The health of older adults in India: an empirical investigation into the perspective of social determinants of health

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Introduction

Ageing of a population occurs at the latter phase of demographic transition. Such populations show a relatively increasing share of people at higher ages. India has an ageing population. The present study considers people aged sixty or above as older adults (OAs). The number of older adults enumerated in the censuses of 1971 and 2011 were 32,699,731 and 103,849,040, respectively. Corresponding to these census years their proportions in the population were 0.06 and 0.09, respectively.

Unlike the people at younger ages, the OAs are at higher risk of suffering from chronic conditions. They are likely to be out of workforce and their marital status may be at risk of changing from married to the widow. Entering into older adulthood may also change the social roles of a person. All these changes accompanying older adulthood make OAs distinct from the rest of the population. Ageing and its implications are well documented and debated in the demographic literature. One of the issues of concern in the developing world is the preparedness of these societies to ensure healthy ageing of the increasing proportion of OAs.

Health being one of the dimensions of well being is too complex an entity to be captured by a single measure or indicator. According to the World Health Organisation (WHO) "health is a state of complete physical mental and social well being and not merely absence of disease or infirmity." To put it in other words diseases and infirmities touch upon the physical aspects of health whereas the mental and the social aspects should not be ignored. This definition applies to all including the OAs.

Though diseases are governed by various biological factors operative in a human being, recent literature has shown that social and economic environmental factors are strongly associated with the prevalence of a disease in a population (Gliksman et al, 1995, Smith et al, 1997, Chandola 1998, Cambois et al, 2001, Adda et al, 2003, Zimmer et al, 2003, Kaneda et al, 2004, Baker et al, 2005, Raotio et al, 2005, Matthews et al, 2005, Matthews et al, 2006, Petrelli et al, 2006, Zimmer, 2006 and Merkin et al, 2007). Even early childhood conditions have a lasting effect on the health at later life (Hayward et al, 2004). The interference of socioeconomic conditions in health at older ages has been debated in detail in recent

demographic literature. These studies provide insight into a gamut of the problem in different socio-cultural environments.

Such studies cover the developed countries and the countries of south-east Asia. Studies exploring the strength of association between health and socioeconomic factors for OA in India are lacking. Further, the relative economic position of an OA in a household and its association with health of him/her has not been addressed in these studies. The present study is an attempt to fill these gaps. The aims of the present study are as follows:

1. Defining the physical health of an OA.
2. Investigating the association of socioeconomic and demographic factors with the health of an OA.

Methods and data

In the present section first, the health of an OA is defined pertaining to physical aspects. It is followed by an introduction to the conceptual framework pertaining to the Social Determinants of Health (SDH). A model of health is proposed based on SDH. Finally, the empirical analyses are carried out utilising the logistic regression models.

Physical health

As stated earlier, WHO has comprehensively defined health as "a state of complete physical, mental, and social well-being and not merely the absence of disease, or infirmity." Physical well being materializes in the absence of diseases and the absence of any kind of handicap. This is indicated substantially by the chronic diseases which OAs suffer from and the disabilities they encounter with growing age. Either or both of these have a bearing on the OAs ability to perform day to day activities. This may lead to a handicap of one kind or the other which in turn may put restrictions on their mobility. Therefore, the diseases and the disabilities faced by an OA indicate his state of physical health.

The present study utilises pooled data from the 42nd and the 52nd rounds of the National Sample Survey. These surveys were conducted during 1986-87 and 1995-96. These two surveys contain information on seven chronic diseases. These are chronic cough, piles,

urinary problems, problem in joints and limbs (PJL), hypertension, heart disease, and diabetes. These diseases fall into two groups. The first four, which fall into the first group, do not require any diagnosis for being detected. The remaining diseases fall into the second group. They can be detected only after proper diagnosis. For the first group of diseases, the information on each disease is available in the form of a nominal binary variable, indicating whether the disease is present or not. For the second group, the information is available on each disease in the form of a nominal variable having three alternative responses. These responses are disease present, disease absent and not known. Since "not known" is not indicative of presence or absence of a disease, all the units responding as "not known" are not included in the analysis. Thus, for the second group of diseases also we are left with information on four binary variables, indicating the presence or absence of disease.

SDH framework

As mentioned earlier for an individual the state of being disease-free and impairment free defines good physical health. Thus, the number of acute and chronic morbidities suffered by an individual and the number of impairments suffered by an individual can serve as indicators of health. The socioeconomic and cultural factors can be viewed as various kinds of exposures that the older adults get subjected to during their lifetime. Moreover, the population of older adults is heterogeneous concerning socioeconomic and cultural aspects. The differentials in the socioeconomic and cultural aspects may correspond to the differentials in the health of older adults. However, if such an association is confirmed, it may be possible to control and ameliorate some of these factors that can shape the health at older ages. Thus, the health of older adults can be improved by creating an environment that is conducive to the improvement of health.

The conceptual framework used in the present study rests partly on the framework outlined in the final report of the WHO Commission on the Social Determinants of Health (Kelly et al. 2009; WHO 2007). In brief, the framework consists of three levels of factors that influence health and health differentials in society. These three levels are namely, the socioeconomic and political context (policies at national and international level), structural determinants of health inequities (income, education, occupation, social class, race/ethnicity and sex) and the intermediary determinants of health (material, psychosocial, behavioural and biological, health system).

These variables operate at micro/individual, semi-macro/household and macro level. The present study shall study the association between health and structural determinants of health only as the information on intermediary variables is not available and the effect of socioeconomic and political environment will be similar for all the older adults in a country.

The variables, namely, income, education, occupation, social class, race/ethnicity and sex describe the socioeconomic position of an individual. The variables social class and race/ethnicity, which form a part of the WHO framework, are not included as they are not relevant to the Indian older adult population. However, the present study adds marital status, age, and living arrangements to the list of structural determinants as they are relevant in the social context of the older adults in India. The variables used in the present study are discussed below in detail. The variables that represent the environments constitute different systems. The framework of analysis presumes that health is an outcome of the effects of these systems. These systems are discussed in what follows.

The economic system consists of a set of variables related to the economic aspect of the life of an OA. Moreover, this study distinguishes between "household economic conditions" and the "financial status" of an OA within a household. The categorical variable financial dependence with three response categories, namely independent, fully dependent and partially dependent, is the variable that indicates financial security. While an OA in the category "independent" enjoys some financial security, OA in the category "fully dependent" does not enjoy that sort of financial security. An OA in the category "partially dependent" enjoys a state of financial security in between the two, mentioned already. Based on the per capita monthly expenditure, the households have been divided into five groups based on pentiles. This grouping has been done for rural and urban regions separately.

The demographic variables age, marital status and gender build up this system. The classification of marital status (MS) as currently married, widowed, never married, divorced and separated has been natural and exhaustive. Most of the OAs in Indian society are confined to either of the first two marital states. The latter three states contain a small proportion of the OAs. In the present analysis, these latter three states are clubbed into a single category "others." Education may influence health awareness among the OAs. Thus, education has been included here in the form of a categorical variable with two categories as

illiterates, and literates. Living arrangements (alone and co-residence as categories), place of residence (rural and urban as categories) and reference period (former 1986-87 and later 1995-96 as categories) are other variables included in the framework.

The Model

Suppose for a given population "P" and a given disease "D", we have a binary response variable Y_D^P coded 1 if a disease/disability is observed and coded 0 otherwise. Letting, π denote the probability that the given disease/disability has been observed, we may write

$$P(Y_D^P = 1) = \pi$$
$$P(Y_D^P = 0) = 1 - \pi$$

Let $\mathbf{X} = (x_1, x_2 ... x_k)$ be a set of explanatory variables that influence Y. Then, the logistic regression model is given by

$$\ln\left(\frac{\pi}{1-\pi}\right) = \sum_{j=1}^{k} \beta_j x_j$$

where, β's are the coefficients for the independent variables namely, the age, the gender, the marital status, the education, the financial independence, the living arrangements, the economic status of the household, the place of residence and the reference period.

Findings

The health of older females

The older females had a higher proportion reporting the chronic diseases, namely, PJL, hypertension and diabetes during 1995-96 when compared to 1986-87. The proportions were found to be higher by 0.08, 0.08, and 0.02 (Table 1) for PJL, hypertension and diabetes respectively. A slight increase was also observed in the proportion of older females reporting urinary problems. However, a decline of 0.02 (Table 1) in the proportion of older females reporting chronic cough was observed. The proportion of older females reporting heart

disease and those reporting piles did not differ during the two reference periods for both the chronic diseases.

Table 1: Proportion with 95% confidence interval of older males and older females who reported having selected chronic diseases during reference periods 1986-87 and 1995-96

	Older males			Older females		
	1986-87 (95% CI)	1995-96 (95% CI)	|difference| (p-value)	1986-87 (95% CI)	1995-96 (95% CI)	|difference| (p-value)
Problem in joints and limbs	0.30 (0.29, 0.30)	0.34 (0.34, 0.36)	0.05 (0.00)	0.34 (0.33, 0.35)	0.42 (0.41, 0.43)	0.08 (0.00)
Chronic cough	0.23 (0.22, 0.23)	0.24 (0.23, 0.24)	0.01(0.14)	0.21 (0.20, 0.21)	0.19 (0.18, 0.20)	0.02 (0.00)
Hypertension	0.07 (0.07, 0.07)	0.14 (0.13, 0.14)	0.07(0.00)	0.08 (0.07, 0.08)	0.16 (0.15, 0.16)	0.08 (0.00)
Heart disease	0.04 (0.03, 0.04)	0.04 (0.04, 0.05)	0.01 (0.00)	0.04 (0.03, 0.04)	0.03 (0.03, 0.04)	0.00 (0.56)
Piles	0.03 (0.03, 0.03)	0.03 (0.03, 0.04)	0.01(0.00)	0.02 (0.02, 0.02)	0.02 (0.02, 0.02)	0.00 (0.63)
Urinary problems	0.03 (0.03, 0.03)	0.04 (0.04, 0.05)	0.01(0.00)	0.02 (0.02, 0.02)	0.02 (0.02, 0.03)	0.00 (0.02)
Diabetes	0.02 (0.02, 0.03)	0.05 (0.05, 0.06)	0.03(0.00)	0.02 (0.01, 0.02)	0.04 (0.04, 0.04)	0.02 (0.00)

The health of older males

The proportion of older males who report PJL, hypertension, heart disease, piles, urinary problems and diabetes rose by 0.05, 0.07, 0.01, 0.01, 0.01 and 0.03 (Table 1) during the reference period 1995-96 when compared to the reference period 1986-87. However, the proportions of males who report chronic cough are not found to differ significantly during the two reference periods.

As described in the methods and data section the prevalence of selected chronic diseases among the OAs is modelled as a function of various socioeconomic variables. In what follows the associations between various socioeconomic variables and the prevalence of selected chronic diseases is described based on the odds ratios pertaining to logistic regression models. The logistic regression models utilised for the purpose are found to be significant (Table 2). An year of increase in the age enhances the odds in favour of hypertension, chronic cough, heart disease, PJL, piles and urinary problems by 1.01, 1.02, 1.03, 1.03, 1.02 and 1.04 times respectively. However, increasing age is not found to be significantly associated with prevalence of diabetes.

Health over the two reference periods

The prevalence of chronic diseases, namely, hypertension, diabetes, PJL, and urinary problems is found to be more likely during the latter reference period when compared to the former reference period. The increase in odds is found to be 1.81, 1.93, 1.33 and 1.23 times respectively (Table 2) for the above mentioned chronic diseases. The prevalence of the rest of the chronic diseases is not found to differ significantly over the two reference periods.

Place of residence and health

The OAs residing in rural areas are less likely to have hypertension, diabetes and heart disease when compared to their urban counterparts. Among the rural OAs the odds for having these chronic diseases are reduced by 0.58, 0.55 and 0.81 times respectively (Table 2) when compared to the urban OAs. However, their odds of having a chronic cough, PJL, and piles are comparatively higher by 1.48, 1.34 and 1.18 times (Table 2). The prevalence of urinary problems is not found to differ significantly between rural and urban OAs.

Household economic stratum and health

The fifth pentile of per capita monthly expenditure is the stratum of most affluent households. The prevalence of chronic diseases in the rest of the strata can be lower or higher than the fifth pentile. The chronic diseases that have relatively lower prevalence in the lower strata are found to be hypertension, diabetes, heart disease, piles and urinary problems. The odds in favour of having hypertension are found to be reduced by 0.77, 0.70, 0.57 and 0.48 times (Table 2) for the strata represented by the fourth through the first pentiles respectively. The corresponding figures for diabetes are 0.74, 0.65, 0.60 and 0.44 times (Table 2) respectively. For heart disease the respective figures are 0.75, 0.66, 0.59 and 0.81 times (Table 2) respectively. For urinary problems the respective figures are 0.80, 0.85, 0.84 and 0.72 times (Table 2) respectively. The prevalence of piles is not found to be significantly different in the economic strata represented by the third and fourth pentiles when compared to the fifth pentile. However, for the second and the first pentile the odds are found to be lesser by 0.86 and 0.76 times respectively.

On the contrary chronic cough and PJL are found to have a relatively higher prevalence in the lower economic strata when compared to the highest economic stratum represented by the

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fifth pentile. When compared to the OAs in the most affluent stratum, the OAs in the strata represented by the fourth through the first pentile are, respectively, 1.11, 1.14, 1.15 and 1.24 times (Table 2) more likely have a prevalence of chronic cough. PJL is 1.15 times (Table 2) more likely to be prevalent among the OAs of strata represented by the first and second pentiles. The strata represented by the third and the fourth pentiles are not found to differ significantly from the fifth pentile in this aspect.

Living arrangements and health

The OAs with an alone type of living arrangement are less likely to experience the prevalence of chronic diseases when compared to the OAs who have a co-residence type of living arrangement. However, an exception is observed for PJL. The prevalence of PJL is found to be 1.26 times (Table 2) more likely among the OAs with alone type of living arrangement. The prevalence of hypertension, chronic cough diabetes, heart disease, piles and urinary problems is reduced by 0.80, 0.92, 0.71, 0.68, 0.76 and 0.80 times (Table 2) respectively among the OAs with alone type of living arrangement when compare to the OAs with co-residence type of living arrangements.

Financial dependence and health

Financial dependence is observed to be conducive to prevalence of chronic diseases. The findings indicate that the prevalence of chronic diseases is more likely among the fully dependent and partially dependent OAs when compared to financially independent OAs. Hypertension is 1.23 times and 1.67 time (Table 2) more likely to be prevalent among the partially dependent and fully dependent OAs when compare to financially independent OAs. The corresponding figures for the prevalence of chronic cough are 1.26 and 1.58 respectively. For the prevalence of diabetes, the corresponding figures are 1.39 and 1.63 respectively. In the case of the prevalence of heart disease the corresponding figures are 1.73 and 1.44 respectively. For the prevalence of PJL the corresponding figures are 1.29 and 1.65 respectively. The corresponding figures for the prevalence of piles are 1.05 and 1.20 respectively. For the prevalence of urinary problems, the corresponding figures are 1.13 and 1.76 respectively.

Gender and health

The findings indicate that the prevalence of chronic cough, diabetes, PJL, piles and urinary problems is less likely among older females when compared to older males. For the respective chronic diseases, the odds are lower by 0.60, 0.79, 0.95, 0.66 and 0.50 times (Table 2) among older females when compared to older males. However, both the genders are not found to differ significantly concerning the prevalence of hypertension and heart disease.

Marital status and health

A comparison of widow OAs with that of currently married OAs indicate a significant difference between these two groups vis-à-vis prevalence of hypertension, chronic cough, diabetes and PJL. The chronic diseases, namely, hypertension, chronic cough and PJL are respectively 1.16, 1.22 and 1.21 times (Table 2) more likely to be prevalent among widow OAs when compared to currently married OAs. However, diabetes is found to be 0.86 times (Table 2) less likely to be prevalent among the widow OAs as compared to their currently married counterparts. Further, the prevalence of heart disease, piles and urinary problems among widow OAs is not found to be significantly different from that of currently married OAs.

Literacy and health

The prevalence of all the selected chronic diseases except PJL is less likely among the illiterate OAs when compared to literate OAs. However, for the prevalence of PJL the illiterate OAs are not found to differ significantly from the literate OAs. The odds for the prevalence of hypertension, diabetes, heart disease, piles and urinary problems are likely to be reduced by 0.44, 0.38, 0.55, 0.55 and 0.77 times respectively (Table 2) among the illiterate OAs when compared to literate OAs. The odds for the prevalence of chronic cough are found to be 1.09 times (Table 2) more likely among the illiterate OAs when compared to the literate OAs.

Discussion

Health is an important integrant of the quality of life of the OAs. Chronic diseases at older ages are detrimental to their quality of life. Prevalence of chronic diseases varies with varying socioeconomic conditions of OAs. Life in a rural set up is conducive to a relatively higher prevalence of chronic cough, PJL and piles. On the other hand, an urban set up is conducive to a relatively higher prevalence of hypertension, diabetes and heart disease. A difference in lifestyle may be the reason for such differing prevalence of chronic diseases. Economic affluence is more likely to be conducive to the prevalence of hypertension, diabetes, heart disease, piles and urinary problems; whereas lower economic affluence is more likely to be conducive to the prevalence of chronic cough and PJL.

At the individual level, financial independence is more likely to keep an OA free of chronic conditions. Possibly a financially independent OA is capable of bearing the cost of maintaining a sound health. Gender wise the older females are better placed vis-à-vis prevalence of chronic cough, diabetes, PJL, piles and urinary problems. Widowhood is a socially disadvantageous state among OAs. This may be the reason why hypertension, chronic cough and PJL are more likely to be prevalent among widow OAs. However, diabetes is more likely among currently married OAs. Literacy is associated with financial affluence. The lifestyle factors of affluence may be the causes of a higher likelihood of prevalence of hypertension, diabetes, heart disease, piles and urinary problems among the literate OAs. An individual OA or an OA couple living alone has a lower likelihood of the prevalence of chronic conditions. An OA being in a state of sound health can afford for alone type of living arrangement. But for OAs in a state of ill health co-residence is a better option for the availability of support and care. This indicates the salience of co-residence at older ages.

Conclusion

The share of older adults in the population of India is projected to reach 12.4% by 2026 (Census of India, 2006). This trend of increasing share is expected to continue in foreseeable future. Health issues among the OAs are distinct from the rest of the population in terms of the disease patterns and the need for health care. Hence, ensuring to the older adults a decent quality of life is as necessary as addressing the issues like malnutrition among children, maternal health and child health. In other words, issues related to the quality of life of the

older adults need to be considered on equal footing along with other high priority issues. To put the matters explicitly we need to know the need for geriatric care in India and how to fulfil the unmet need for geriatric care. This requires specially designed countrywide sample surveys and incorporation SDH perspectives into health policies of OAs. Policies promoting co-residence and financial independence of OAs may also contribute to an enhanced quality of life among OAs. Further, the quantum and the type of geriatric care required may differ from region to region for the reason that process of ageing is not uniform across the states of India and the socioeconomic environment is also not uniform across different states of India. Therefore, region-specific socioeconomic and health policies may be needed to mitigate the effect of financial constraints, widowhood and gender on the health-related quality of life of older adults.

Table 2: Odds ratios with 95% confidence intervals for logistic regression of prevalence of selected chronic diseases on various socioeconomic variables

variables	hypertension	chronic cough	diabetes	heart disease	problems in joints and limbs	piles	urinary problems
intercept	0.11(0.08, 0.14)	0.04(0.03, 0.05)	0.07(0.04, 0.12)	0.01(0.01, 0.01)	0.03(0.03, 0.04)	0.01(0.01, 0.01)	0.00(0.00, 0.00)
age	1.01(1.01, 1.01)	1.02(1.02, 1.02)	1.00$^\$$(0.99, 1.01)	1.03(1.02, 1.04)	1.03(1.03, 1.03)	1.02(1.01, 1.03)	1.04(1.04, 1.05)
gender							
female	1.05$^\$$ (0.97, 1.13)	0.60(0.57, 0.63)	0.79(0.69, 0.90)	0.97$^\$$ (0.86, 1.09)	0.95(0.91, 0.99)	0.66(0.58, 0.75)	0.50(0.44, 0.56)
male®							
marital status							
others#	1.03$^\$$ (0.75, 1.39)	1.22(1.01, 1.46)	1.12$^\$$ (0.66, 1.77)	0.83$^\$$ (0.49, 1.32)	1.10$^\$$ (0.93, 1.30)	1.36$^\$$ (0.84, 2.06)	0.60$^\$$ (0.31, 1.04)
widowed	1.16(1.08, 1.26)	1.22(1.17, 1.28)	0.86(0.75, 0.99)	0.95$^\$$ (0.85, 1.07)	1.21(1.16, 1.26)	1.01$^\$$ (0.89, 1.16)	0.99$^\$$ (0.87, 1.12)
married®							
education							
illiterate	0.44(0.41, 0.47)	1.09(1.04, 1.14)	0.38(0.34, 0.43)	0.55(0.50, 0.61)	0.97$^\$$ (0.93, 1.00)	0.55(0.49, 0.61)	0.77(0.69, 0.85)
literate®							
financial independence							
fully dependent	1.67(1.54, 1.81)	1.58(1.51, 1.66)	1.63(1.43, 1.86)	1.44(1.28, 1.63)	1.65(1.58, 1.72)	1.20(1.06, 1.35)	1.76(1.56, 1.98)
partially dependent	1.23(1.12, 1.36)	1.26(1.19, 1.33)	1.39(1.19, 1.62)	1.73(1.51, 1.97)	1.29(1.23, 1.36)	1.05$^\$$ (0.91, 1.22)	1.13$^\$$ (0.97, 1.32)
independent ®							
living arrangements							
alone	0.80(0.72, 0.88)	0.92(0.87, 0.97)	0.71(0.60, 0.84)	0.68(0.59, 0.79)	1.26(1.20, 1.32)	0.76(0.65, 0.89)	0.86(0.74, 0.99)
co-residence®							
economic stratum							
first pentile	0.48(0.43, 0.53)	1.24(1.17, 1.31)	0.44(0.36, 0.52)	0.81(0.70, 0.92)	1.15(1.09, 1.21)	0.76(0.65, 0.89)	0.72(0.62, 0.84)
second pentile	0.57(0.52, 0.62)	1.15(1.09, 1.22)	0.60(0.51, 0.69)	0.59(0.52, 0.67)	1.15(1.09, 1.20)	0.86(0.75, 1.00)	0.84(0.73, 0.96)
third pentile	0.70(0.64, 0.77)	1.14(1.07, 1.22)	0.65(0.56, 0.76)	0.66(0.57, 0.77)	1.04$^\$$ (0.95, 1.05)	1.02$^\$$ (0.87, 1.19)	0.85(0.72, 0.99)
fourth pentile	0.77(0.71, 0.84)	1.11(1.05, 1.18)	0.74(0.64, 0.84)	0.75(0.66, 0.85)	1.00$^\$$ (0.98, 1.09)	0.99$^\$$ (0.86, 1.14)	0.80(0.70, 0.92)
fifth pentile®							
place of residence							
rural	0.58(0.54, 0.61)	1.48(1.42, 1.56)	0.55(0.50, 0.62)	0.81(0.74, 0.90)	1.34(1.29, 1.40)	1.18(1.05, 1.33)	0.94$^\$$ (0.84, 1.05)
urban®							
reference period							
1995_96	1.81(0.71, 0.92)	0.98$^\$$ (0.94, 1.02)	1.93(1.74, 2.14)	0.95$^\$$ (0.86, 1.05)	1.33(1.28, 1.37)	1.02$^\$$ (0.92, 1.12)	1.23(1.11, 1.35)
1986-87®							
model chi-square (p-value)	2769.75 (0.00)	1644.01 (0.00)	1153.05 (0.00)	562.06 (0.00)	2836.24 (0.00)	362.58 (0.00)	621.96 (0.00)

never married/divorced/separated; ® reference category; note: the effects in logistic regression models are found to be significant at level of significance 5 per cent or less unless otherwise stated; $ indicates that the effects in logistic regression models are not found to be significant at 5 per cent level of significance.

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