Household Context and Health of the Elderly in India

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Abstract
Support for older adults in developing countries is becoming an increasingly important issue in the face of accelerated population aging including India that has now second largest (around 80 million) elderly population in the world. This paper investigates the importance of living arrangement on the health of the elderly in India at a time when the country is also experiencing rapid socioeconomic changes including globalization, urbanization, occupational mobility and outmigration of young people. Notably, family *still* remains the central source of support for elderly as institutional systems of care are largely inadequate in the country. Using data from the *India Human Development Survey* (2004-05), a nationally representative survey of 41,554 households, the current study examines the association between household context (especially co-residence with adult children) and elderly health (short term morbidity-cough, diarrhea and fever). Preliminary results from logistic regression analyses demonstrate that elderly living in extended family settings are less likely to fall ill when compared to elderly living independently. In addition, household wealth seems to have protective effects on the health of the elderly. Finally, there is no significant gender difference in the likelihood of falling sick; both elderly men and women living independently fare the worst, net of individual and household covariates.

Key words: elderly, living arrangements, health outcomes, India

Introduction

> "Countries should recognize and take into account their demographic trends and changes in the structure of their populations in order to optimize their development"
> (*United Nations, 1999: International Plan of Action on Ageing*)

Increases in the population of older adults in many developing countries have led to an increased concern about the wellbeing of this potentially vulnerable age group. This concern is particularly relevant for India that has the second largest population (around 80 million in 2004-05, *India Human Development Survey*) of elderly persons after China. Though high levels of family interaction and exchange, especially between adult children and aging parents, have been documented in most Asian societies, policy makers and researchers have expressed growing concerns about rapid socioeconomic and demographic transformations. Unlike western

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industrialized countries that have government-funded institutional support (e.g. social security, pension and public health systems), many developing countries are not institutionally adapted to handle the transition from traditional social support systems for the elderly to more modern ones (Treas & Logue, 1986; Wu, *et al*, 2000; Bongaarts & Zimmer, 2002). Given the normative climate about familial systems of care for elders, governments in some developing countries like Singapore and India[1] have written norms into their laws, promoting familial support rather than introducing potentially expensive government programs. However, academic research has been largely inadequate to assess the potential multifaceted implications of such a policy promotion.

Meanwhile, some demographers and family sociologists have predicted that industrialization will lead to a convergence of family systems to the conjugal type whereby the nuclear family becomes a more independent kinship unit (Goode, 1963; McDonald, 1992). According to these researchers, one of the implications of this transition is "weakening of ties with older generation", which in turn entails greater prevalence of separate living arrangements as countries develop. This paper examines the living arrangement (co-residence with adult children) dimension of the convergence theory. We might expect the household context to be critical for the elderly given the intergenerational transfers of space, time and money from adult children to their parents (Subaiya, 2005; Chen, *et al* 2008). Again, the generally accepted truism motivating much of this literature is that stronger intergenerational ties through extended family systems

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[1] The *Senior Citizens' Act*, 2007 and the *Maintenance and Welfare of Parents and Senior Citizens Act*, 2007 (Ministry of Law and Justice, Government of India) aim at achieving increased welfare, maintenance and protection of older persons by offering social prescriptions around appropriate elderly care. The Acts also mandate compulsory maintenance of older parents by adult children or close relatives with punitive measures including fines and prison sentence. In Singapore, the *Maintenance of Parents Act* was passed in 1996 states adult children should support elderly parents either in a lump-sum payment or in the form of monthly allowances.

enhance the health and wellbeing of the elderly. Given this background, the motivation for this current paper is two-fold-

- Given the socio-demographic changes and high rates of migration associated with globalization, more elderly are likely to live on their own. This potential disintegration of family systems in developing societies raises questions about the future health of elderly in India. A systematic examination of not only the linkages between living arrangements and elderly health but how issues of age, gender, education and community factors interact with living arrangements to affect elderly health is warranted.

- From a policy perspective, it is important to critically investigate the conditions under which living with children is beneficial for the elderly in a society that has been undergoing dramatic socioeconomic transformations and shifting cultural norms. Identifying and recognizing the complex interaction between individual preferences, normative practices and elderly wellbeing should be part of the research agenda on aging for designing future family based policies in developing countries.

The current paper thus directly examines the association between household structure (primarily, co-residence with adult children) and elderly health outcome (as reflected by likelihood of falling sick with coughs, fevers and diarrhea). By looking only at short-term morbidity as opposed to disability and chronic illness among the aged, the current study aims to mitigate the potential endogeneity problem that may arise from using a cross sectional data. (further explanation of the endogeneity problem is provided in the "Data and Analytic Strategy" section)

Ideally, time series data on living arrangements would have been most appropriate for such an analysis. Unfortunately these data are not readily available for most developing countries, including India. Hence the current analysis relies on cross-sectional data drawn from 41,554 households (*India Human Development Survey*, 2004-05) to investigate the association between household structure and elderly well being. Previous studies on living arrangements have been mostly descriptive- documenting the socioeconomic correlates of living arrangements; the current paper takes an extra step to link the socioeconomic correlates of living arrangement to health outcomes of the elderly. The current paper hopes to make an important contribution in improving our understanding of the association between household structure and elderly well being in a setting where aging research has just begun. Finally, the *India Human Development Survey* will eventually be longitudinal so the current analysis would provide a good foundation for future panel analyses of changes in health outcomes (as well as changes in living arrangements).

Background

The demographic literature examining the linkages between social environment (including the household context, availability of institutional care, level of medical infrastructure and health behaviors in general) and aging in developing countries is a relatively new endeavor. Two of the broad aspects of social environment that are typically studied in the social science literature are *household* and the *community* contexts. The household-which is the central focus of this paper-provides a crucial context as it includes the network of personal ties within which most of us live our lives. More specifically, the bulk of demographic literature on intergenerational relationships has concentrated on three types of household ties: coresidence, transfers of time and care-giving and financial support (Bianchi, *et al*, 2008). These have important implications for health of the

elderly particularly in the context of developing countries where the family household is the traditional social institution where older persons are cared for (Chen, *et al*, 2008). However, although a huge body of literature documents trends in living arrangements, determinants of living arrangements and implications of living arrangements for patterns of intergenerational ties in the contexts of Asian (Casterline, *et al* 1991; Freedman, *et al*, 1994; Bongaarts and Zimmer, 2002; Whyte, 2003; Rajan and Kumar, 2003) and Latin American (DeVos, 1990) countries, far less research has looked into the connection between living arrangements and elderly health. A few notable exceptions to this have been works of Hughes and Waite (2002), Zimmer (2005) and Chen *et al* (2008) who have examined health of the elderly in the household context while paying particular attention to the living arrangement dimension of the household

Household Context and Well-Being: Theoretical Considerations

Extensive literature from different disciplines has provided interesting explanations concerning interactions between generations while providing a framework with which familial behaviors can be examined.

Much of the theoretical literature that connects living arrangement with elderly well being is based on cooperative models where families are characterized as exhibiting *intergenerational solidarity*-that helps them to function as cohesive units (Bengston, et al 1991; 2000). Again, in contrast to this idea of solidarity and cooperation, authors (Connidus & McMullin, 2002; Bengston, et al, 2002) have also recognized that parents and children, husbands and wives, adult children and elderly parents may sometimes hold different interests (*structured ambivalence* framework). Hence it can be argued that relations between household members can create tensions and they may involve unpleasant interactions that may have damaging consequences to

individuals' well being. Thus analyses exploring the association between the household context and health outcomes should recognize the dialectic between the dimensions of solidarity and aspects of conflict.

Again, economists would argue based on the dominant intra-household resource allocation model of family decision making (Becker, 1974; 1981) and the rational choice framework that living arrangement decisions are made from a discrete set of alternatives as summarized by a household production function (Schwatrz, et al 1984; Wolf, 1994). From this perspective, variations in children's willingness to "supply" coresidence are incorporated into the framework and can be viewed as operating through household production and/or division of household output. Elderly parents can "buy" the care and attention of their adult children with promises to provide the latter with bequests or other transfers (Bernheim, et al 1985). Thus caring and coresiding with elderly parents, for example, could be given in response to resources received long ago, perhaps in return to parental investment in schooling, caring for a young grandchild, help with buying a home or land or in response to expected future compensation, as with a bequest

Based on the existing theoretical literature, the article starts from the theoretical premise that the household context plays an important role in shaping the association between living arrangements and elderly well being (See Figure 1). Again, India provides an important context as it has a longstanding tradition of extended family and of patrilineal and patrilocal living arrangements. Some of the variables that seem to play an intervening role (variables reflecting the economic status of the household fall in this category) in shaping the association have also been indicated. Marital status of the elderly is particularly crucial to this model, as there seem to

be a strong link between marital status, living arrangement and health outcome. However the direction of causality is unclear at this point.

[Figure 1 about here]

Parallel to the theoretical inconclusiveness of the relationship between living arrangements and health outcomes is a mixed range of results from empirical studies. In the next few sections the current study critically examines empirical research from different countries in Asia and Latin America, while also elucidating the relevance of the Indian setting in investigating the proposed association.

Household Context, Aging and Well-Being: sifting through evidence in developing countries

In studies of the relationship between household structure and well being of elderly, researchers consider a wide range of health outcomes including subjective wellbeing, functional status, disability and mortality. Regardless of what measure has been used, findings from studies have been less than conclusive about the association between household structure and health outcomes (Chen, *et al*, 2008). In addition, a clear deterrent to such studies in the developing world has been the difficulty in obtaining comparable data, given the largely inadequate and unstructured nature of demographic literature (Bongaarts & Zimmer, 2002; Sen and Noon, 2007) on aging and lack of methodological rigor in integrating empirical research with theory building (Ramamurti, 2003).

In their review of the existing literature on household context and its effect on well being, Chen *et al* (2008) concluded that the household can be a double edged sword, promoting well being and at the same time perhaps weakening health when conflict is high. However it can be argued that in settings where intergenerational ties are traditionally strong and coresidence with children

is common, living with adult children seems to be beneficial to elderly health-Wu *et al* (2000) in Malaysia, Wang et al, (2001) in rural Taiwan, Cui (2002) and Chen et al (2008) in China. Interestingly, Kochar (1999) while examining a similar association in rural Pakistan, concluded that it is not immediately clear if elderly benefitted from being a part of an extended family household. Her findings based on intra-household resource allocation models are consistent with analyses on intergenerational households in the United States (Pezzine & Schone, 1997). Again, the hypothesized positive association between coresidence and elderly wellbeing has been challenged in recent decades by several studies across different settings; Logan & Bian (1999) and Whyte & Xu (2003) in the context of China found that elderly parents would prefer not to live with married sons if situations allowed suggesting conflict and tension; similar results are reported by Silverstein & Bengston (1994) in their longitudinal study of three generation families in California. However, using data from the Health & Retirement Survey, Waite & Hughes (1999) and Hughes and Waite (2002) found no difference in health outcomes between married couples living alone and couples living with children, in the context of the United States.

The Indian Context

Exploring these relationships and linkages are particularly important in the Indian context, as India had almost 75 million elderly persons above the age of 60 in 2001 (as compared to China's 127 million); around 8 percent of the total population (*National Sample Survey Organization* ,61st Round-2004-05; *India Human Development Survey*, 2005). In addition, projections indicate that the elderly population (age group 60 and above) is expected to increase to 179 million in 2031 and further to 301 million in 2051 (Rajan, et al, 2003). By the year 2025, the elderly population in India and China combined will account for 38% of the world's total elderly

population (Rajan & Liebig, 2003). Further, as India moves along the path of demographic transition, it is expected that decline in fertility will be faster in immediate future as compared to mortality (as mortality is already at a low level) thereby intensifying the aging process. However, studies have consistently pointed out that India's elderly potentially face significant economic insecurity (Rajan & Mathew, 2008; Bloom, et al 2010) due to lack of social security provisions, informal sector employment and risk of major health expenditures, making majority of elderly fully or partially dependent on others for meeting basic needs. Elderly women are particularly vulnerable given the differences in men and women's marital histories, allocation of economic resources/land ownership and employment opportunities which are further exacerbated in patriarchal settings (Chen & Drez, 1992).

India, like many other developing countries, has been undergoing rapid economic transformation including urbanization, modernization and globalization. Nuclear households, characterized by individuality and independence are increasingly preferred among young married/unmarried adults, particularly in urban settings. Some authors have noted a possible change that would take place in recent future-increased share of Indians living in cities leading to greater number of women participating in paid employment (Bloom, et al 2010). In a setting where women are expected to be the primary caregivers, working outside home would decrease their ability to care for aging parents/in-laws (although it might increase their capacity to provide their parents with financial assistance). Irrespective of the nature of the association, studies have consistently expressed concerns over women's increased income earning opportunities and the associated implications for living arrangement and elderly care. In light of these changes and the potential challenges associated with care-giving of the elderly, government of India has enacted laws

(*Maintenance and Welfare of Senior Citizens Act*, 2007) which mandates adult children to provide maintenance of elderly parents/grandparents in terms of food, healthcare and shelter (up to approx $210 per month) and care-giving adult children are also subject to penal provisions in case of failure to comply. As of August 2010, out of 33 applicable states, the *Maintenance Act* has been fully implemented in 7 states and partially implemented in all except 4 states in the country. (For details see: *http://socialjustice.nic.in/oldageact.php?pageid=1*)

Surprisingly, in spite of the policy interventions, demographic research on aging in India has been primarily motivated by an interest in fertility dynamics. Several authors have examined association between desired number of children and the security children provide during old age (Cain, 1986; Dharmalingam, 1994; Kumar, 2003). A second cluster of studies come from the field of biomedical research that primarily focuses on identification of age related disease conditions and the role of gene changes, nutrition and DNA repair associated with the aging process (Hasan, 1996; Rao & Bhaskar, 1996). Finally, though there have been descriptive studies on living arrangement patterns of elderly (Rajan, et al, 1995; Rajan & Kumar, 2003) in India, the extra step of linking the household context to the well being outcomes have not been examined in the Indian context. Meanwhile existing data indicate significant morbidity levels among the aged, much of which remain subclinical (*National Sample Survey Organization, 61st* Round-2004-05). Data also indicates that there are considerable variations in morbidity in terms of gender, place of residence (rural/urban) and socioeconomic status. Finally, as indicated earlier, a rapid demographic transition without a concomitant epidemiological transition is responsible for the dual load of infections and degenerative diseases in older persons (Kumar, 2003). Identification of the factors that affect health outcomes among the aged is particularly important

in India, where a separate system of geriatric services is almost nonexistent. These factors make a strong case for further empirical investigation.

Thus given these research and policy backgrounds in India, few key questions remain answered. First, does co-residence with children *always* have protective health effects on the elderly? Or in other words, does changes in household composition owing to urbanization, occupational mobility and outmigration lead to concomitant weakening of ties between elderly and other family members that may adversely affect elderly well being? Again, what are the conditions that may affect the *strength* of the hypothesized positive association between co-residence and elderly well being? Using cross-sectional data from the *India Human Development Survey*, 2004-05, this paper begins documenting patterns of living arrangements among elderly in India and subsequently answers some of the above questions. The following sets of hypotheses are examined at the household level. The first two hypotheses examine the broad relationship between co-residence and elderly health while hypotheses 3 and 4 particularly examine the strength of the relationships.

Hypothesis 1:

Co-residence with adult children as opposed to living independently is associated with *decreased* likelihood of short-term morbidity among the aged, after controlling for SES. In other words, living with children has protective effects on the health of the elderly.

Hypothesis 2:

Co-residence with adult children is associated with wealthier households that decrease the likelihood of short term morbidity among the aged. In other words, household wealth through

better sanitation systems and clean household fuel use play positive intervening roles in the association between co-residence and elderly health outcomes.

Hypothesis 3:

The negative association between co-residence with adult children and lower levels of short term morbidity among the aged is *weakened* in households where the elderly are enrolled in and have been receiving benefits from pension schemes. In other words, economic independence among the elderly is associated with positive health outcomes irrespective of their living arrangement status.

Hypothesis 4:

The negative association between co-residence with adult children and lesser likelihood of short term illnesses among the aged is *strengthened* for elderly widows as compared to elderly widowers. Co-residence with adult child is expected to be more responsive to the health outcomes of elderly women, as aging mothers are more likely to be widowed (given the spousal age difference in marriage) and economically vulnerable (given low levels of schooling and lack of formal employment).

Data and Analytical Strategy

This paper relies on data from the *India Human Development Survey* (http://ihds.umd.edu/), 2004-05, designed jointly by the University of Maryland and the National Council of Applied Economic Research, India: a survey conducted across 33 Indian states and union territories, collecting responses from 41,554 households. The common demographic definition in India classifies people aged sixty and older as the elderly. The IHDS data has a broad spectrum of information on elderly population ranging from health status/well-being indicators (e.g.

incidence of short term morbidity, long term morbidity and the ability to perform activities of daily living), health seeking behavior (whether treatment has been sought and the expenditures incurred) and other socioeconomic variables including education, living arrangements, participation in productive work (paid and/or unpaid) and participation in government sponsored pension programs. About 17,904 people (8963 male and 8941 female) in this age category lived in the households that were surveyed in this particular dataset.

[Table 1 about here]

Dependent Variable

Considering the scope and the purpose of this study, the current paper will focus only on short term illnesses-fever, cough and diarrhea. The survey questions used in the current study come from "Health and Education" questionnaire of the IHDS, which were administered to the women (frequently the spouse of the household head) in the households. The IHDS asked a series of questions to the woman if any family member in the household had been suffering from these three specific short term illnesses in the last month. Table 2 shows incidence of short term morbidity among elderly. Elderly women are more likely to report having fallen sick from minor illness for all old age categories as compared to elderly men. However, part of the gender differences in morbidity could be explained by the fact that (elderly) women were often respondents to these morbidity questions in the survey than elderly men.

[Table 2 about here]

The dependent variable of this study is *likelihood of falling sick* which is a categorical variable that take the value of "1" if they have fallen sick and "0" if they remained healthy. About 11% of

elderly have been sick (i.e. reported any cough, fever or diarrhea) in the last month with a standard error of 0.31.

Independent Variables

The primary independent variable is the living arrangement variable which captures the co-resident types- *living alone or with spouse*, *with children* and *with others*. Elderly persons who are single and hence living all by themselves is rare in India, hence the first family type consists of the elderly person and his/her spouse. Around 12 per cent of elderly men and women live in this family arrangement. The IHDS data indicates that in spite of the potential erosion of multigenerational families, most (around 83 per cent) elderly persons continue to live with their children. Finally, around 5 per cent of elderly persons live with others-brothers/sisters, nephews/nieces, sibling-in-laws, servants or other relatives. In the regression analysis, each of the co-resident types will enter as dummy variables into the models. Table 3 shows living co-resident types by marital status of the elderly.

[Table 3 about here]

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Given the huge body of literature examining the complex association between SES and health, the control variables in the current study will include household background characteristics-caste, religion, place of residence (rural/urban), household wealth-(measured using a constructed scale of the number of consumer goods owned from a list of 27 (e.g. chair or table, television, car, credit card, etc)- as well as individual characteristics (gender, education, employment and marital status) of the elderly person. Education enters the multivariate analyses as a continuous variable and is measured by completed years ranging from 0= no education through 15 years=

graduate degree. Marital status is measured as a two category variable, currently married and widowed/single. Other marital status categories-divorced, separated or absent spouse- are ignored for this analysis as they are not theoretically relevant for the Indian context.

Other than wealth, economic standing is also measured in terms of clean fuel (LPG) use in cooking as opposed to firewood and biomass fuels, presence of flush toilet system as opposed to traditional pit latrine systems or no facility at home and piped indoor water for drinking as opposed to other sources like tube well, canal water or covered well. Social group membership is measured in terms of caste and religion groups. Additional income, like pensions, received by the elderly has been measured by receipt of any government pension including National Old Age Pension (NOAP), disability pension or the widow pension in the last 12 months. The current paper distinguishes three major caste groups-high caste Brahmin (6%), lower castes (66%- including scheduled castes, scheduled tribes and backward castes) and other castes (26%) - and five major religion groups-Hindu (81%), Muslim (11%), Christian (3 %), Sikh (3%) and other religion (2%). Both caste and religion groups are included in the multivariate analyses as dummy variables with high caste Brahmins and Hindus serving as the comparison group for caste and religion dummies respectively. Respondents are classified as living in rural (65%) or urban (35%) areas based on the Indian census definition. Diversity in patterns of residential arrangements is so large in India that we control for the place of residence (rural versus urban) in all regression analyses.

State dummies (22 major states) are also added to control for the context; elderly health outcomes are consequences of not only biology, behavior, socio-economic factors but also of the

context and structural antecedents. The contextual analysis is particularly important in the Indian context where there are marked inter-state differences in health outcomes; the southerners reporting consistently lower levels of short term morbidity and higher levels of health care than elsewhere in the country (Desai, et al in *Human Development in India*, 2010). Figure 2 shows the state wise distribution of short term morbidity among elderly in India. Most states have incidence of short-term morbidity levels ranging from 7 to 10 percent. There are no marked differences between south and north Indian states, though northwestern states of Uttarakhand, Rajasthan and Himachal Pradesh report relatively higher levels of morbidity. Regression models also control for the elderly respondent's work status operationalized as participation in any sector of work including wage work, work in a business, farm work, or animal care. Additionally, interactional association between living arrangement and marital status and again living arrangement and pension income have been explored in order to test hypotheses 3 and 4. Table 4 shows descriptive statistics on selected independent and control variables used in the analysis

[Figure 2 and Table 4 about here]

Finally, since the empirical analysis is based on cross-sectional data with a focus on *current* living arrangements of the elderly, without loss of generality, the study assumes that education, marital status and past occupation of the elderly to be given. However to examine whether co-residing with children *reduces* the likelihood of falling sick among elderly, the paper recognizes the potential selectivity/endogeneity problem. Since living arrangement is predetermined it is important to be aware of the causal interplay; does elderly health determine living arrangement decisions rather than the other way round? And, are the types of people who choose to live alone also the types of people more (or less) prone to illness? Given this limitation, results from the multivariate analyses will be interpreted with caution.

Results

Table 5 present results from logistic regression models on likelihood of falling sick (any of the three types of short term morbidity-cough, fever, diarrhea- and the table shows four specifications.. The *first* model looks at the total effect of living arrangement on likelihood of falling sick, after controlling for key demographic variables of age and sex. The *second* model is nested and it also includes the household wealth and economic standing variables-standard of living scale, water and sanitation systems and information on household fuel use. *Model 3* is non-nested and considers the effect of living arrangement on the likelihood of falling sick for elderly men (model 3a) and women (model 3b) separately. This analysis has been especially conducted to test if living arrangement decisions are more crucial for elderly women's health outcomes (and widows) as compared to elderly men's (and widowers). *Model 4* (the full model) explores the interaction and region effects in details.

[Table 5 about here]

Consistent with our Hypothesis 1, we find strong evidence that living arrangements are crucial to the health status of the elderly, after controlling for all other covariates. More specifically, residence in an extended family setting (living with children or living with other family members) seems to have protective effects on the health of the elderly in all the models. Clearly, elderly living alone fare the worst. For an elderly living alone with/without spouse in a nuclear household, his/her odds of falling sick in increased by a factor of 2.11 (predicted log odds coefficient =0.563) when compared to their extended family counterparts, after controlling for their demographic characteristics (model 1). This result remains fairly stable across all models and for both elderly men and women. The result is particularly interesting when state dummies are added in the last model; the odds of falling sick with any of the three short term morbidity for

elderly living alone increases by a factor of 4.20 (predicted log odds coefficient = 1.43), net of the covariates in the model (Model 4). In addition to the family structure, presence of adults in the household seems to have protective effects on the health of the elderly. These results are consistent with the existing literature on developing countries, where co-residence is common and elderly care is rooted in the normative principles.

From the controls in the baseline model (model 1), the results are mostly consistent with the existing literature on developing countries where health of the elderly is dependent upon host of factors like urban residence, age, education and gender. The elderly seem more likely to fall ill if they live are located in rural areas, are more aged and have less education. Consistent to the notion that elderly females and particularly widows are more vulnerable to adverse health conditions given the general neglect and devaluation of women in patriarchal settings, results from models 1 and 2 seem to suggest higher likelihood of short term morbidity among elderly females and widows. Interestingly, a closer look at the only elderly women model (Model 3a) demonstrates that being married is negatively and significantly associated to likelihood of falling sick, whereas marital status do not have any significant impact on the likelihood of falling sick for elderly males (Model 3b). However, the effect of living arrangement on likelihood of falling sick is almost same (and not strengthened for elderly women as proposed in Hypothesis 4) for both elderly men and women (models 3a and 3b), even after controlling for marital status. Table 6 summarizes the predicted probability of falling sick for groups of elderly by marital status and residential types.

[Table 6 about here]

From models 2 and 3, it is evident that household standard of living scale is negatively and significantly associated with the likelihood of falling sick. Surprisingly, additional household wealth characteristics (clean fuel, piper indoor water and flush toilet system) do not seem to play significant intervening roles between living arrangement and likelihood of falling sick. These results offer partial support to our Hypothesis 2. Health literature on developing countries have shown drinking water, household fuel and sanitation systems to have significant health effects on children and women, but preliminary results from the current analysis indicate that these pathways may operate differently for elderly persons, which needs to be explored further.

Among the social group controls-caste and religion-we have surprising findings. With respect to caste differences, after controlling for all variables, there seems to be no significant difference in the likelihood of falling sick. Caste groups-lower castes and other- when compared with the high caste Brahmins, and religion groups-Muslims, Sikhs and Christians-when compared with Hindus, do not seem to stand disadvantaged in terms of their likelihood to short term morbidity. This is an unexpected finding as lower castes and particularly Muslims fare poorly in many other socio-economic outcomes (e.g. education, immunization, mortality, etc) when compared to high caste Brahmins and Hindus. It is difficult to evaluate these preliminary findings of no-differences in caste and religion groups as there is not much literature that looks into the association between social stratification and socio-economic outcomes of elderly in India.

Though we had anticipated that marital status and additional income (e.g. pensions) may interact with living arrangement to influence the likelihood of short term morbidity among elderly persons, we find that none of the interaction effects are significantly associated with the

likelihood of falling sick. We thus find no support for Hypothesis 3. Finally, once state dummies are added the last model shows significant improvement over the baseline models reflected by the smallest value for the Bayesian Information Criterion, or BIC (not shown).

Preliminary Conclusions

At this stage, we are unable to determine causality given the complex nature of the relationship between living arrangement decision and well being. As mentioned before, since there may be a selectivity problem in an analysis of this nature, we intend to conduct a propensity score matching technique to mitigate the selection biases in estimation. In addition, contextual (level of economic development, social networks, community health interventions, etc) and supply side factors (e.g. medical infrastructure, access to health care, etc) need to be explored in depth to get a clearer picture of the interaction between household context and elderly wellbeing. Nevertheless, based on our preliminary logistic regression results we find strong evidence that elderly persons living independently are the ones who are most likely to fall sick. In addition, we also have partial support for our hypothesis that elderly living in extended family settings are primarily from relatively wealthier households thereby reducing the chances of morbidity risks. Our analyses thus support previous research on developing countries and confirm that family systems and intergenerational ties are crucial for the well being of the elderly in settings where institutional support is largely inadequate. These findings corroborate the concern over potential erosion of multigenerational family systems and calls for policy interventions. But this does not necessarily mean mandating blanket legislation on parental responsibility (like the *Maintenance Act, 2007* described earlier). Instead, more research on elderly is warranted to suggest effective policies that support co-operative efforts between the family, community and the State.

Figure 1: Conceptual Map

Conceptual Map:
Household Context and Health of the Elderly
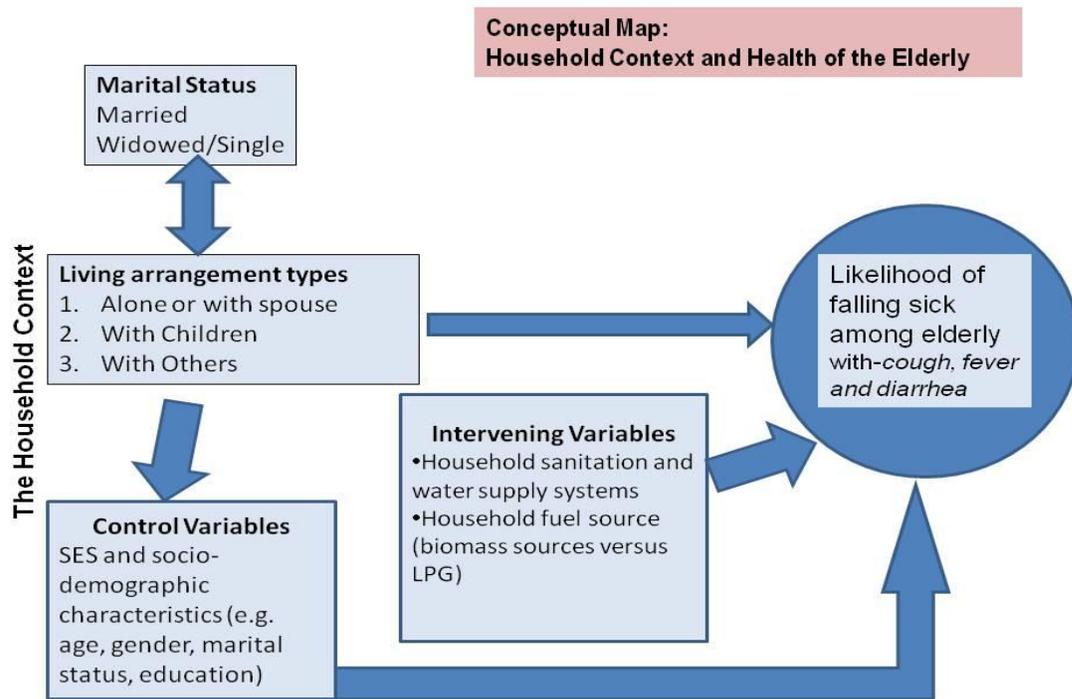
Figure 2: State-wise distribution of short term morbidity among elderly (per cent)

Source: India Human Development Survey, 2004-05

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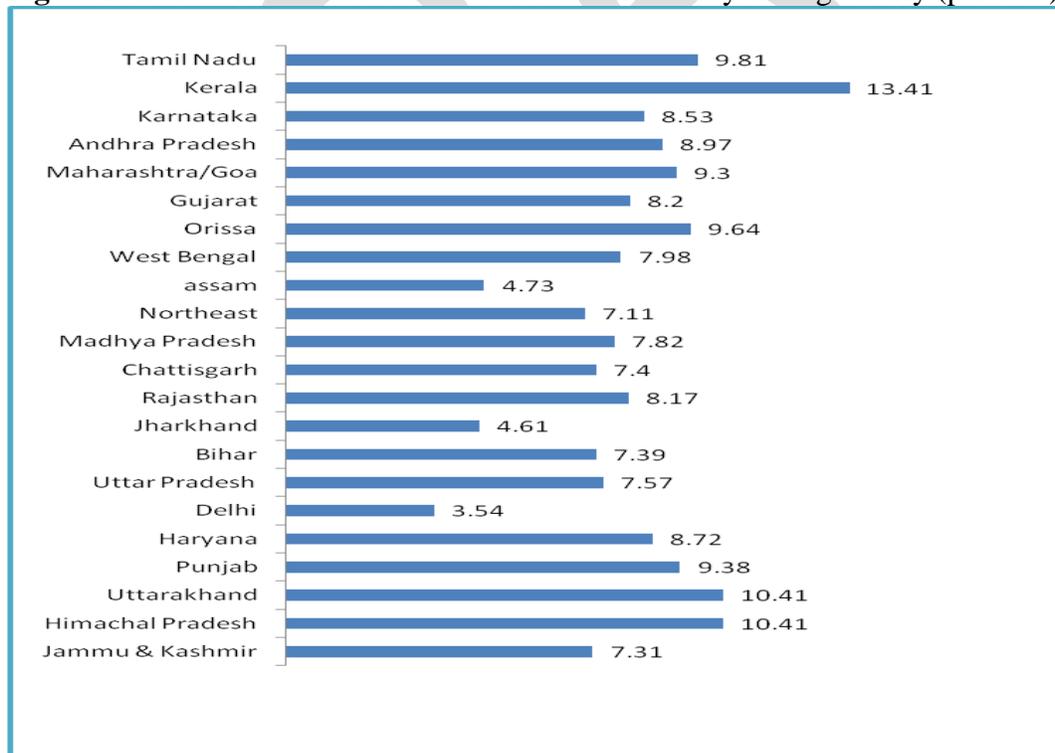
Table 1: Distribution of elderly (60 and above) population by gender (Percentages)

Age Categories	Sex		Total
	Male (n =8,963)	**Female** (n=8,941)	(n=17,904)
Age 60 - 69	60.57	61.38	60.98
Age 70-79	29.39	28.70	29.04
Age >80	10.04	9.92	9.98
Total	100.00	100.00	100.00

Source: India Human Development Survey, 2004-05

Table 2: Short term morbidity among elderly in India (Percentages)

	Male	Female	Total
Fever	8.27	11.02	9.64
Cough	7.14	8.93	8.03
Diarrhea	2.02	2.18	2.10
Not ill	**90.25**	**87.50**	**88.87**

Source: India Human Development Survey, 2004-05

Table 3: Living arrangement types of the elderly in India (Percentages)

	Male		Female	
	Married (n=7390)	Widowed/Single (n=1573)	Married (n=3864)	Widowed/single (n=5077)
Alone or with spouse	14.14	5.59	16.02	5.77
with children	81.96	83.41	79.79	87.81
with others	3.9	11	4.19	6.42
Total(n=17,904)	100	100	100	100

Source: India Human Development Survey, 2004-05

Table 4: Descriptive statistics on dependent variable and selected independent variables

Variables	Mean	Std Dev	Min	Max
whether ill with any short term morbidity	0.11	0.317	0	1
whether living alone	0.64	0.480	0	1
whether living with children	0.31	0.461	0	1
whether living with others	0.05	0.224	0	1
Age	67.72	7.402	60	116
female	0.64	0.481	0	1
No. of adults in the household	3.77	1.636	1	18
Whether married or widowed/single	0.49	0.500	0	1
Education	2.79	4.155	0	15
Caste (brahmin, low castes, other castes)	2.21	0.561	1	3
Religion (hindu, muslim, christian,sikh, other)	1.33	0.834	1	5
Urban (1= urban,0= rural)	0.30	0.458	0	1
Standard of Living	11.90	5.550	0	27
Does any work (including animal care)	0.40	0.490	0	1
Whether receives pension	0.10	0.300	0	1
Has piped indoor water	0.31	0.463	0	1
Has flush toilet	0.28	0.448	0	1
Uses clean fuel/LPG	0.46	0.498	0	1

Source: India Human Development Survey, 2004-05

Table 5: Logistic regression on likelihood of falling sick among elderly (60+) in India

Variables	Model1	Model2	Model3 Elderly males (Model 3a)	elderly females (Model 3b)	Model 4 (full model including state dummies coefficients omitted)
living alone[a]	0.563***	0.537***	0.541***	0.563***	1.435***
	(-0.07)	(-0.07)	(-0.13)	(-0.09)	(0.14)
with others	-0.027	-0.083	0.144	-0.244	0.109
	(-0.15)	(-0.15)	(-0.23)	(-0.2)	(-0.22)
Age	0.009**	0.012***	0.014*	0.011*	0.006
	(0.01)	(0.00)	(-0.01)	(0.00)	(0.00)
Female(1=female, 0=male)	0.291***	0.375***	-----	-----	0.287***
	(-0.06)	(-0.06)			(-0.06)
No. of adults in household	-0.211***	-0.156***	-0.161***	-0.151***	-0.104***
	(-0.02)	(-0.02)	(-0.03)	(-0.03)	(-0.02)
Married(1=yes, 0=widowed/single)	-0.165*	-0.171**	-0.105	-0.228**	-0.025
	(-0.07)	(-0.07)	(-0.10)	(-0.09)	(-0.12)
Education	-0.037***	-0.007	-0.003	-0.013	-0.013
	(-0.01)	(-0.01)	(-0.01)	(-0.02)	(-0.01)
Lower castes[b]	-0.066	-0.187	-0.224	-0.151	-0.017
	(-0.10)	(-0.10)	(-0.15)	(-0.14)	(-0.10)
Other castes	-0.093	-0.107	-0.229	-0.001	-0.046
	(-0.11)	(-0.11)	(-0.16)	(-0.15)	(-0.11)
Muslim[c]	-0.052	-0.104	-0.063	-0.135	-0.142
	(-0.09)	(-0.09)	(-0.13)	(-0.13)	(-0.09)
Christian	-0.073	0.026	0.054	0.011	0.211
	(-0.14)	(-0.14)	(-0.22)	(-0.19)	(-0.14)
Sikh	-0.126	0.124	-0.185	0.34	0.125
	(-0.15)	(-0.15)	(-0.26)	(-0.19)	(-0.15)
Other religion	-0.212	-0.268	-0.121	-0.413	-0.260
	(-0.21)	(-0.21)	(-0.29)	(-0.30)	(-0.21)
urban(1=urban, 0=rural)	-0.388***	-0.156*	-0.164	-0.149	-0.159*
	(-0.06)	(-0.07)	(-0.11)	(-0.09)	(-0.07)
Standard of Living		-0.050***	-0.061***	-0.042***	-0.031***
		(-0.01)	(-0.01)	(-0.01)	(-0.01)
Any work (1=yes, 0=no)		0.06	0.026	0.089	0.081
		(-0.06)	(-0.08)	(-0.08)	(-0.06)
Receive pension(1=yes,0=no)		-0.063	-0.106	-0.05	0.066
		(-0.08)	(-0.14)	(-0.10)	(-0.13)

Piped indoor water(1=yes,0=No)		-0.069	0.002	-0.126	-0.021
		(-0.07)	(-0.10)	(-0.09)	(-0.07)
Flush Toilet(1=yes,0=No)		-0.147*	-0.152	-0.143	-0.165*
		(-0.07)	(-0.11)	(-0.10)	(-0.07)
Clean fuel/LPG(1=yes,0=No)		0.03	0.147	-0.065	-0.015
		(-0.06)	(-0.08)	(-0.08)	(-0.06)
Married*living alone[d]					-0.816
					(-0.14)
Married* living with others					0.094
					(-0.31)
Receive pension*living alone					-0.308
					(-0.17)
Receive pension*living with others					-0.598
					(-0.64)
Constant		-2.091***	-1.991***	-2.031***	-1.647***	-2.049***
		(-0.3)	(-0.31)	(-0.48)	(-0.4)	(-0.32)
Log Likelihood		-5669.296	-5629.217	-2592.252	-3031.740	-5621.260
LR chi		431.700	511.860	218.920	263.930	702.930
Df		14	20	20	20	45
Observations		16689	16689	8440	8249	16689

Note: Coefficients are unstandardized; Standard Errors in parantheses
[a]: *Living with children* is the reference category; [b]: *Brahmin* is the reference category; [c]: *Hindu* is the reference category; [d]: *(variable)*living with children* is the reference category for all interaction terms
*p<0.05 **p<0.01 ***p<0.001

Table 6: Predicted probabilities for elderly groups by marital status and living arrangement

Groups	Probability of falling sick	95% Confidence Interval
Married and living alone	0.12	(0.11,0.14)
Widowed and living alone	0.13	(0.11,0.15)
Married and living with children	0.07	(0.05,0.07)
Widowed and living with children	0.07	(0.05,0.08)
Married and living with others	0.09	(0.05,0.12)
Widowed and living with others	0.10	(0.06,0.13)

Source: India Human Development Survey, 2004-05

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