the children may not have the socially advantageous sex, they may die, may be economically incapable or may not be altruistic in the end; and the most productive years of children are so far into the future, it is difficult to determine fully whether such expectations will be realised when parents are actually having them. The decision about the number to have becomes very consequential; especially for women who bear more costs than men in health, foregone employment and income. In poor societies, women may benefit from having many children because they lack alternative means of old-age support (Nugent 1985; Seebens 2009). Yet not all adult children may be helpful at that point in life and the social costs of 'extra' children which may be trivial to them, may be costly to society. So if it can be shown that there may be diminishing welfare returns to high numbers of surviving children for older individuals and that the excess fertility causes adverse social outcomes for subsequent generations, social programmes may have grounds to promote the idea that old-age security through children need not be incompatible with lower fertility levels. If, on the other hand, high fertility seems necessary for individuals' future welfare in such societies, then there may be greater impetus for governments to provide viable alternatives to children; given that the world population is rising. It is therefore important to understand the contribution of family size to the welfare of older women in such societies.

In this study, I utilise data from the 2002 Senegalese Population and Housing Census to examine the relationship between actual childbearing histories (not just motives) and a future welfare outcome, food insecurity, among Senegalese women aged 60–85 years. Understanding the relationship in an African context of high fertility is relevant for many reasons. First, there are important demographic and socio-economic ramifications. Although the proportion of sub-Saharan Africans older than 60 years is currently smaller than any world region, the built-up population momentum accompanying the ongoing demographic transition indicates that population ageing may proceed at relatively fast rates in the future (Velkoff and Kowal 2002). With improvements in life expectancy, older African women will constitute a larger fraction of the population of older people, and are likely to bear the larger share of the problems associated with

inadequate public welfare systems. Africa's population ageing is also occurring amidst low levels of economic development which raises multiple concerns, one of which is that excessive childbearing may stymie women's ability to escape conditions of poverty even in their older ages. African women tend to be poorer than men at older ages due to factors such as lower levels of formal education, disproportionally higher spending on their households, inequitable production and inheritance systems, and higher rates of widowhood (Duflo and Udry 2003; Pfeiffer, Gloyd and Ramierez Li 2001; Seebens 2009; Warner and Campbell 2000). Besides health challenges, which tend to limit their food production or acquisition, older women are particularly susceptible to adverse changes in their income situation, and often have few external opportunities for expanding their economic resources; except through their children, social networks and the State. Naturally, their adult children would be the first avenue of support for financial and instrumental resources. However, fundamental changes in family arrangements in the last few decades have disproportionately impacted them more than men. For example, older women continue to maintain responsibilities as primary care-givers to their HIV/AIDS-affected children and grandchildren (Joint United Nations Programme on AIDS 2006; Ogunmefun and Schatz 2006). Furthermore, current evidence also suggests that children who have functioned as safety nets for old-age support in Africa are no longer able to give much support due to forces of modernisation, unemployment and migration of adults to urban areas (Cohen and Menken 2006; Ezeh *et al.* 2006). Yet, there is also evidence suggesting that older Africans' subjective assessments of individual welfare may be positively correlated with the number of children they have (Kodzi *et al.* 2011). Such pieces of evidence beg the question of whether adult children provide mostly psychological benefits or also tangibly contribute to their parents' health and economic welfare. Relatively little is known about this issue.

Secondly, not much is known about how children may contribute to alleviate food insecurity problems, in particular among older women in the region. In developed societies, older folks are highly vulnerable to adverse health pressures related to inconsistencies in food supply. In general, older people experience higher rates of food insecurity than younger adults (Charlton and Rose 2001; Nord 2002). Food insufficiency leads to dietary problems which have consequences for their mental health and physical functioning (Hadley and Patil 2008; Heflin, Siefert and Williams 2005; Mowe, Bohmer and Kindt 1994). Among older people, food insecurity worsens chronic diseases and increases vulnerability to degenerative diseases, delays recovery from illnesses and contributes to poor quality of life, which ultimately reduces their lifespan (Habicht *et al.* 2004; Nord 2002).

Needless to say, over the past several decades in sub-Saharan Africa, household food insecurity has grown into a major problem in many parts; Senegal is no exception. More than 60 per cent of Senegal's population of about 12 million is engaged in subsistence farming or fisheries which do not meet the basic food needs. The limited export revenues from fish, groundnut oil, cotton and fresh vegetables do not cover the cost of importing rice, the staple food consumed by most Senegalese (OECD Development Center 2008). More generally, the ability of many Africans, to grow or buy food for their households has waned over time (Feleke, Kilmer and Gladwin 2005; Nyangweso *et al.* 2007). More than 40 per cent of people in sub-Saharan African live on less than US $1.25 a day (Chandy and Gertz 2011). While other world regions have made significant progress, food security in Africa has worsened since the early 1970s and the proportion of the population which is malnourished has somewhat levelled at around one-third (Rosegrant *et al.* 2005). Besides young children, older African women are heavily affected (Charlton and Rose 2001; Muga and Onyango-Ouma 2009). Despite the need, studies on the food security of older people, which are relatively scarce in the social sciences, have mostly been based on restricted samples of older people in developed countries. Those conducted in Africa on household food security in general, and the few food security studies focusing on older Africans (Charlton and Rose 2001; Muga and Onyango-Ouma 2009), have not focused on the effects of own fertility, as compared to household composition. This study aims to fill these gaps.

Individuals and households are said to be food insecure when they lack or cannot afford or access safe and nutritious food at all times (Anderson 1990; Lee and Frongillo 2001*a*). In the census, each household was asked whether in the preceding 12 months they had ever skipped a meal due to lack of resources. Studies on the concept of household food insecurity have identified a pattern in its severity across different social contexts. This pattern generally begins with anxiety about food, then evolves into lack or shortage of stored food, decrease in the quality and diversity of the diet, reduction in the quantity of food eaten per meal, skipping meals and going hungry for a day or more (Coates *et al.* 2006; Habicht *et al.* 2004). Usually, there is a slower progression to the level of going hungry for young children because their mothers tend to shield them from food insecurity. The buffering dynamics, however, change when children become adults and parents reach older ages. Thus, the census question of ever skipping meals due to lack of resources adequately captures the expected family dynamics. Conceptual reasoning backed by extensive international evidence on the existence of intergenerational support would suggest that the number of children is likely to be associated with food insecurity. Therefore in this

study, I estimate differences in household food insecurity using relevant regression adjustments and tease out fertility effects while accounting for a number of salient determinants. I posit that the probability of older women experiencing food insecurity is likely to decrease with the number of surviving children living away or co-resident with them, because food is such a fundamental need. In that regard, I hypothesise that the number of children may be more important for poorer women than richer women who are able to take care of their own food needs. Even though I include a thorough conceptual discussion, my empirical analyses do not focus on the lifecourse mechanisms linking fertility to future food insecurity due to limitations of the census data, but I provide valuable insights about the fundamental nature of the association in a typical sub-Saharan African society.

Women's fertility and food security in later life

Food security is influenced by a variety of factors including the environment, farming practices, technology, government policies and household income. Studies on households of older people suggest some explanatory factors affecting food security, namely the availability of economic resources, social resources, functional health and disabilities, among others (Habicht *et al.* 2004; Lee and Frongillo 2001*b*; Wolfe *et al.* 1996, 1998). More directly, current income, the transitory component of an individual's wealth, is believed to be highly related to household food security. Current income in older ages is affected by accumulated assets, lifetime savings, current employment, and transfers from adult children and others. Naturally, fertility and later-life food security are intricately linked to the above factors – while lifetime fertility affects all the factors, transfers (income supplementation and food supplies) can only come from surviving children. The availability of current income is also highly gendered among older people (Plotnick 2009). In traditional societies, women in general are more likely than men to enter older ages with less savings, or means of production, partly because in the younger years women disproportionally spend their resources on their children's needs (Pfeiffer, Gloyd and Ramierez Li 2001; Seebens 2009).

Child-related expenditures are likely to increase with the number of children had. In addition, dropping out of the labour force or underemployment due to pregnancy-related morbidity and child care may negatively affect women's cumulative experience and competitiveness for jobs in later years. Yet, considerable international evidence has established that substantial amounts of support (financial and other forms of material support) flow from adult children to parents. Various theoretical explanations have

been propounded for why intergenerational transfers occur, including altruism, moral duty on the part of children, power dynamics over means of production and *quid-pro-quo* motivations (Caldwell 1977; Cox 1987; Lee, Parish and Willis 1994). Given some motivation, at least one child is likely to supplement the mother's food resources and such support is likely to increase with the number of children. This expectation is plausible for number of reasons. While the likelihood of 'free-riding' may increase with the number of children, where each child feels a sense of obligation to take care of their parents, they are likely to perceive their individual contributions to be smaller when they have more siblings than when they have fewer siblings to share responsibilities with. As Bernheim and Stark (1988) point out, with larger numbers of children, the probability of children teaming up to evade responsibilities is likely to be reduced. Especially if the children expect bequests from parents and approval from society, it is more likely that the children will rather compete. If receiving favours is a major motivation for children, then richer parents are likely to receive more support from their children than poorer parents. However, if altruism or moral duty is the major motivation, poorer parents may benefit more from such support than richer parents (Freedman *et al.* 1991). But obviously, the availability of support is also a function of the children's ability to give support.

The ability to support will depend on how economically successful the children turn out to be. Studies suggest that in recent decades many adult children in Africa are not able to give much support to their parents (Cohen and Menken 2006; Ezeh *et al.* 2006). In countries hardest hit by HIV/AIDS, the morbidity and mortality from the disease has especially deprived older women of the contributions from some of their children and kin. What is more, in some households, orphaned grandchildren become their primary responsibility (Nyambedha, Wandibba and Aagaard-Hansen 2003; Ssengonzi 2007). These developments suggest that older African women may be receiving less material and financial help from children, but may rather be living in situations where they continue to absorb the basic care needs of dependent adult children, grandchildren and other extended family members. It is observed that due to so-called poverty–fertility traps, women who have many children are typically more likely to have poor children who may be limited in their contributions or may rely on parental resources (Schultz 2006). Such pressures on economic resources potentially also increase with the number of surviving children.

Yet, to command resources sufficient for food security, other factors should be considered in addition to current income adequacy, because welfare is an increasing function of several other capabilities (Alkire

2011; Sen 1992). Non-income contributors may, for example, include family labour and relational resources. Food insecurity is one area where the ageing process strongly interacts with social behaviour to determine welfare. In particular, social isolation[1] has specifically been observed to be an important determinant of food insecurity among older people in Western societies (Dean and Starkey 2011; Quant *et al.* 2000). In older ages, supportive relationships with husbands and children provide the closest safety net against isolation; especially through arrangements like intergenerational co-residency. Superficially, co-residency with children may be expected to be positively correlated with food security; however, there are other complexities which muffle such positive expectations. As a welfare-maximising strategy, parents may choose to live with economically well-off children but they may do so for other reasons.

Likewise, 'richer' children may also elect to stay with their parents and may populate their parents' household with their children who invariably contribute to the household's food demand and supply. Yet, it is possible that poorer children may also 'select' into their parents' household, especially if their parents are economically better off. In sum, the opportunity for co-residency potentially increases with the number of children; yet co-residency itself may have salutary or adverse effects depending on the role the mother plays within the household economy – whether she is a dependant or not. If she is a dependant, she may be better off with more co-resident children but if she is the host, she is likely to be adversely affected by the presence of her own children (and grandchildren).

Besides co-residency, children may affect the accumulation of other sources of social capital over the lifecourse. Unlike Western societies which generally define households within a nuclear family context, traditional African households are generally organised around the extended family. The communal living arrangement facilitated by the extended family system, for example, not only promotes social integration in older ages but also affects the demographic composition and resources within the household. The demographic composition of a woman's household in later life may be influenced by the woman's fertility history. It is possible that women who had fewer children invest more in extended family relationships but there is no telling which direction the effects of fertility on extended family resources should go. By and large, one can expect that apart from the contribution of own children, the total number of other household members old enough to contribute to the household economy will be a critical positive determinant of food security.

Apart from the above channels, women can choose to work to avoid food insecurity; in that regard, physical and mental functioning will be critical whether they work for money or in exchange for other services (Lee and

Frongillo 2001a). Therefore, among older people especially, the presence of functional impairments is likely to hamper their household food security. A natural question is whether prevailing impairments are related to child-bearing or childrearing. There is scanty evidence supporting this linkage from developing countries (*see e.g.* Engelman *et al.* 2010) but the evidence from developed countries, although inconsistent, generally suggests a U-shaped relationship between the number of children had and later-life health and mortality outcomes (Grundy and Kravdal 2010; Read, Grundy and Wolf 2011; Smith, Mineau and Bean 2002; Spence 2008). That said, the effect of women's functional impairments on their household's food security will also depend, in part, on when the impairments developed during the lifecourse, as the timing may not only affect the ability to save money but may also affect the number of children and their opportunities to develop human capital. In the older ages particularly, the most direct way children can affect their mothers' functionality is by providing support necessary for alleviating accumulated health problems; thus freeing her from work. In general, given there are limits to how much children can contribute, households of functionally impaired older women may be worse off due to the limited contribution of their own supplemental resources.

Besides the above factors, previous research has shown that household food security is associated with a number of other factors, some of which may also be related to the number of children or may have independent effects. Many of these are accounted for in my empirical models and will be explained in the next section.

Methods

Data

I used data from the 10 per cent micro-sample of the 2002 Senegalese Population and Housing Census available from the Integrated Public Use Microdata Series Project (Minnesota Population Center 2011). The census provides a unique opportunity in its coverage of household food security, together with some reproductive characteristics and living conditions of older women. The estimation sample comprised 15,606 women aged 60–85 years living in 14,571 single-family households – 21 per cent were household heads, 23 per cent were wives of heads and 38 were mothers of the heads (*see* Table 1). The average age of the sample was 67.5 years (standard deviation = 6.67 years). Almost all the women had no formal education (97%). A little less than two-thirds of the sample lived in rural areas. They were also mostly married women (61%). These women mostly lived communally with about two-thirds of them living with at least one adult

TABLE 1. *Distribution of the characteristics of older women by estimation samples (column total)*

Variables	Bottom 40% of wealth distribution	Top 60% of wealth distribution	All households of women aged 60–85 years
	Percentages		
Ever skipped meals due to lack of resources	43.57	31.36	36.23
Number of children ever born:			
None	5.76	5.79	5.77
One	6.67	6.53	6.59
Two	7.69	7.14	7.36
Three	8.40	8.78	8.63
Four	9.33	9.21	9.26
Five or more	62.15	62.55	62.39
Number of surviving children:			
None	7.63	7.50	7.55
One	9.22	8.18	8.60
Two	10.97	9.96	10.37
Three	13.14	12.74	12.90
Four	14.12	13.71	13.88
Five or more	44.91	47.90	46.71
Number of adult children living in household:			
None	29.37	29.90	29.69
One	30.96	28.03	29.20
Two	17.63	16.34	16.85
Three	10.27	10.93	10.67
Four	5.35	6.13	5.82
Five or more	6.43	8.67	7.78
Mean number of other family members in household	9.41 (6.35)	9.76 (7.12)	9.62 (6.80)
Mean age (years)	67.27 (6.62)	67.59 (6.58)	67.46 (6.67)
Woman's educational attainment: no school	98.18	95.47	96.55
Woman is functionally limited	6.62	5.55	5.98
Relationship to household head:			
Head	18.16	22.49	20.77
Wife	22.32	23.24	22.87
Parent	41.13	35.72	37.89
Sibling	4.03	3.25	3.56
Grandparent	3.05	2.90	2.96
Other relative or unknown	11.31	12.39	11.95
Household head employed in the last year	22.69	18.35	20.08
Educational attainment of head: no school	99.08	96.55	97.56
Relative household wealth position:			
Richest	–	30.86	18.56
Richer	–	32.20	19.36
Middle	–	36.94	22.21
Poorer	47.54	–	18.96
Poorest	52.46	–	20.92
Type of place of residence: urban	41.21	36.77	38.54
N	6,224	9,386	15,606

Note: Standard deviations are given in parentheses.

child and several extended family members. The majority of the women (62%) had had five or more children, and nearly half (47%) still had five or more surviving children. Only 6 per cent of the sample had never had a child and 8 per cent were childless at the time of the census.

Empirical strategy

In conceptualising how children affect their mothers' later-life welfare outcomes, especially within high-fertility contexts, a general concern is that parents' family size preferences and fertility behaviour may have been motivated by concerns for their future welfare. However, it is almost impossible to measure correctly all earlier life circumstances and motives that affected their family size preferences and fertility behaviour. Needless to say, the census data do not include much relevant retrospective life histories but this limitation does not pose significant problems for analytical clarity. With respect to fertility motives, most likely, such attitudes will be correlated with other measured characteristics of women (especially educational attainment) which can be accounted for in empirical modelling. This group is also largely homogenous with respect to educational attainment – 97 per cent had no formal education. More importantly, the data allow us to ascertain how the actual number of children ever born relates to old-age food insecurity. In addition, finding how the number of surviving children relates to future food insecurity will invariably provide the ultimate test of the utility of adult children for old-age security if cash or food transfers are the major channels – prior fertility motives will be unimportant at this stage of life. In a way, the question on food insecurity in a census setting provides an excellent opportunity empirically, as food security is truly a fundamental starting point for the study of all welfare outcomes. Lastly, these data specifically track how many surviving children live in their parent's household or away.

To estimate the odds of experiencing household food insecurity, I used binary logit regression models of the form:

$$\ln\left(\frac{p}{1-p}\right) = b_0 + b_1 N + b_2 \mathbf{X} + e,$$

where p is the probability that the older woman lives in a household where meals had been skipped at least once in the past year due to lack of resources. The census records the number of children ever born, the number and sex of surviving children for each woman, together with the number living in her household at the time of the census. For brevity, N represents the number of children – in different models, it represents

children ever born and surviving, and it is coded categorically from no children to five or more. **X** is a vector of household and personal characteristics. The *b* values are the coefficients of the explanatory variables; with the b_1 coefficients of substantive interest. In the models, I compare the effect of having five or more children to other fertility levels. Categorising the number of children this way is prudent as the effects of additional children may be non-linear. Table 1 presents the distributions of the number of children ever born, the number surviving and the number living with their mother. In the regression models, I account for the few cases of clustering of women within households using robust standard errors. A few assumptions are noteworthy. In the analyses, I assume implicitly that once children are alive, they are all willing and able to help with food provision. This assumption is likely to be tenable as many studies document that children tend to support parents even for altruistic reasons. Also, I assume that sibling contributions are equal which is unlikely but cannot be tested with the available data.

In the estimation, I included a measure of household wealth status, the number of household members (other relatives and non-relatives) at different ages (5 or less, 6–10, 11–17 and 18–59 years), and whether or not the woman was physically impaired, as determinants. These measures are likely to be good proxies for capturing the household or woman's situation when meals were skipped. A rich set of data on household possessions, and on access to basic amenities and modes of production was collected in the census, from which I computed a composite wealth index, measuring the household's relative wealth status using principal components analysis. This method of ranking households is commonly used in many developing country welfare studies (*see* Rustein and Johnson 2004). The battery of indicators include the type of water supply, mode of garbage disposal, mode of sewage disposal, type of toilet facility, wall material, roof material, floor material and the possession of various household durable assets and means of production such as television set, VCR, computer, radio, refrigerator, cellphone, land phone, cart for farming, traditional boat, horses, oxen, tractor, car, motorcycle, sewing machine, grain-shelling machine and others. As rural and urban households tend to have different dimensions for measuring relative wealth status, I calculated the wealth rankings for rural households separately from urban households. I then combined the quintile categories across both rural and urban settings. In addition, to capture fully the effect of the socio-economic status of the household, I also included the level of education and employment status of the household head (whether he or she had ever worked in the past year). Not all (only those who were household heads) the women were asked about their employment status; limiting the inclusion of this variable.

Women who had disabilities such as blindness, deafness, lower and upper limb and mental disabilities were captured as functionally impaired with a binary variable. I also control for age which might capture some of the biological dimensions of physical limitations. Age is included as a continuous variable. I also included several personal and household factors as covariates – the role of the woman in the household economy (whether she was the household head, living with her husband, or a dependent living with a child or other relative), the region of residence (capturing the geographic dimensions of food insecurity), and whether the household is located in a rural or urban area are important covariates of household food insecurity. A factor like place of residence may be regarded as a confounding variable if the woman has lived in that place during the years she had her children, it may also act as a covariate if she recently moved to the area; however, the data do not allow for such analytical distinctions to be made. In line with the literature, I expect that the households of more educated household heads will be more food secure than the uneducated due to their higher levels of human capital and associated permanent income.

Married women living with their husbands are also more likely to be better off than unmarried women due to additional support from spouses. Studies also document variations in food availability across rural or urban settings. Studies show an urban advantage in food availability and diversity and rural African settings are notably more food insecure than urban settings (Dean and Sharkey 2011).

Results

Table 1 clearly shows that household food insecurity is a serious problem in Senegal – 36 per cent of the households of older women experienced food insecurity in the past year. This proportion is almost similar to the equivalent proportion for the entire country, 35 per cent. Nearly half of the poorest 20 per cent of households experienced food insecurity compared to about 15 per cent of the richest (top 20%) households (not shown). Table 2 presents the results from the logistic regression models predicting the probability that an older woman experienced food insecurity in the past year. The table presents estimates of the odds ratios and significance levels. In all models, one observes that the main explanatory factors characterising food insecurity were the household's socio-economic position (as captured by household wealth and formal educational attainment of the head), geographic location, that is, the region of residence and level of urbanisation, age composition (specifically, the number of working-age residents) and the physical health status of the woman.

Regarding the contribution of fertility, it is evident from Model 1 of Table 2 that, controlling for other determinants, the number of children ever born was associated with future household food insecurity, albeit very weakly. Model 1 suggests, however, that those who had only one child in their lifetime were significantly worse off than those who had five or more children. But there was no difference between women who had had no children and those who had ever had two or more as compared to those who have had five or more. As expected, the number of surviving children was significantly associated ($p < 0.05$), but accounted for a small proportion of the variation in food insecurity (Model 2). Because the effect of the number of surviving children may have direct and indirect effects through some of the variables included in the models (*e.g.* the wealth status, the age composition of the household), in preliminary analyses, I used decomposition methods appropriate for logistic regression models (*see* Buis 2010) to tease out such effects and found no substantive indirect effects of those variables in the models (not shown) – each predictor, including the number of surviving children, had an independent effect on the outcome. Thus, it is very likely that the main mechanism by which children impact their aged mothers' household food security is through income supplementation and/or foods supplies, which obviously would come from surviving children.

Furthermore, Model 2 suggests that older women with no surviving children and those with one or two children were the most adversely affected by food insecurity. The odds that these women experienced food insecurity were 1.20–1.30 times more than women who had five or more surviving children. The disadvantage decreased significantly for women with three children but the difference between three and five or more children is not statistically significant at conventional levels. Generally, a slightly decreasing pattern of risk is indicated with every additional surviving child. Holding all predictors at their means (*see* the 'average' line in Figure 1), the probabilities of experiencing food insecurity decreased by about 2 per cent between those with no surviving children and those with one surviving child, and again by about 2 per cent moving from one child to two surviving children. However, between those with two and three children, there was a 13 per cent drop in the probability of experiencing food insecurity. As seen in Figure 1, the households of women with four surviving children had slightly higher risks of food insecurity (about 10% more) than those with three children.

Further chi-squared tests of significance of the differences between successive numbers of surviving children among poorer and richer households (households in the bottom 40% of the wealth distribution and the top 60%[2]) in Table 3 show that in both sub-samples, significant differences

TABLE 2. *Effects of the number of children on household food insecurity, households of women aged 60–85, 2002 Senegal Population and Housing Census*

Variables	Model 1	Model 2	Model 3	Model 4
	Odds ratios			
Number of children ever born (Ref. five or more):				
None	1.061	–	–	–
One	1.209**	–	–	–
Two	1.031	–	–	–
Three	0.973	–	–	–
Four	1.076	–	–	–
Number of surviving children (Ref. five or more):				
None	–	1.236**	–	1.276**
One	–	1.205**	–	1.244**
Two	–	1.170*	–	1.201**
Three	–	0.949	–	0.968
Four	–	1.148*	–	1.164**
Number of own children in household	–	–	1.002	1.037*
Age (years)	0.993*	0.993*	0.993*	0.994
Head of household (Ref. a child is head)	1.132*	1.129*	1.129*	1.124*
Co-resident husband is head	0.908	0.906	0.906	0.906
Other relative heads household	1.024	0.995	0.995	1.061
Woman has functional disability	1.494***	1.490***	1.490***	1.492***
Other household characteristics:				
Head has primary education or higher	0.637**	0.644**	0.644**	0.640**
Head ever employed in the last 12 months (Ref. unemployed)	1.003	1.004	1.003	1.004
Wealth position of household (Ref. richest 20%):				
Poorest 20%	4.121***	4.100***	4.114***	4.092***
Poorer 20%	3.286***	3.283***	3.286***	3.277***
Middle 20%	3.412***	3.405***	3.412***	3.396***
Richer 20%	2.180***	2.177***	2.174***	2.174***
Number of household members <5 years	0.995	0.997	0.995	0.997
Number of household members 6–10 years	0.995	0.995	0.995	0.997
Number of household members 11–17 years	0.972*	0.972*	0.972*	0.972*
Number of household members 18–59 years	0.933***	0.935***	0.927***	0.927***
Household in urban area (Ref. rural)	0.407***	0.409***	0.408***	0.408***
Region of residence (Ref. Dakar):				
Djourbel	0.400***	0.396**	0.404***	0.396**
Fatick	0.568***	0.565***	0.567***	0.566***
Kaolack	0.831*	0.827*	0.835*	0.829*
Kolda	2.415***	2.385***	2.422***	2.397***
Louga	0.485***	0.484***	0.488***	0.485***
Matam	1.701***	1.697***	1.715***	1.709***
Saint Louis	1.414***	1.414***	1.419***	1.417***
Tambacounda	1.396**	1.373**	1.388**	1.384**
Thies	0.609***	0.607***	0.608***	0.608***
Zinguinchor	1.149	1.155	1.148	1.168
−2log likelihood	−8,968.729	−8,962.687	−8,965.399	−8,959.477
Pseudo-R^2	0.122	0.123	0.123	0.123

Note: N = 15,606 women, living in 14,571 households. Ref.: reference category.
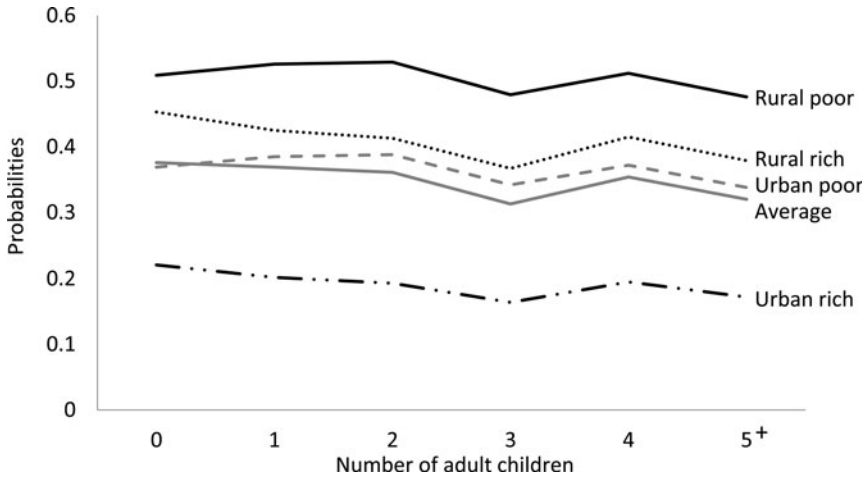*Significance levels*: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Figure 1. Predicted probabilities of household food insecurity by parity and socio-economic status.

TABLE 3. *Test of statistical significance of differences between successive numbers of surviving children*

	All prob $> \chi^2(1)$	Bottom 40% prob $> \chi^2(1)$	Top 60% prob $> \chi^2(1)$
None and one child	0.734	0.571	0.306
One and two children	0.656	0.923	0.602
Two and three children	0.003	0.049	0.037
Three and four children	0.009	0.162	0.014
Four and five plus children	0.002	0.055	0.023
All variables jointly: prob $> \chi^2(5)$	0.000	0.0524	0.0007

exist only between women who have two or more surviving children. Generally having one or no surviving children was a disadvantage for older-age food security. It is also striking that the number of surviving children was not a significant determinant of food insecurity among women in the bottom 40 per cent of the wealth distribution. Their fertility did not also seem to explain as much of the variability in food insecurity as it did for richer households.

As argued earlier, co-residency itself may have salutary or adverse effects on the woman's food security. One consistent finding, evident in all models, is that women were better off when they lived with a child as a dependant than when they were the household heads. Models 3 and 4 of Table 2 delineate the effects of the number of co-resident children in the household.

Model 3 includes the variable for the number of co-resident children without adjusting for the number of surviving children, and shows no impact. In Model 4, I aptly adjust for the number of surviving children to capture the idea that the more children a woman has, the more likely it will be that she has more children living with her in the older ages. Model 4 suggests that the odds of food insecurity increases by a factor of 1.04 with every additional child who lived in the household, net of the number of surviving children and other characteristics of the household. In other words, the more of her own children there were in the household, the worse off the household was.

Table 4 presents separate findings on co-residency effects for women in the two sub-samples (households in the top 60% of the wealth distribution and the bottom 40%). Note here that women in these two groups had similar characteristics by way of fertility histories. The nature of the effect of the number of children living in their mothers' households was more evident – there was a positive effect (although not significant) in poorer households but a significant negative and relatively strong effect in richer households. The odds for richer households were 1.08 times higher with every additional co-resident child. Richer women seem to have both beneficial and detrimental effects of high fertility. High fertility may predispose richer women to have additional support from their children in general, but they are also more likely to experience the negative effects of co-resident children. This finding may indicate that at least some of the adult children who co-reside with their mothers may depend on the household resources – naturally the case if children who are not economically well off choose to remain in those households.

Discussion and conclusions

It is extensively documented across all cultures that good health, sound finances and social support are the key determinants of individual welfare in the older ages. Differences in socialisation, family roles and economic opportunities, however, result in markedly different levels of these welfare determinants for men and women at this point in life. For example, even though women tend to live longer than men, they have a higher burden of morbidity. Women also tend to have less economic wealth than men in the older ages because of their reduced access to the opportunities of life that foster wealth generation – partly because they allocate resources to childbearing and rearing and often do not participate as much in the labour force (Denton and Boos 2007). They also tend to spend a disproportional amount of their income on their children (Seebens 2009; Pfeiffer,

TABLE 4. *Logistic regression odds ratios showing the effects of the number of living children on household food insecurity, households of women aged 60–85, 2002 Senegal Population and Housing Census*

Variables	Bottom 40% of wealth distribution	Top 60% of wealth distribution
	Odds ratios	
Number of surviving children (Ref. five or more):		
None	1.154	1.403***
One	1.244*	1.239*
Two	1.259*	1.168†
Three	1.017	0.943
Four	1.172†	1.182*
Number of own children in household	0.997	1.079***
Age (years)	0.998	0.992†
Head of household (Ref. a child is head)	1.215*	1.061
Co-resident husband is head	0.918	0.858*
Other relative heads household	1.102	0.950
Woman has functional disability	1.663***	1.362**
Other household characteristics:		
Household head has primary education or higher	0.817	0.494***
Head ever employed in the last 12 months (Ref. unemployed)	1.026	1.026
Number of household members <5 years	0.995	1.004
Number of household members 6–10 years	1.000	0.989
Number of household members 11–17 years	0.957*	0.975
Number of household members 18–59 years	0.937***	0.902***
Households in urban area (Ref. rural)	0.539***	0.305***
Constant	1.750	1.974*
Pseudo-R^2	0.063	0.126
N	6,224	9,382

Note: Coefficients are adjusted for region of residence. Ref.: reference category.
Significance levels: † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Gloyd and Ramierez Li 2001). In the end, they may also have poor welfare outcomes because they receive low returns on their investments in children. Then again, women may benefit greatly from financial and social support, particularly through their investments in children; and the more children they have raised, the better their chances may be. In societies where public welfare support systems are inadequate, adult children may confer some protection against adverse conditions. Such is the situation in sub-Saharan Africa where it is expected that older women benefit from their children both in terms of instrumental and financial support. Yet little is known about how children contribute to the welfare of the growing

number of older African women who have typically had many children. Their subjective assessments of life satisfaction seem to increase with the number of children; however, objective evaluations of later-life welfare are scarce (Kodzi *et al.* 2011). Using data from the 10 per cent micro-sample of the 2002 Senegalese Population and Housing Census, I investigated the effects of the fertility of older women (aged 60–85) on the likelihood that their households experienced food insecurity in the past year. Since food is a fundamental need, based on principles of intergenerational altruism and moral obligation, I expected that the chances of household food insecurity will reduce with increasing numbers of living children. I also hypothesised that poorer women may benefit more from a higher number of surviving children than richer women.

I found that the number of children the women had ever had seemed to have a weak association with later-life food insecurity. This finding seems to indicate that parenthood in and of itself does not seem to confer serious food security advantages in later life. Childless women were not significantly different from those who had had five or more children. On the contrary, only women who had had one child were significantly worse off than those who had had five or more children in their lifetimes. Most likely, to the extent that family resources matter, the advantages will be related to the number of living children and significant relatives in the lives of the women. Accordingly, in these data, the number of surviving children was a stronger determinant than the number ever born. Food insecurity slightly decreased with increases in the number of surviving children. Women with no surviving children and those with one or two were the most affected by food insecurity. The odds that these women experienced food insecurity were 1.2–1.3 times more than women who had had five or more living children. The data also showed that the household's socio-economic status, the number of working-age adults living in the household, the physical health of women and their geographic location (region of residence and whether rural or urban) were the most important determinants of food insecurity.

Considering a variety of welfare indicators, empirical studies from different societies (developed societies especially) suggest that, generally, older people who have never had children are not worse off than those who have been parents (*e.g.* Chang, Wilber and Silverstein 2010; Hank and Wagner 2013; Hansen, Slagsvold and Moum 2009), but this may not be concretely said of women (*see* Plotnick 2009) and of people living in developing societies for whom the evidence is really scanty. However, among parents, a few studies have indicated that the number of children matter although the benefits are not necessarily linear. In rural China, for example, Guo (2013) found positive effects of the number of adult children on their parent's

psychological health. Likewise, Grundy and Read (2012) found that social contact and instrumental help increased with the number of children during late parenthood in the United Kingdom. Therefore, to the extent that adult children are willing and able, they could be an important source of old-age support for the parents – especially those in need. Paradoxically, although the fertility variables in these data did not explain so much of the variance in household food insecurity, a weaker association was found among women in the bottom 40 per cent of the wealth distribution than the top 60 per cent. Even the number of co-resident children was not related to food insecurity at conventional levels of statistical significance among these poorer women. Although this finding may appear somewhat counter-intuitive, it may be consistent with diverse pieces of evidence on the existence of intergenerational poverty traps where both parents and children are caught in a web of economic disadvantages that persistently perpetuate low standards of living. It is not far-fetched to conclude that in the end, what really matters for welfare in the older ages, is whether the adult children are economically better off than their mothers. Excess fertility may stifle this end.

In these data, the benefits of children seem to accrue to richer women – those in the top 60 per cent of the wealth distribution. Among the richer women, having no living children or less than three, and co-resident children were significant risk factors. The findings clearly show that co-residency benefits older women when they are dependants in a child's home, not when they are the hosts (for negative effects on health in Indonesia, *see* Meliyanni and Shiko 2014). Yet generally, the more children the women had had, the more likely it was that more of these children lived in the women's households, ultimately posing significant risks to the household welfare. Here again, having more children who may not be economically engaged seemed to hurt their welfare. More importantly, for these relatively better-off women, their needing more than two surviving children to assure food security in older age is obviously an inefficient and unreliable way of reducing their welfare risks and clearly highlights some policy implications.

Developing societies like Senegal cannot sustain development if the demand for children, even for such reasons as old-age support, is so high. Structural incentives (complementary means of old-age support) that encourage smaller families need to be provided. More specifically, policy solutions to the problem of old-age poverty should include boosting economic development, and providing or strengthening contributory and non-contributory social security pension programmes, private insurance markets and health-care systems. For poor older women who cannot participate in formal social security programmes, non-contributory pension programmes which have been piloted and successfully implemented in

several Southern African governments should be emulated by West African governments. By and large, an optimal combination of family and public welfare responses will be required. These data are indicative of the fact that there is very limited economic gain in having and raising children, so younger women especially need to be helped to balance family and economic roles as they age so that they enter the older ages with enough social and economic resources of their own. More generally, the costs and benefits of having too many or too few children are borne not only by individuals in the future but also by society at large. Detailing out the future welfare consequences of fertility among older people so as to inform population and social policies is very useful in both developing and developed societies with below-replacement fertility rates (*see* Kravdal 2010).

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NOTES

1 Social isolation is the process of being kept out of active social life or cultural systems which determine integration in society.
2 Recall that I calculated the wealth distribution separately for rural and urban households and grouped households into quintiles based on their separate distributions. I then combined the quintiles so that, for example, all those who were in the poorest quintile were in one group irrespective of being rural or urban. I ran chi-squared tests and regressions with this combined classification, starting with the poorest quintile, then added on the next poorest quintile, until I found distinctions between the households in the bottom 40 per cent and the top 60 per cent of the distribution.

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