

Ageing, ADL Disabilities and Need for Public Health Initiatives*

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Abstract:

Evidently, the process of ageing in India is seriously mired by the frailties and poor health conditions of the aged. While there have been some attempts by empiricists in recent years to examine this phenomenon and its demand-supply implications for the health sector in the country, nothing much has however been made to assess the problems of functional limitations suffered by the aged with deficient health. These limitations obviously force a majority of them to rely on filial assistance in their activities of daily living (ADL). Many believe that much of this assistance may gradually disappear with changes in social norms, reduced family size and decadence in major non-market institutions. Going by these considerations, this paper attempts to examine the prevalence of ADL impairments in two health domains among the older adults in India – namely physical and sensory – and some of their causal risk factors. Three issues were chosen to examine while using a survey of 1000 households in Delhi with elderly co-residents namely: (i) prevalence of ADL dependence among the aged by gender and socio-economic strata, (ii) some of their causal risk factors, and (iii) public health as a route to forestall some of these conditions. Our results indicate a very high prevalence of non-senescent ADL impairments in both the health domains with major risk factors involving frailties, diseases, sedentary life style and poor economic standing of the aged. Women were found to have suffered more. This brought us to identify a set of public health interventions as an option.

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Ageing, ADL¹ Disabilities and Need for Public Health Initiatives

Moneer Alam and Mukta Mukherjee

Introduction

India is fast catching up with many other graying societies as a result of its pervasive demographic changes and a rapid growth in the size of the older population. Two factors are noted at work to this direction: (i) progressive reductions in fertility and mortality, and (ii) added life span with increased survival chances - especially at the later end of the life cycle. These changes, and especially the added life years, have however been mired by the high prevalence of chronic diseases, that affect more than half of the country's older population (Alam 2004). Such a situation, coupled with large-scale poverty and the poor financial status of older persons, is likely to pose many serious socio-medical issues for the country. One of the more critical may indeed be the growing frailty, senescence², functional limitations and dependency of older persons in activities of their daily living (ADL)³ – constraining the caregivers both in terms of time and money. This aspect has almost been completely missed in the received literature on health and ageing in India.⁴ The analysis presented below is therefore an attempt to fill this void, and also to examine the following issues in the same order:

- (i) the prevalence of ADL limitations suffered by the older persons (aged 60 and above) due to physical and sensory impairments - cross-classified by gender and socio-economic characteristics. We may also try to identify the most prevalent ADL dependencies and their sex differentials,
- (ii) the likelihood of older persons becoming ADL disabled, and finally
- (iii) the linkages between the ADL dependencies and the public health system.

1: Analyzing ADL Limitations by Gender and Socio-economic Strata

ADL Disabilities: A Functional Definition

Conceptually, disability is a complex phenomenon that manifests itself in many ways and evolves over a much longer time span (Manton and Stallard, 1994). Further, its definition is subject to the environmental and socio-economic conditions of individuals. At a simplistic level, however, it refers to an individual's inability to perform basic household and self-maintenance activities, such as eating, dressing, bathing, walking and climbing stairs, etc. Under this paradigm, an individual can be described as disabled if his personal capabilities fall short of what has been actually demanded by his or her own environment or family conditions. When people are unable to perform their basic tasks, they become dependent for help on others – either informal (that is, from family or friends) or formal (i.e., paid caregivers).

¹ ADL refers to the activities of daily living.

² Senescence is usually defined as (non-disease based) physiological changes of ageing like poor reflexes, sensory decline or loss of skeletal muscle causing frailty, poor endurance and functional disabilities. Senescent changes can however be advanced or accelerated in presence of diseases. The process of ageing in India is currently mired by disease-linked senescence.

³ Albert et al. (2002) present an interesting discussion on the three pathways to disability in the Editorial of the *American Journal of Public Health*. We will describe these pathways in greater detail later in Section 3.

⁴ A study by Raju (2002) tries to examine the health status of the urban elderly and the attendant socio-medical issues. The study has, however, not been extended to the questions of ADL limitations or support.

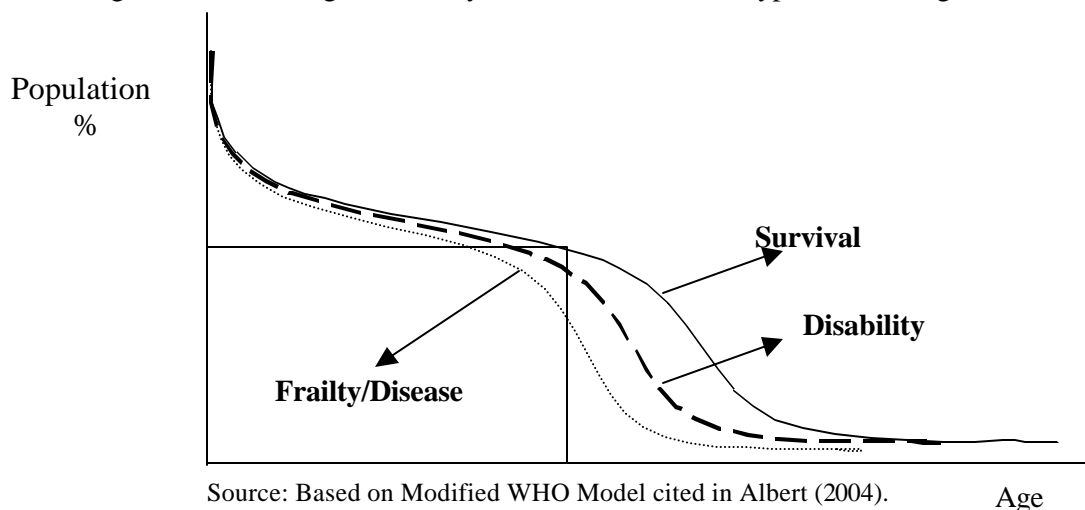
Despite difficulties in its conceptualizations, the attempt to measure disabilities is important because of its association with a decreased functional autonomy and the increased demand for long term care. Besides, its usefulness in making assessments about morbidity, mortality and certain health care needs is obvious. For instance, studies by Mor, Wilcox and Hiris (1994), Severson, Smith, Tangalos, et al (1994), etc., have shown that the ADL difficulties are significant predictor to derive estimates about the use of nursing home and hospital facilities. Similarly, an increasing number of long-term care insurance policies are now relying on the ADL disabilities as a trigger for paying benefits to those covered against these risks (Van and Johnson, 1989).

As further refinements, attempts have also been made in the literature to assess the hierarchy by which the loss of functional abilities progresses across a set of activities required by individuals for their self-maintenance.⁵ We have however not tried to postulate any such hierarchies in this exercise; and have attempted to analyze the extent of disabilities and support requirements as obtained from a survey of 1000 households with elderly (60+) co-residents. The survey, conducted as part of a bigger study on the health and livelihood issues of ageing Indians, was held during June-September 2002 in all the nine urban districts of Delhi, and covered a total of 1,385 older persons – 617 males and 768 females - cross-classified into four major socio-economic strata including those from high income group (HIG), slum dwellers, residents of government apartments and mixed income groups (for further details, see Alam 2004).

WHO Model of Disability

In 1981, the World Health Organization (WHO) presented an International Classification of Impairment, Disability, and Handicap (ICIDH) to catalogue the functional limitations suffered by individuals on account of physiological impairments and bad health. The model was subsequently revised in 2001 for further explorations in the relationship between functioning, disability and health (International Classification of Functioning, Disability and Health, ICF, WHO, 2001).

Figure 1: Partitioning Survival by Functional Status: A Hypothetical Diagram



⁵ Katz et al. (1963) have, for example, developed a hierarchy for a set of daily functions including bathing, dressing, toileting, transferring, feeding, continence, etc. Theoretically, this ordering was justified on the consideration that generally people lose abilities and become disabled in a manner opposite to the order in which primary biological and physiological functions are acquired (Dunlop, Hughes and Manheim, 1997).

An interesting feature of the ICF (2001) was that it allowed survival to be partitioned according to the functional status of the aged (Albert, 2004). The exercise presented below is largely drawn on the basis of this partitioning assumption with two additional premises – namely (i) the frailty precedes disability, so that people reach frailty before disability. And (ii) the states of disability precede mortality. With the high incidence of chronic and multiple diseases suffered by a majority of the aged in India, old age is resulting into a painful experience for many in this country with high risks of ADL impairment and dependencies. As a further clarification, Fig. 1 illustrates a hypothetical partitioning survival curve for India underlining the basic argument that frailty (shown with a thin broken line) – followed by disabilities (thick broken line) - worsen the quality of the individuals' life in the later years of their survival.

Tasks of Daily Living and Measurement of ADL Difficulties

As was noted, this analysis is an attempt to examine the ADL difficulties in terms of two health domains namely, the physical, and the sensory. In all, 9 physiological and 2 sensory tasks of daily living were included in the survey, and respondents were asked to furnish details about the difficulties in performing each of them. They were also requested to provide corresponding details about: (a) their need for ADL assistance, and (b) its availability or non-availability. Going by this, no or partial assistance may be considered as the *unmet need for assistance* required by the functionally disabled.

The 11 ADL difficulties under consideration are as under:⁶

(i) Physical Domain: (1) Eating, (2) Dressing, (3) Bathing, (4) Walking indoors (say to toilet), (5) Outdoor walk (say for routine shopping), (6) Cooking/Home cleaning, (7) Climbing stairs, (8) Combing hair, and (9) Getting-up from a sitting position.

(ii) Sensory Domain: (1) Hearing losses (or limitations of the auditory system), and (2) Vision impairments.

Using these domains and their listed tasks, we attempted to index the functional capabilities (FCI) of the aged into the following:

- a. No difficulty/No help (ND/NH)
- b. Difficulty/No help (D/NH)
- c. Difficulty/Help (D/H)
- d. No difficulty/Help (ND/H).

Those without any major difficulty or help requirement (ND/NH) in performing the respective activities in both health domains are considered healthy with better health stock. Similarly, there may be people who do not suffer any difficulty and yet receive assistance. The number of such persons is however minuscule and does not therefore affect the results. The problem group would therefore be those who fall into the second and the third categories – i.e., D/NH and D/H. Especially, those falling into the D/NH category may give an idea about the magnitude of unmet assistance to the ADL impaired. In addition, these functional capability indices (FCIs) may also be collated further to identify the size of ADL impaired persons with single and multiple difficulties. These details, and especially the size of persons with multiple difficulties, may help

⁶ In addition to these, there may be many more disabilities caused by cognitive, psychological or other forms of impairments.

to get an idea of the quality of survival in later years (Fig. 1), and the need for interventionist measures through public health initiatives leading to bringing down the level of disabilities.

ADL Disabilities: Some Results

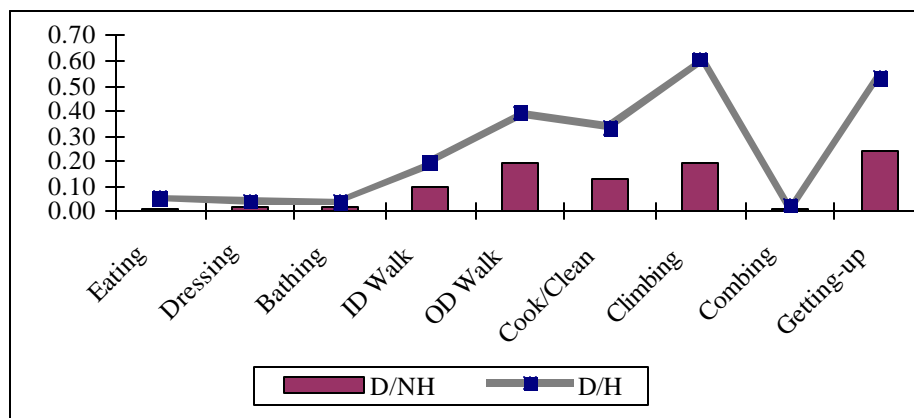
Table 1 contains a profile: (i) the ADL dependence of the older persons in both the health domains, and (ii) their needed assistance. There is evidence of wide-ranging disabilities from this table in all the eleven activities under reference. Another point of even greater concern may be the spread and magnitude of these disabilities. For example, the disabilities - and therefore the need for assistance or (D/H) - are present even in most modest activities like eating, dressing, combing or bathing. Although, the share of those reporting dependence for these activities are relatively much less, and vary between 3 to 5 percent of the total. To illustrate, the lowest dependence is found in combing (2.5 percent) followed by dressing

Table 1: Persons With & Without ADL Impairments and Support Requirements: 60+

Daily Activities (ADL)	Limitations/Difficulties & Help: Proportions				
	ND/NH	D/NH	D/H	ND/H	N
Physical					
Eating	0.933	0.013	0.053	0.001	1004
Dressing	0.941	0.017	0.042	0.000	1004
Bathing	0.939	0.020	0.038	0.003	1003
ID Walk	0.712	0.096	0.192	0.000	1003
OD Walk	0.414	0.193	0.391	0.001	999
Cooking/Cleaning	0.535	0.132	0.332	0.001	873
Climbing stair	0.200	0.193	0.606	0.001	999
Combing	0.965	0.008	0.025	0.002	1003
Getting-up	0.222	0.244	0.532	0.002	1001
Sensory					
Reading	0.839	0.024	0.136	0.10	997
Hearing	0.222	0.244	0.532	0.30	1001

Source: IEG/CIDA Ageing Survey.

Figure 2: Met and Unmet Assistance: Physically Impaired Persons



Source: Based on Table 1 (columns 3rd and 4th).

(4.2 percent), bathing (3.8 percent) and eating (5.3). Conversely, the other five physical activities suggest very high functional impairments, resulting into large-scale dependence on caregivers. It appears from these results that the most difficult task for an aged person is to climb stairs (with as much as 80 percent of dependencies). Getting-up from a sitting position is another difficult activity for more than three-fourth of the respondents. Moreover, it also generates high level of dependencies. Other difficult tasks included outdoor walking and cooking or cleaning, etc (see Table 1).

Unmet Assistance to ADL Impaired

An issue of greater concern perhaps is the lack of assistance to large proportions of the aged. Figure 1, for example, shows a great deal of unmet assistance to the respondents with problems in climbing stairs. The non-availability of assistance is also much higher for persons unable to walk outside or who find it difficult to get-up from sitting positions. Many of those unable to cook or clean are also short of assistance. Alongside, Fig. 1 also depicts the share of older persons drawing ADL assistance from family or friends (in thick broken line). Interestingly, the shares of those enjoying family assistance are always higher than those without assistance. This is particularly true for all such activities requiring greater physical effort including getting-up, out door walk or climbing stairs.

As has been expected, persons with no difficulty but receiving help are only few in numbers and, therefore, need no comment (col. 5 of Table 1).

In the case of sensory impairments, persons with hearing losses are surprisingly large and several times more than the number of persons with poor vision. Here also about a third of those with poor hearing capacity are left to fend for themselves (see last two rows of Table 1).

Distribution of ADL Impairments by Stratum

With evidence showing high a presence of ADL dependence among the aged, an obvious question that needs to be examined is: how do these dependencies vary across different socio-economic strata? Or, in other words, do the poor elderly suffer more with ADL impairments than their non-poor counterparts? To tentatively answer these questions, we redistribute the preceding table into four major strata – namely, the high-income respondents (HIG), slum dwellers, government and mixed categories of households. The results with these distributions are given in Tables 2a, 2b, and 2c. Given very few cases of ND/H, we drop this category altogether from further discussion.

Table 2a suggests that the high-income (HIG) elderly are far more ADL competent than others – linking income level with disabilities. This table, for instance, reveals that the HIG with ND/NH have the highest shares in activities involving eating, dressing, out door walk, climbing stairs, combing getting-up from sitting position, reading and hearing (bold figures in Table 2a). Next to the HIG are persons from the mixed category of households. Another point to note in this context is that the highest level of competence among the slum elderly is in cooking and home cleaning. In contrast, the HIG group turns out to be extremely poor in this ADL category.

Despite some relative advantages, Table 2a also reveals cases of disabilities in out door walking, cooking/cleaning, climbing stairs, getting-up and hearing reported by sizeable proportions of HIG respondents. They are particularly more vulnerable in climbing stairs (67 percent dependence), getting-up from sitting position (73 dependence) and hearing (73 percent dependence). As a bottom line, therefore, while income in some cases may prove as a protective cover against

Table 2a: Stratum-wise ND/NH

ADL Type	HIG	Slum	Government	Mixed
	Physical			
Eating	0.979	0.833	0.951	0.951
Dressing	1.000	0.914	0.927	0.944
Bathing	0.917	0.938	0.951	0.940
ID Walk	0.813	0.753	0.829	0.690
OD Walk	0.553	0.475	0.439	0.391
Cook/Clean	0.541	0.767	0.725	0.465
Climbing Stairs	0.333	0.315	0.220	0.166
Combing	0.979	0.938	0.976	0.969
Getting-up	0.271	0.204	0.122	0.228
	Sensory			
Reading	0.896	0.824	0.780	0.841
Hearing	0.271	0.204	0.122	0.228

Table 2b: Stratum-wise D/NH

ADL Type	HIG	Slums	Govt.	Mixed
	Physical			
Eating	0.021	0.031	0.000	0.009
Dressing	0.000	0.006	0.024	0.020
Bathing	0.063	0.000	0.000	0.023
ID Walk	0.125	0.031	0.024	0.112
OD Walk	0.277	0.111	0.244	0.203
Cook/Clean	0.108	0.050	0.050	0.159
Climbing Stairs	0.271	0.222	0.171	0.183
Combing	0.000	0.012	0.024	0.007
Getting-up	0.396	0.160	0.146	0.257
	Sensory			
Reading	0.000	0.025	0.000	0.027
Hearing	0.396	0.160	0.146	0.257

Table 2c: Stratum-wise D/H

ADL Type	HIG	Slums	Govt.	Mixed
	Physical			
Eating	0.000	0.136	0.049	0.049
Dressing	0.000	0.080	0.049	0.049
Bathing	0.000	0.062	0.049	0.049
ID Walk	0.063	0.216	0.146	0.146
OD Walk	0.170	0.414	0.317	0.317
Cook/Clean	0.351	0.182	0.225	0.225
Climbing Stairs	0.396	0.463	0.610	0.610
Combing	0.000	0.043	0.000	0.000
Getting-up	0.333	0.630	0.732	0.732
	Sensory			
Reading	0.104	0.145	0.220	0.132
Hearing	0.333	0.630	0.732	0.513

Source: IEG/CIDA Ageing Survey.

Note: Bold figures suggest the highest share of aged in a particular state of functional ability and help.

certain disabilities, it remains ineffective in many others.

Another source of vulnerability for the HIG elderly is the lack of ADL assistance available to many of them. This is clearly borne out from Table 2b (see bold figures). However, given their smaller family size and large-scale migration of HIG children, this result is not very surprising. Problems of inadequate ADL support may also be observed for the mixed income households. Despite their serious health disadvantages, the low-income slum elderly are relatively better off in terms of support provided by their family and friends. Table 2c clearly brings out this fact. Does this mean that the family size or number of children may also serve as a cover to minimize the risks of unmet assistance in situations of frailty and ADL dependence? Perhaps yes, but this exercise may not be able to make a conclusive observation on this.

Gender and ADL Disabilities

Gender differentials in the underlying context may be noted from Table 3. In line with general expectations, ADL impaired women outnumber men in considerable proportions. In addition, barring cooking or cleaning, it is true for all other activities under consideration in both the health domains (see the first two columns of Table 3). The share of functionally handicapped women are shown to be disturbingly high in activities requiring more physical strength such as climbing stairs (86 percent women are impaired and needing help) followed by the tasks requiring getting-up from sitting positions (85 percent impaired), going for various out door activities (65 percent dependence), etc. Even cooking or home cleaning was found to be difficult for more than 56 percent of the sample women. Also, 85 percent of the women were not able to hear properly. As opposed to this, men were found to be less impaired, though a big share of this category reported serious difficulties in activities requiring lower extremity strength like climbing stairs (73 percent), getting-up from sitting position (69 percent) or going out side for shopping and other routine work (49 percent).

Table 3: Proportions of Aged Males and Females with or without ADL Impairments

Nature of ADL	ND/NH		D/NH		D/H		N	
	Male	Female	Male	Female	Male	Female	Male*	Female*
	Physical							
Eating	0.955	0.914	0.011	0.015	0.032	0.071	470	533
Dressing	0.962	0.923	0.008	0.024	0.030	0.053	471	533
Bathing	0.953	0.927	0.015	0.024	0.032	0.043	471	534
ID Walk	0.785	0.647	0.079	0.111	0.136	0.242	470	533
OD Walk	0.512	0.334	0.217	0.171	0.272	0.493	471	532
Cook/Clean	0.662	0.437	0.153	0.115	0.182	0.447	378	494
Climb. Stairs	0.271	0.137	0.250	0.143	0.479	0.718	468	530
Combing	0.975	0.957	0.006	0.009	0.017	0.032	470	531
Getting-up	0.304	0.149	0.309	0.186	0.387	0.661	470	529
	Sensory							
Reading	0.861	0.818	0.015	0.032	0.124	0.148	469	527
Hearing	0.304	0.148	0.309	0.186	0.387	0.662	470	531

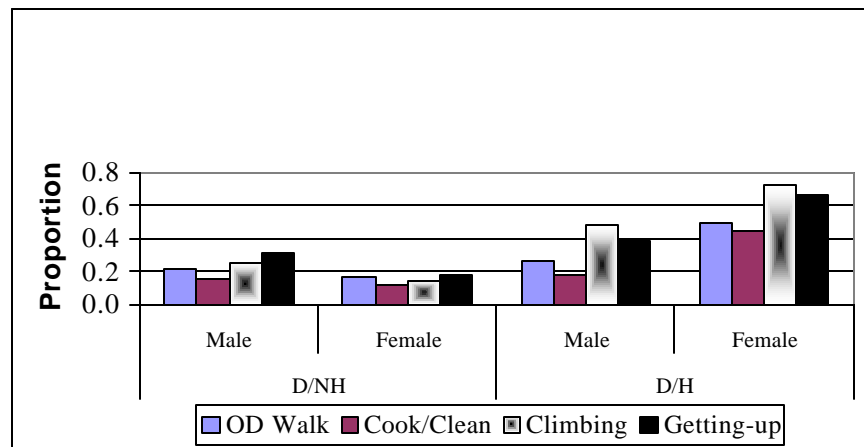
Source: IEG/CIDA Ageing Survey. * ND/H not included. Note: Bold figures denote more of vulnerable.

In addition, the male-female differences in functional abilities are evident from data presented in Table 3, which helps to identify a set of most impairing tasks for both the genders. These include,

- Climbing stairs
 - Getting-up from sitting positions
 - Out-door walk
 - Cooking and cleaning
- } Suggesting limitations of lower extremity

The difficult nature of these tasks is further substantiated by Fig. 3, which also exhibits very high proportions of both sexes with severe constraints in performing all the four activities noted above. The extent of disability is particularly high in climbing stairs as about three in every four men, and six in every seven women are shown to be dependents. Getting up from a sitting position is equally difficult for those who find it difficult to climb stairs. Not only that, even more than half the women respondents reported that they were disabled in cooking or cleaning the place in which they live.

Figure 3: Four Most Critical ADL Functions and Their Gender Differentials



Source: IEG/CIDA Ageing Survey.

Women are not only the worst victims of ADL impairments; they are also short of assistance. While a majority of them are indeed drawing help from family or friends, those without needed assistance are also significantly large. This is clearly highlighted by the D/NH columns representing the unmet assistance in Table 3 (Fig. 3). This poses a very serious issue both for the disabled elderly and their care providers – especially if they are in wage employment. Keeping these and many other ongoing socio-economic and demographic changes in mind, the ageing scenario and the need for the elder care in India is apparently fraught with serious issues. How far the care institutions like the old age homes and other specialized nursing institutions - both in the public and NGO domains - fill some of this void needs to be examined. Also these institutions can train nursing attendants to help the sick and disabled elderly at their residence.⁷ All these services may however come with a cost, and can only be used by high-income people.

⁷ An example may be that of the Heritage Hospital and Heritage Home Care services (Hyderabad, Andhra Pradesh), which is not only engaged in providing medical services to the older persons but also training nursing attendants for the sick and disabled elderly. The monthly costs of hiring these attendants range between Rs. 5000-6000 a month.

Persons with Multiple ADL Impairments

As noted, the existing level of disabilities and the needed support is likely to make care giving an extremely difficult and time consuming activity - with implicit risks of neglect by the family. But this is not all, for the magnitude of this problem may grow even further if the disabilities are functionally more constraining and cause multiple ADL impairments. The support in such situations would need to be more pervasive, and the unmet assistance to older persons may prove more traumatic. Given this, we tried to compute the number of persons in our sample with or without multiple ADL disabilities. This would enable us to get an idea about the burden of dependence imposed on families if the disabilities follow the pattern emerging from this survey.

Table 4 gives a gender-wise break-up of respondents by the number of disabilities they have been suffering at the time of this survey. In many ways, these results conform to those presented earlier. For instance, this table also suggests that women are in a more pitiable situation. Further, while the share of those with no difficulties is much less for both the genders – little over a third of their total sample size – the ADL efficient men outnumber the women. However, the more significant observations arising from this exercise relates to the sex-wise break-up of persons suffering from multiple physical impairments. Three points bear special consideration:

- (i) The share of males and females suffering from multiple (2/3 or more) disabilities are far much higher than those that reported no or single disability,
- (ii) Compared to men, women suffer from a greater number of disabilities (Fig. 4), and
- (iii) About half of the responding females (i.e., 49.7 percent) are reported to suffer from three or more disabilities. This share is however much lesser for the males (i.e., 38.4 percent).

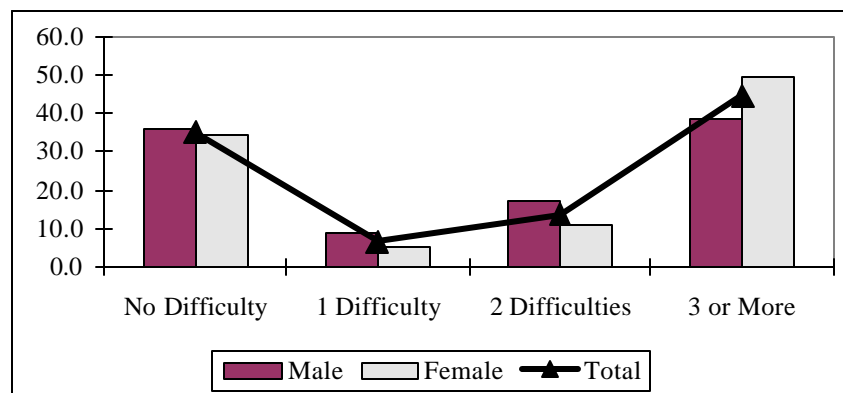
Table 4: Distribution of Persons with Single or Multiple ADL Limitations: (%)

Number of Disabilities	Gender		Column %
	Male	Female	
No disability	35.98	34.38	35.09
1 disability	8.59	4.95	6.57
2 disabilities	17.02	10.94	13.65
3 or more disabilities	38.41	49.74	44.69
Column total (Number)	617	768	1385

Source: IEG/CIDA Ageing Survey.

Note: Col. totals in this table may not compare with Tables 1 or 3 due to differences in response formats.

Figure 4: Distribution of Responding Males & Females by Number of Disabilities



Source: Based on Table 4.

Many policy issues arise from these results. One is the quality of survival at the tail end of life – especially when the tail is increasing with time (Fig. 1). Another is the gender dimension of disabilities. Particularly women with their multiple disabilities may ultimately drop below the threshold of physical, sensory or cognitive capacities and, as a result, need more intense and regular care to perform ADL tasks. Could the required care be arranged informally through family sources? This is indeed a big issue and needs to be examined with more specific details. Yet another aspect relates to the ongoing debate on healthy ageing. With so much functional disability and chronic disease, especially among the females, the whole idea of healthy or active ageing needs to be revisited. Simultaneously, this is now the time to re-think the whole concept of health from the viewpoint of ageing, and the need to remain without functional dependency at the later stages of the life span. As a first step, however, what is required is the need to look into some of the causal factors, which are likely to contribute to the ADL disabilities. Further, how can public health be geared to bring the current level of disabilities down is another issue of wider public concern. We will take-up these issues below.

2: ADL Disabilities and Some of Their Causal Factors

As we search for insights into disabilities in various health domains, an obvious issue would be to examine some of their causalities with higher risks. Two methods may be followed. The first would be to adopt a more medically oriented approach with a study of a prospective cohort and its lifelong details including the health behaviors and health risks. Such an approach has however seldom been applied by analysts. Even the gerontological research cohorts usually begin from age 55 and above (Albert, 2004). The other is to use certain proxy measures and capture the likely risk factors. We have relied on the latter in this exercise and have used a host of socio-economic and health indicators to assess the possible risks of ADL disabilities among the aged. We begin by a brief discussion of the model, especially the details about the set of variables chosen for the analysis. This would be followed by the results.

Description of the Model

As has been earlier mentioned, the exercise reported below is based on our survey data and is designed to identify a set of socio-economic and health factors with associated risks of physical disabilities among the aged, forcing them to rely on others for their self-maintenance. An implicit hypothesis of this analysis is that the low income and financially dependent men and women (especially women) with a sedentary life style may have greater risks of suffering from the ADL disabilities. The necessary details of the model including the set of explanatory variables are

Box 1: Description of Model to Estimate the Risks of Disabilities		
Estimation Model	Dependent Variable	Independent Variables
Count Data Regression (Negative Binomial)	ADL Disability Index (0-3) as shown in Table 3.32.	(i) Initial Health Stock (ii) Standard of Living Index (iii) Habit Index (iv) Age (v) Age Square (vi) Sex

presented in Box 1. Given the multiple and discrete nature of our dependent variable (i.e., 0 - 3 disabilities), a count data model is employed for this analysis. Methodologically, the count models usually rely on the Poisson process where each y_i is drawn from a Poisson distribution

with parameter $\tilde{\epsilon}$, which is related to the explanatory variables X . A serious drawback of the model, however, lies with the assumption that its conditional mean and variance are equal. In reality, and especially in situations of over-dispersions like in the present case, this is highly unlikely.⁸ In order to overcome this difficulty, a Negative Binomial Model - which by formulation has a cross-sectional heterogeneity - has been suggested in the literature (Greene, 2002). The Poisson model is generalized by introducing an individual, unobserved effect into the conditional mean (i.e., $\ln \lambda_i = X'_i \hat{\alpha} + \hat{\alpha}$). This leads to bringing about a difference in the conditional mean and conditional variance. We have therefore tried to follow this procedure in the exercise reported below.

Construction of Variables

Details of the variables used in the exercise reported below are as under. In addition, Appendix Table 1 presents the descriptive statistics of all the variables under reference.

ADL Disability Index (0-3): A composite disability index (i.e., without going into activity specific disabilities) was generated to identify the range of persons with no disabilities to those having a maximum of three or more disabilities (see Table 4).

Income Status (Standard of Living Index): The income of an individual is proxied by the standard of living (SLI) indices. These indices were constructed by taking into consideration the asset holdings of an individual household, where the assets were scored on the basis of their notional market price (see Appendix Table 3). Finally, we aggregated these overall scores for every sample household, and assigned them to each household member (for further details on this, see Alam 2004).

Initial Health Stock Index (1-4): It is usually believed that the healthier an individual is the less he will suffer from disability. In order to capture this effect we have tried to formulate a health index on the basis of the number of disease(s) that an individual is suffering from over a reference period of the past one-year from the date of the survey. We asked our respondents about a total of 17 common diseases of later ages (for a list of these diseases, see Appendix Table 2). A scrutiny of this data suggested that in no case an individual in our sample was seen as suffering from more than four diseases. Accordingly, we have indexed them on a scale of 1 to 4. An individual suffering from one disease is considered healthier (and scored 1) than those suffering from a greater number of diseases.⁹

Habit Index (0-2): Healthy habits will also help to make an elderly person less prone to disability. In our survey, we tried to capture this effect by considering the life style of an individual, i.e., whether or not he or she goes for a walk or meditates. Also, in order to capture the effect of regularity and irregularity, we have further segregated the respondents into three broad categories: (i) those regular in their routine, (ii) those not so regular, and (iii) those who do not at all follow any exercise or meditation regime. Those with regularity in their habit got the highest index value (i.e., 2) followed by the remaining two with 1 and 0, respectively. We however finally dropped meditation from our estimations to avoid the problem of co-linearity arising between this and the exercising habit.

Gender: This variable was considered in a binary format with 1 assigned to males, and 0 otherwise.

⁸ For good discussions on these issues, see Cameron and Trivedi (1986), Grootendorst (2002), etc.

⁹ We have however failed to consider the nature and the gravity of these diseases.

Age: Persons aged 60 and above.

Discussion of the Results

In line with the general expectations, Table 5 reveals the number of diseases – or health stock of an individual - as the factor most potent to cause the ADL disabilities. An individual with multiple diseases is far more likely to suffer from disabilities than one with a good health legacy. This brings to the forefront an important issue raised in recent gerontological literature linking the health status during the first fifty years of life with the rest of the life span. As most of the existing gerontological researches have usually relied on higher age cohorts, the linkages between the earlier and the later age health stocks are not very evident (Albert 2004). This may particularly be important for the low-income countries like India where the burden the diseases among children and persons in younger ages are considerably large (World Bank, 1993). With possibilities of such linkages being strong, as is also highlighted by the results presented in Table 5, there is clearly a need to probe this hitherto rather neglected area with medically drawn inputs and more comprehensive data from high disease countries including India, which is also at the threshold of rapid ageing.

Another interesting finding of this analysis is the significance of life style, particularly the habit of regular exercising to promote strength, balance and stamina. Our results reveal that persons with regular walking practices (exercise) would be likely to escape the risks of physical disabilities to a certain extent. The coefficient of habit index is statistically significant at the 1 percent level with a negative sign, implying greater risks for those with a sedentary life style. Another important factor with a higher-level of statistical significance is the income status. Persons with higher SLI values are less likely to suffer disabilities in the physical domain. Gender is another risk factor with women being at the receiving end. It validates our earlier findings showing women outnumbering the men in various activity specific disabilities. Age is yet another contributory factor and adds to the risks of various functional impairments. However, the risks of disabilities declines with age.

Table 5: Risk Factors In ADL Disabilities: Results Based on Count Data Model
 Dependent Variable: ADL Disability Index
 Number of Observations = 959

Variables	Coefficients	St. Error	z	P> z
Constant	-2.566077	1.716195	-1.495	0.135
Health stock index	.1204281**	.0218977	5.500	0.000
Habit index	-.0655843**	.0256563	-2.556	0.011
Age	.0836547	0478117	1.750	0.080
Age ²	-.0005061	.0003298	-1.534	0.125
Sex	-.0916575*	.0462358	-1.982	0.047
Income status	-.0035207**	.0015761	-2.234	0.025
Log likelihood = -1473.9751			Pseudo R ² = 0.0262	

** Statistically significant at 1 percent level.

* Statistically significant at 5 percent level.

These results are indeed informative and may help in many ways and especially in evolving certain public health responses to the health of the ageing population. However, it must be pointed out that the R² in our equation turns out to be very low. While the R²s are often low in cross-sectional exercises, it mostly indicates the relevance of unaccounted factors. In our context,

it seems to suggest that the risks of disabilities cannot be fully explained with the help of the socio-economic indicators alone. Further inputs in the form of medico-environmental and related details would also be required to work out various overtime physiologic changes¹⁰ (or biomarkers of ageing) associated with frailty, health risks and disabilities among the aged.

3: Ageing, Functional Disabilities and Public Health

Currently, India is in the midst of several transitions, and these transitions are particularly discernable in the economic, demographic and epidemiological spheres of life. At the economic level, for instance, India is aggressively pursuing market reforms while dismantling the control process and aiming at gradual privatization of the major health and non-health services. This was however brought about without developing a worthwhile social safety net for the vulnerable segments of population including the aged. At the demographic level, India is by and large out of the high fertility-mortality syndrome with major gains in terms of added life span and a reduction in high age deaths.¹¹ Epidemiologically also, India is now far from the early 20th century phases of contiguous, poverty driven and vector born diseases. The later two – i.e., demographic and epidemiological transitions - were obviously the results of an improvement in living standards and a better quality of life due to improved medical infrastructure and effective public health measures including improved sanitation, supply of potable water and a high rate of vaccinations to prevent the childhood diseases.

Despite these improvements, most of our preceding results are mired by the poor health conditions of the aged with a high prevalence of co-morbid conditions and multiple ADL disabilities. With an increasing role being assigned to market forces, the growing cost of medical care, persistent poverty, the poor quality of health services in the government sector, the lack of social health insurance, and the degenerating nature of old age diseases, it may be said that a majority of aged in India have apparently run out of options. With time, they may even lose family care as the result of various socio-cultural and economic changes. This is indeed a situation that needs to be seriously examined with the help of specially designed studies and relevant statistical details.

The present discussion, which is more in the context of our preceding results on ADL limitations and functional disabilities, examines this problem by going into two specific issues: (i) the pathways of functional disabilities, and (ii) their likely public health responses. We posit that an understanding about these two issues is important for the simple reason that most of the reported disabilities in our survey were not age determined¹². Rather, these were almost entirely caused by frailty, medical conditions and the sedentary life style of the individuals (see Appendix Table 4). Given this, a preventive route, with the public measures, may well be adopted.

Figure 4 is drawn on the assumption that the disabilities may be caused both for reasons of: (i) age-determined senescence, and (ii) general or disease related frailties (Albert, Im and Raveis,

¹⁰ These changes generally apply to indicators of respiratory and cardiac functions, as well as walking speed, working memory, visual reaction time, gait speed, sensory discrimination, and other more typical indicators of age (Albert, 2004).

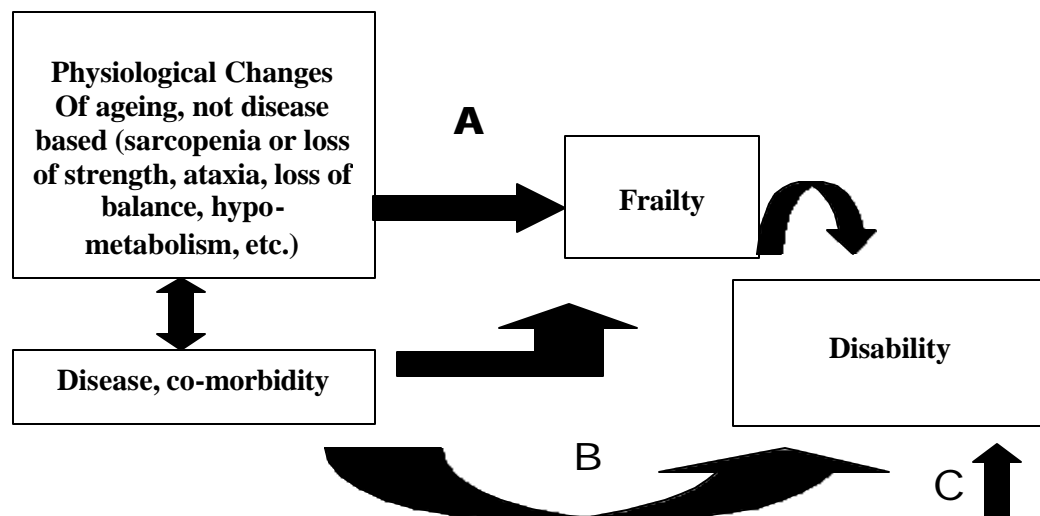
¹¹ A temporal comparison would however reveal that the rate of decline remains very low during the past few years (see, for example, the reports of Sample Registration System for 1980, 1991 and 1998, published by the Registrar General of India).

¹² Geriatricians often distinguish between the “age related” and the “age determined” changes in human life. Also, they argue that the true senescent changes result due to the late life declines in physiological reserves (Albert 2004).

2002). Pathway A in Fig. 5, for example, illustrates the direct effects of age-based changes in individuals resulting into true senescence, severe weaknesses, poor endurance capacities, lack of body resistance, memory loss, and run down physical and mental conditions. This age determined physiological changes might leave the aged in a situation where they may have to rely on external support for their self-maintenance activities including cooking a meal, cleaning or going out for daily purchases. These usually incurable conditions may tend to gradually worsen with the ultimate option of seeking medical or home care. In India, few can afford this option.

Path B that causes an individual to fall into disabilities, on the other hand, is directly an outcome of various ailments and frailties – a situation mostly endorsed by our survey respondents at the time of their interviews. Appendix Table 4 also brings out the same trend and suggests the very high role of diseases, especially frailties, in predisposing the responding older adults to suffer from functional losses. To be more precise, a majority of the respondents in our survey (over 52 percent as may be noted from Appendix Table 2) have reported frailty as the major cause of their disabilities and incapacity to self-maintain themselves.

Figure 5: Pathways of Frailty and Disability



Source: Albert, Im, and Raveis, 2002.

Besides, the environmental conditions of individuals, marked by the arrow C in Fig. 5, may also be a reason and may cause severe disabilities among the older persons. Especially, the lack of a supportive environment – which remains the case with a big fraction of our sample elderly (see the D/NH columns in Tables 1 to 3) – is likely to converge into a highly critical issue, especially for the older women and people from lower economic strata. Geriatricians have already started recognizing that an improper atmosphere or poor inter-generational bonding can produce disabilities among people who are otherwise the same in frailty or medical conditions.

Of these three pathways, the roles of B and C are turning out to be the most potent causal factors in Indian conditions. And, for a majority of the ageing Indians, getting away from these conditions seem difficult without strong and concerted efforts by the major stakeholders including the families, the community, the NGOs, the media, and above all, the government. At the

government level, perhaps the public health strategies offer a low cost and economically viable window of hope. It may however require changing the pathways of ageing by preventing more and more people from plunging into the conditions marked by the pathways B and C. The NGOs may also have a role, and may join the public health agencies and media in sensitizing people against the risks of frailties and early age diseases.

Role of Public Health in Preventing Disabilities

A big question may now be: what role can be played by the public health agencies in altering the pathways of disabilities and preventing or forestalling people from falling sick? A recent study by Albert (2004) has tried to examine this issue at a much broader level. An important contribution of this study is the identification of a set of public health goals for four different categories of the older people: (i) robust (like ND/NH given in Tables 1 to 3), (ii) demented with serious cognitive impairments, (iii) persons in late ages (or old old), and (iv) frail. These goals are summarized in Table 6 with an emphasis on the prevention of frailties among the robust, and improvements in the living conditions of the frail by helping them to minimize their day-to-day responsibilities, and making them save their remaining physiologic abilities.

The study further argues to change the pathways of ageing by sensitizing people to improve their post-fifties’ life span by evolving to take-up enhanced habits of cognitive engagement, physical exercise, balanced diet, moderate drinking, no smoking or tobacco chewing, and frequent health screenings. The study also recommends providing mineral supplementations to the old old to forestall decay in their bone mass. Similarly, statins or aspirins may be provided as part of public health measures to reduce the cholesterol deposition and bring down the cases of cardiac death.

Table 6: Ageing Experiences and Goals of Public health Strategies

Type of Older Persons	Goals of Public Health
Robust	Prevention of Frailty and disability
Demented	Prevention of excess morbidity, and excellent custodial care
Late Stage of Life (old old)	Reduction of isolation, maximization of choice
Frail	Environmental modification to reduce task demand; rehabilitation to increase capacity by developing spared abilities

Source: Albert (2004).

The maximum emphasis was given in the study to avoid the pathway B – the biggest reason for disabilities, especially in India. Sensitization to follow good life practices including cutting down sedentary habits, along with measures to reduce the risks of dementia, stroke, heart disease, respiratory or such other problems would most likely help in reducing the risks of disabilities.

The third pathway – i.e., unsupportive environment – may be another critical factor and needs serious consideration in countries like India where family-provided care is the main stay of ageing. Understanding the social context of ageing may therefore be significant to devise ways for creating a more amenable atmosphere for the growing number of elderly.

Given these facts, drawing a comprehensive preventive mechanism to make the ageing process a more endurable experience is almost imperative for a country like India. This is all the more significant because of the high incidence of morbidities, non-existent publicly run health care infrastructure in rural areas, old age poverty and no trace of social health insurance practices in the country.

But, are we moving to this direction? At least, presently no such effort is visible. Particularly, the public health route of ageing remains completely unexplored. We may however need to take recourse to this system so as to integrate old age health issues with the public health programme. NGOs and media may serve as close partners in this venture.

4: Summary and Conclusion

The following issues were at the core of this discussion:

- Physical and sensory impairments of the older adults and their ADL dependencies, cross-classified by gender and socio-economic strata.
- Likely causes of these impairments, and
- Some of their public health responses in the form of primary prevention strategies.

Functional impairments in both the health domains were judged on the basis of curtailments in the activities of daily living (ADL) by the older adults. In all, eleven ADL tasks were considered from these two health domains: nine physical, and two sensory. Our results suggest a very high prevalence of disabilities in both the domains – dropping a very large majority of older males and females below the threshold of their ADL capacities. At the sensory level, a larger number of people had reported suffering from hearing losses rather than impaired vision.

Physically, more than three quarters of the sample elderly were reported as disabled in many of the activities - particularly walking out door, getting-up from sitting positions or climbing stairs. These results suggest that problems of lower extremity strength become a serious health hazard for a large majority of the ageing population in India. Also, it causes acute forms of ADL dependencies. With a smaller family size, changes in traditional values, growing migrations, and the incidence of intergenerational frictions, sustained and full time family support is likely to wear-off gradually.

Despite good instances of family support to their elderly, persons with unmet assistance did exist, and in significant proportions. We argue that this proportion would increase with time.

At its worst is the presence of a gender dimension to the ADL disabilities. Women are found to be in the worst conditions – both in terms of disabilities and in missing a supportive atmosphere. Even more than half of our women respondents reported as being disabled to cook or clean the place they lived in. Overwhelmingly, a majority of them reported impairment in lower extremity strength and, therefore, were unable to walk, get-up or climb stairs. Out of every seven women, six suffer from most of these difficulties. In addition, a larger number of women are faced with multiple impairments than men.

On causalities of the ADL disabilities, individuals' health stock (or health reserves) – proxied by the number of diseases they suffered – turns out to be a major risk factor with likelihood to inflict severe functional impairments. Similar other risk factors included levels of living (i.e. income status), sedentary life style (lack of regular exercise), and gender - with women facing much greater odds. Another significant factor in this context is, of course, the individual's age.

To conclude, two observations may bear significance at the policy level. One is the poor quality of survival due to a high prevalence of disabilities in later life years. And the second relates to the fact that in most cases the functional disabilities are not age determined. These are rather the outcome of gender or health related factors – disease, frailties, life style, etc. It is therefore

advisable to follow a public health route to prevent the disabilities by: (i) creating awareness among people about the need for preserving their health stock to ensure healthy ageing, (ii) setting up public health goals for different segments of the older population – robust, frail, demented and old old, and (iii) taking-up drug supplementation activities to ensure primary preventions of complex conditions.

Appendix Table1: Descriptive Statistic of Variables used in Table 5

Variable	Observations	Mean	Std. Dev.	Min	Max
Disability index	1385	1.644043	1.331454	0	3
Habit index	1019	1.030422	0.918088	0	2
Age Sq	1385	4685.678	971.6838	3600	9801
Age	1385	68.11986	6.737658	60	99
Gender	1385	0.445487	0.497199	0	1
Health stock index	959	2.573514	1.028085	1	4
Std. of living index	1385	38.16029	14.62455	1	90

Appendix Table 2: Disease-Disability (or Difficulty) Matrix

Diseases	Disability Index				Col. %
	0	1	2	3	
1. Poor vision/Cataract/Other eye impairment	31.7	34.1	19.5	14.6	4.28
2. Lung problem/Respiratory problem/Asthma	7.7	23.1	15.4	53.8	1.36
3. Tuberculosis/Other chronic fever	33.3	33.3	33.3	0.0	0.31
4. Diarrhea/Gastroenteritis/Stomach ulcer	33.3	66.7	0.0	0.0	0.31
5. Skin disease	33.3	33.3	0.0	33.3	0.31
6. Angina/Chest pain/Cardiac problem	5.9	5.9	11.8	76.5	1.77
7. High BP	19.4	9.7	19.4	51.6	3.23
8. Arthritis/Rheumatism/Joint pain	3.9	5.2	10.4	80.5	8.03
9. Back Pain/Slip disc	8.3	4.2	25.0	62.5	2.50
10. Neurological or Mental problems (Depression)	50.0	0.0	0.0	50.0	0.21
11. Cancer (of any form)	0.0	0.0	0.0	100.0	0.10
12. Demented/Memory loss	0.0	0.0	100.0	0.0	0.10
13. Alzheimer	0.0	0.0	0.0	0.0	0.00
14. Frailty/General weakness/Run down condition	7.9	10.2	24.4	57.5	52.97
15. Injury & related disabilities	0.0	0.0	0.0	100.0	0.73
16. Burn & related disabilities	0.0	0.0	100.0	0.0	0.21
17. Diabetes & other problems like Prostate/Dental, etc	2.7	6.6	21.2	69.5	23.57
Row Total s (Number)	76	97	208	578	959
Row %	7.9	10.1	21.7	60.3	100.0

Source: IEG/CIDA Ageing Survey.

Appendix Table 3: Standard of Living Index (SLI)

<i>Assets</i>	<i>Score</i>
<i>Goods & Services</i>	
Truck /van	12
Cars	11
2 wheelers	10
Computers	10
Refrigerator	9
Television	9
Telephone	8
Sewing machine	7
Table fan	6
Cycle	5
Banking & other facilities combined	5
Radio	4
<i>Immoveable Assets</i>	
Pucca house	3
Semi -kucha	2
Kucha	1
Flush toilet & inside the house	3
Dry toilet & inside the house	2
Outside toilet/No toilet	1

Source: Alam (2004).

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