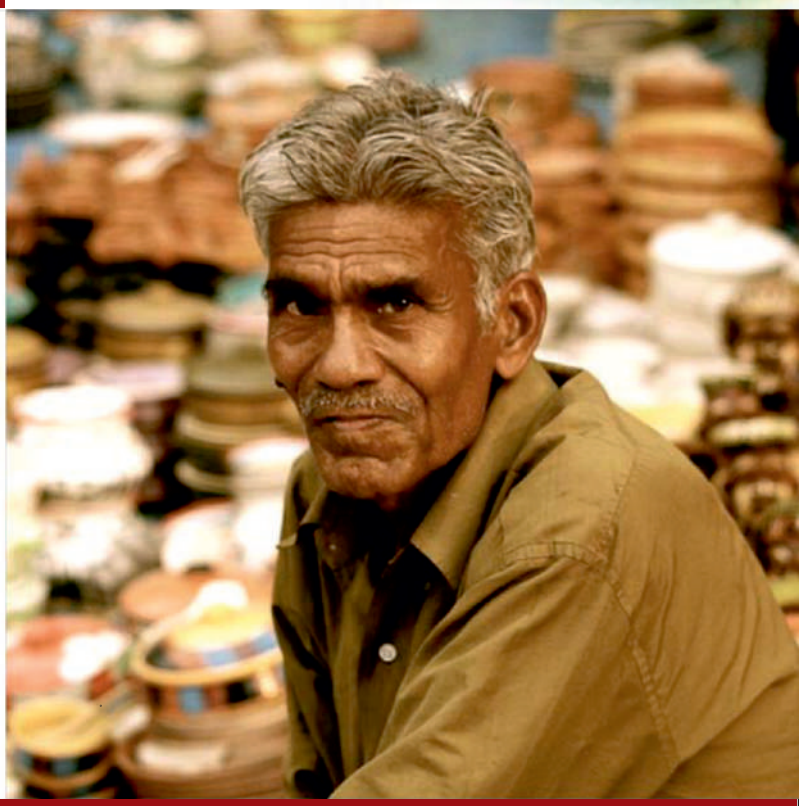
Longitudinal Ageing Study in India



Pilot Survey, India 2010

An investigation of the health, social and economic well-being of India's growing elderly population

International Institute for Population Sciences · Harvard School of Public Health · RAND Corporation

LONGITUDINAL AGEING STUDY IN INDIA

(LASI: PILOT SURVEY - 2010)

India Report

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For additional information about the 2010 Longitudinal Ageing study In India (LASI – Pilot Survey)

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CONTENTS

TABLE OF FIGURES

CHAPTER 5 HEALTH AND HEALTH CARE OF OLDER POPULATION

CHAPTER 6 BIOLOGICAL MARKERS OF AGEING AND ELDERLY HEALTH

ACKNOWLEDGEMENTS

The Longitudinal Aging Study in India (LASI) is a partnership between the International Institute for Population Sciences, the Harvard School of Public Health, and the RAND Corporation. Funded by the National Institute on Aging (NIA), the LASI pilot was successfully implemented in 2010. LASI addressed issues of great policy importance using a science-based agenda and internationally harmonized survey instruments.

We are grateful to the Ministry of Health and Family Welfare (MoHFW) and Indian Council of Medical Research (ICMR) Government of India for their approval of LASI Pilot and guidance and support. We are also thankful to many organizations / individuals for supporting LASI initiative. Prof. F. Ram, Director, IIPS whose guidance and help is gratefully acknowledged. The administration of IIPS, including Registrar and Accounts Officer, extended all possible help in completing this survey.

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The IIPS research team from LASI Project worked hard in preparatory work for the survey, developing survey instruments, in tabulation and analysis in drafting the report. Last but not the least, our thanks goes to all respondents who took part in the LASI Pilot Survey and willingly provided all obligatory information.

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SUMMARY OF FINDINGS

This section summarizes the key findings from the LASI pilot modules on economic well-being, family and social networks, health and health care and biological markers.

Economic well-being of households with older adults

For the first time, economic well-being was measured with respect to a set of direct economic measures (consumption expenditure and household income), economic proxies (household wealth and assets), and other subjective measures of economic well-being.

We found that consumption and wealth differentials were well captured, but income estimates appeared grossly underreported. The correlation of the consumption quintile with the wealth quintile was stronger than that of the consumption quintile with the income quintile. For example, among households in the poorest quintile of consumption expenditures, about 46 percent are also classified in the poorest quintile of wealth, whereas only about 19 percent are also classified in the poorest quintile of income. Thus, the consumption quintile and wealth index are preferable to use in pilot data analysis than income. We suggest a careful modification and administration of the income questionnaire for the main wave. Some key results are:

Living conditions: In rural areas, half of the households had no toilet facility and one-fifth had no electricity. The availability of a toilet facility, improved drinking water, and electricity was significantly higher in urban areas than rural areas.

Consumption, income, and wealth: State differentials in economic conditions of the household were large—the mean monthly per capita expenditure (MPCE) was highest in Kerala followed by Punjab, Karnataka, and Rajasthan. The MPCE was significantly higher in urban areas and among households with less than three members, and it declined as people aged. How do older people spend their money? Almost half (49 percent) went for non-food expenditure, while about 45 percent went for food and about 6 percent for health care. The proportion of expenditure on health and non-food increased with wealth quintile, while that for food declined with wealth quintile.

Subjective measures: Comparing subjective measures of economic well-being for the poorest and richest showed a big gap. Among those in the poorest consumption quintile, 19 percent reported that they find it difficult or very difficult to manage their households compared with only 5 percent in the richest quintile. Similarly, while 48 percent of the households in the poorest consumption quintile reported that they are living comfortably, 83 percent did so in the richest quintile. As for the state of their economic condition over the past two years, only 23 percent of the households in the poorest wealth quintile said it had improved, compared to 70 percent among the richest. Similarly, while 45 percent of those in the poorest wealth quintile said their economic conditions have worsened, only 7 percent in the richest quintile did.

Family and social network

Family is the most-cherished institution in India and the most important non-formal social security for older people—traditionally providing psychological, social, and economic support. But with changes taking place in family structures, intergenerational relationship, and women's role within the family changing, the survey probed family social networks for older people.

Socio-demographic characteristics: Our respondents were evenly spread throughout the five wealth quintiles; most (73 percent) were from rural areas; 57 percent were female; and 81 percent were married. About, 66 percent were aged 45–59-years-old, with 26 percent age 60–74, and 8 percent age 75+. More than 60 percent lived with both their spouse and children, 15 percent lived with just their children, 12 percent lived with just their spouse, and only 5 percent lived alone. About half were literate versus illiterate; in fact, 48 percent had no schooling, while only 18 percent had high school and above. The main (76 percent) religion was Hindu. And in terms of caste, 28 percent were SC/ST, 42 percent OBC, and the rest "other."

Social activities: Among the states, Kerala had the highest participation level, with about 21 percent having membership in at least one organization, closely followed by Karnataka; however, in Punjab and Rajasthan, elderly membership in organizations was almost absent. Positive influences for engagement were education and wealth.

Financial help: The median value of financial help received annually by respondents from close relatives and friends was rupees 15,000 (rupees 20,000 for men, and rupees 10,000 for women)—with more going to those in rural areas and those living alone. As for the median value of financial help given, it was rupees 4,500, with men giving double that of women. However, these observations are based on very small number of cases as reported.

Relationship with spouse/partner: When asked how often they felt lonely, 65 percent reported 'hardly ever or never,' but 8 percent reported 'often' and 28 percent reported 'some of the time'. Feeling lonely was slightly higher among females and also those who were widowed. As for their feelings toward their spouse/partner, the vast majority (82 percent) of respondents were fully satisfied, with males slightly more likely to be fully satisfied than females. Those living with a spouse and children reported the highest level of satisfaction (87 percent).

Ill-treatment within family: About 74 percent of respondents stated that they 'hardly ever/never' felt ill-treated within the family, although 7 percent said ill-treatment was 'often' and 19 percent responded as 'some of the time'. No difference was observed between males and females or between rural and urban areas. Being reported as often ill-treated is more common among lower income and less educated groups.

Overall life satisfaction: The verdict on life as a whole showed about 63 percent of respondents were highly satisfied—with males slightly higher than females—while only 4 percent felt their satisfaction was low. Rural versus urban living was not a factor, although a

better education and economic status, being married, and living with a spouse or spouse and children definitely helped.

Health and health care of the older population

The Ageing population in India is resulting in an overall increased burden of diseases, particularly that of chronic diseases. For that reason, this module looked at three domains: self-reported diagnosed morbidity prevalence, functional health, and health care use pattern. The "chronic disease" category includes hypertension, diabetes, cancer, lung disease, heart disease, stroke and arthritis. "Cardiovascular diseases" include hypertension, heart diseases, and stroke.

Chronic disease: Overall, the prevalence of any chronic disease among older persons was 27 percent. By states, the prevalence was highest in Kerala (55 percent) and lowest in Rajasthan (13 percent). A higher proportion of those in urban areas reported that they were diagnosed with chronic diseases than in rural areas. Among males and females, there was no significant difference. Living arrangement results showed a much higher prevalence among those living alone (44 percent) than those living with someone else, especially with spouse and children (23 percent). By age, the prevalence was highest among those 60–74 (42 percent), followed by those 75+ (39 percent), and those less than 60 (20 percent).

Socioeconomic characteristic - such as education and household wealth and consumption expenditures (the latter two measured by quintiles from poorest to richest)—showed a strong positive correlation with the prevalence of chronic diseases as a group. However, among the diseases, lung disease did not show a clear pattern of variation with these characteristics.

Cardiovascular diseases: Its overall prevalence was 17 percent. Within this group, the overall prevalence for heart disease was 3 percent, and for hypertension, 15 percent.

Lung disease: Its overall prevalence was 4 percent.

Arthritis: Its overall prevalence was 7 percent.

Diabetes: Its overall prevalence was 8 percent.

Injuries/falls/conditions owing to natural disasters: Overall, the prevalence was 12 percent with the highest in Kerala (17 percent) and the other states in the 10–12 percent range. The prevalence increased with age.

Sources of diagnosis: More than 90 percent of all chronic diseases except arthritis (81 percent) were diagnosed by an MBBS doctor.

Health risk: Overall, 16 percent of the respondents reported currently consuming tobacco and around 8 percent reported currently consuming alcohol. The percentages were much higher for

men (30 percent for tobacco and 18 percent for alcohol) than for women (5 percent for tobacco and 1 percent for alcohol).

Activities of Daily Living (ADL): Overall, 88 percent of respondents do not have any ADL difficulties, while 6 percent reported one ADL difficulty and 7 percent reported two or more ADL difficulties. These difficulties included dressing, walking across a room, eating, bathing, getting in or out of bed, and using a toilet.

Health care utilization: Among those who reported ill health during the past 30 days, 65 percent visited a medical facility, with females more likely to do so than males.

Biological markers of Ageing and health status

Biological markers—also known as biomarkers—of population provide a measurement tool for observing physiological processes (including disease processes), physiological changes related to Ageing, and the ageing process as a whole. Although biomarker based health research is advancing rapidly, in many ways, it is still in its early stages. This module gathered a range of biomarker information.

Physiological functions. Overall, 30 percent of the older adults were measured with either high systolic or diastolic blood pressure, while 21 percent had both. Punjab had the highest percentage of high systolic or diastolic blood pressure or both, whereas the prevalence in other states was considerably lower. Those who live with their spouse and children were clearly seen to have better health with a lower prevalence of high blood pressure (17 percent).

As for lung functions, the mean FVC, FEV1, and FEV1% values varied greatly across states and between males and females. Older adults in Punjab have the highest mean FVC values—the higher, the better—followed by those in Kerala for males and in Rajasthan for females. Mean values of lung function capacity for FVC and FEV1 declined with age.

Overall, about 40 percent of older adults suffer from chronic obstruction in lung function with different levels of severity: mild, moderate, or severe. Among the states, the overall prevalence of chronic obstruction in lung functions was highest in Rajasthan (45 percent) and the lowest in Punjab (36 percent). Chronic obstruction in lung functions is more prevalent among older males (47 percent) than older females (36 percent).

Physical: As for grip strength, measured mean grip strength for males was highest (both hands) for older adults in Kerala, followed by in Karnataka, but mean grip strength for females was higher for older adults in Karnataka. Measured mean grip strength increased with education, wealth, and consumption quintile.

As for vision, overall, more than 29 percent of older adults have low distance vision acuity, and 61 percent of older adults have low near vision acuity. Among states, Karnataka has the highest

prevalence of low vision acuity for both distance (32 percent) and near vision (66 percent). Age is a prominent factor affecting visual acuity as the prevalence of both near and distance low vision acuity increased with age. Socioeconomic characteristics show a negative correlation with the prevalence of low distance and near vision acuity.

Body shape: Mean measured height and weight were higher for males than females while mean body mass index (BMI) values were much higher for older females than older males. This pattern is consistent across all four states and socioeconomic characteristics indicating an overall higher obesity risk for older females than males. Socioeconomic characteristics display strong positive correlations with overweight/obesity prevalence among older adults. Overall, 28 percent of older people fall into the overweight/obese category, with a much higher level in urban areas (42 percent) compared with rural areas (23 percent).

Overall, 25 percent of older people fall into the high risk category of waist circumference. Sex differentials in high-risk waist circumference are highly pronounced. Overall, 9 percent of older males and 36 percent of older females were in the high-risk category of waist circumference—with the highest levels in Punjab (22 percent males and 60 percent females) and the lowest in Rajasthan (4 percent males and 23 percent females).

Overall, 48 percent of older people fall into the high risk waist-hip ratio category. Punjab has the largest proportion of males and Kerala has the largest proportion of females in the high risk category of waist-hip ratio, followed by Kerala for males and Punjab for females. Overall, almost one in five males were found to be in high risk waist-hip ratio, while more than two-thirds of female respondents were in the high risk category of waist-hip ratio. Mean values of waist and hip circumference and waist-hip ratio for males and females both increased remarkably with education, wealth, and consumption quintiles.

INTRODUCTION 1

1.1 Global Population Ageing: Trends, Prospects and Issues

The contours of global population have undergone marked changes over the past several decades—with population Ageing standing out as one of the most remarkable demographic events. In 1950, the world population was 2.5 billion, with roughly 5 percent aged 65 and above. Today, it has risen to 6.9 billion, of which roughly 8 percent (or 523 million) are aged 65 and above. Going forward, we will see further increases: by 2050, global population is expected to reach 9.1 billion, with the older population aged 65 years and above accounting for 16 percent, or nearly 1.5 billion, of the total global population.

In sum, though the world population is projected to increase 3.6 times from 1950 to 2050, the 65 and above age group will increase by a factor of 11; moreover, the 80 and above age group will increase by a factor of 27. The share of the population aged 65 and over is expected to increase in every country in the world between now and 2050 (United Nations 2008, National Institute on Ageing 2007b). This shift in age-structure can have an intense impact on nations' socioeconomic and political conditions.

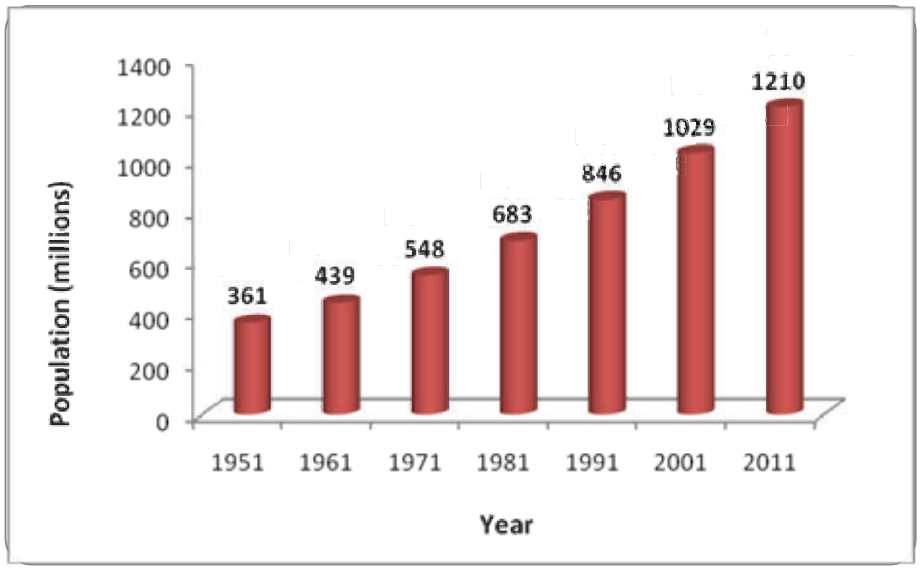
While global Ageing can be seen as a symbol of medical, social, and economic advances over the past half century, it also represents a significant policy challenge. Population ageing threatens to topple existing health insurance and pension systems, and it calls into question existing models of familial and social support. The phenomenon of global graying has the potential to fundamentally alter economies and trade, family structure, disease burden, and health care. Although some governments have begun to plan for their Ageing societies, most have not. There remains a dire need to raise awareness about the significance of population ageing and its potentially dramatic implications. In addition, gathering robust and internationally harmonized data on ageing will prove vital to prepare financially, socially, and medically for rapid population ageing.

1.2 Population, Size, Growth, Distribution in India

India's population now stands at 1.21 billion, a dramatic increase from only 238.4 million at the beginning of the 20th century (Figure 1.1). The population grew by one and a half times in the first half of the 20th century, then recorded a phenomenal three-fold increase in the latter half—although in the past two decades, the pace of growth has slowed down. The sharpest decline of decadal growth of population was during 2001-2011 (Figure 1.2), with the decline occurring among all states, although it was a first time event in the demographically lagging states of Uttar Pradesh, Uttarakhand, Bihar, Chhattisgarh, Rajasthan, Madhya Pradesh, Jharkhand, and Orissa. Although India accounts for a meager 2.4 percent of the world surface area of 135.79 million square kilometers, it supports and sustains a whopping 17.5 percent of

the world population (Census of India, 2011). The gap between India, the country with the world's second largest population, and China, the country with the world's largest population, has narrowed from 238 million in 2001 to nearly 131 million in 2011.

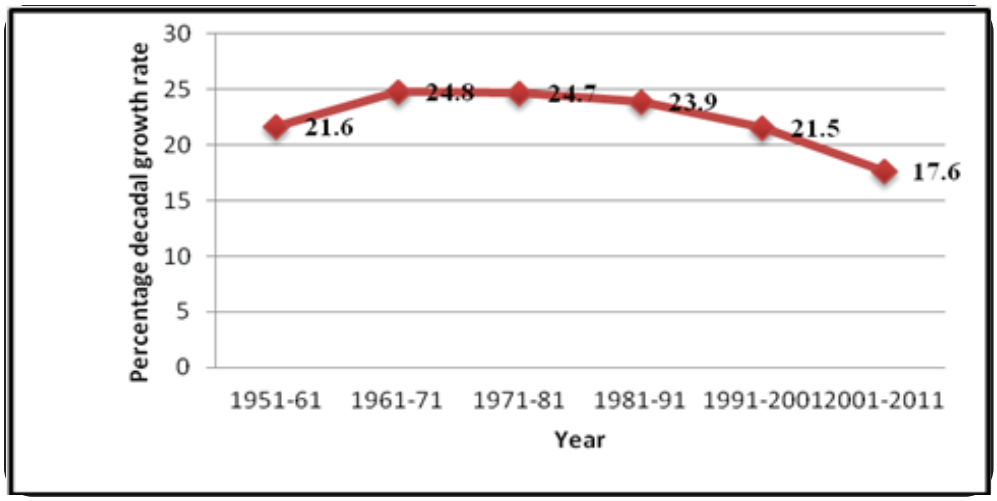
Figure 1.1: Population growth trend in India, 1951-2011



Source: Registrar General of India, the Population Totals, Census of India 2011, Office of the Registrar General, Government of India, New Delhi.

Although the rate of population growth is slowing, India's population will continue to rise until 2050 when it reaches around 1.6 billion—a consequence of lower mortality and falling fertility. This demographic transition reflects progress in health care, education, urbanization, income growth, and, more important, fertility control programs (Bloom, 2011).

Figure 1.2: Percentage decadal growth of population, India, 1951-2011

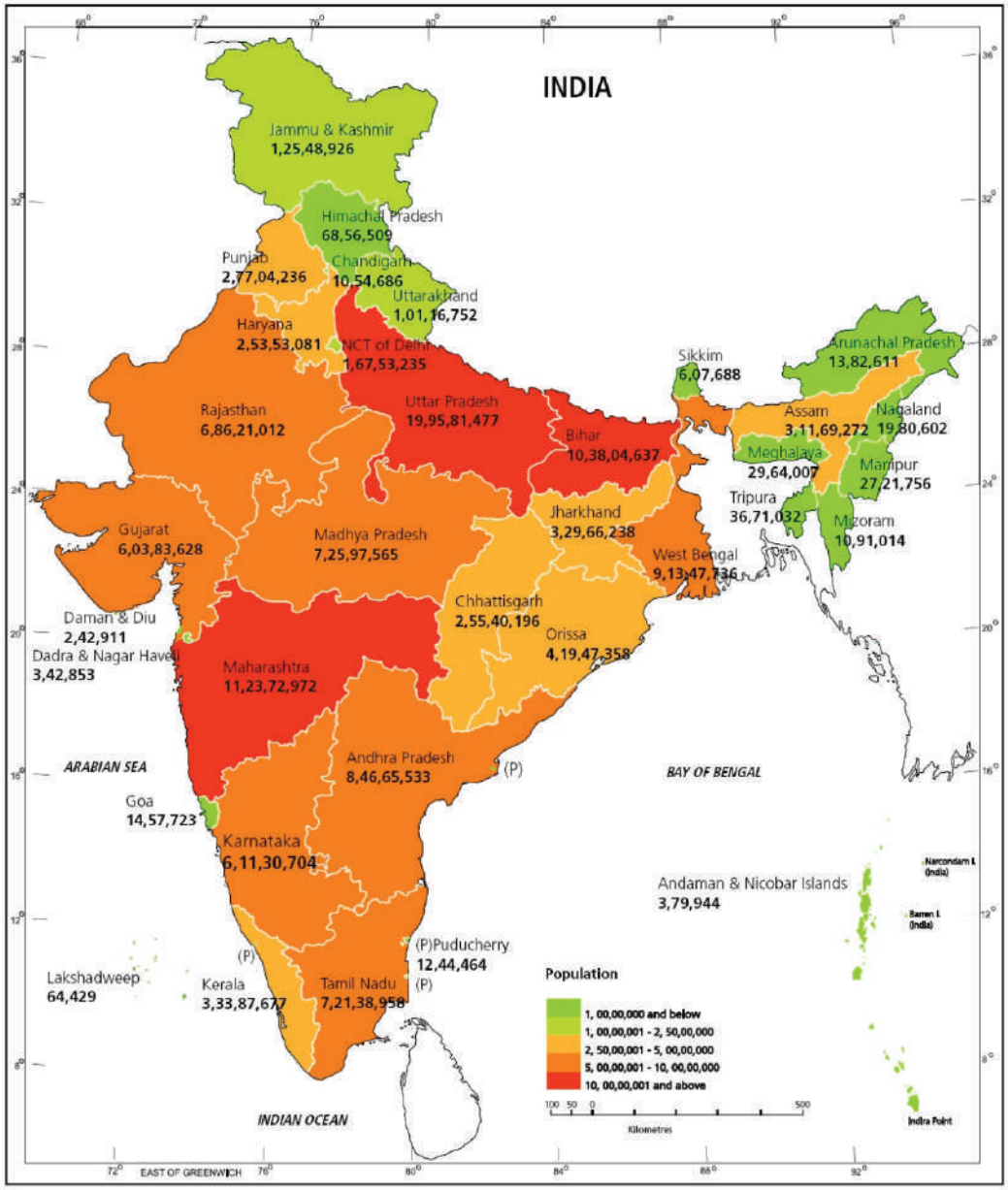


Source: Registrar General & Census Commissioner of India, the Population Totals, Census of India 2011, Office of the Registrar General, Government of India, New Delhi.

1.2.1 State Variations

How about the distribution of population across states and union territories of India? As Map 1.1shows, Uttar Pradesh is the most populous state with almost 200 million people, ahead of Brazil, the fifth most populous country in the world. Moreover, the combined population of Uttar Pradesh and Maharashtra (the second most populous state), at 312 million, is substantially greater than the U.S. population (Census of India, 2011). A little more than six of every ten Indians live in one of the seven states of Uttar Pradesh (199.6 million), Maharashtra (112.4 million), Bihar (103.8 million), West Bengal (91.3 million), and Andhra Pradesh (84.7 million)—all of which experienced higher population growth rates from 1981–2001. In the south Indian states, the population growth rates slowed during this period—as also occurred in several other progressive states, including Goa, Gujarat, Maharashtra, West Bengal, Punjab, and Haryana. More encouragingly, however, from 2001-2011 all states indicated a slowdown in population growth rates.

Map 1.1: The distribution of population among states in India, 2011



Source: Registrar General& Census Commissioner of India. The Population Totals, Census of India 2011, Office of the Registrar General, Government of India, New Delhi.

1.2.2 Ageing Trends in India

Currently, the older population aged 60 years and above accounts for almost 9 percent of India's national population, translating into roughly 100 million people (2011). By 2050, these numbers are projected to climb to nearly 22 percent, or approximately 320 million people. The share of the "oldest old", or the population aged 80 and over, is also projected to increase from 1 percent to 3 percent (CIA 2010, United Nations 2008).

The rapid rise of India's older population, coupled with changing family structures and limited social provisions, presents policymakers with pressing economic, health, and social challenges. There are several forces driving India's population growth and changing age structure, including an upward trend in life expectancy. An Indian born in 1950, for example, could expect to live for 37 years, whereas today, India's life expectancy at birth has nearly doubled to 69 years; by 2050 it is projected to increase to 76 years and more. This trend reflects significant declines in infant and adult mortality rates and improvements in survival rates at all ages. India's population will rise from 1.2 billion today to an estimated 1.6 billion by 2050, with a much larger share of older people.

In economic terms, the concern with population ageing in India stems from the fact that the elderly typically do not have an independent source of income. They are reliant on family or, to a lesser extent, government programs, for their support. India's traditional reliance on family networks to provide elderly with care and support will come under strain in the coming decades. An emerging wave of expense to treat non communicable diseases will burden India, and, when it comes, there will be a policy vacuum (Bloom, 2011).

1.2.3 National Ageing Policy

In light of the ongoing changes in the country's economy, the government of India has taken some steps to reform the pension system but has yet to initiate policies to plan for the growing challenge of population ageing. Under the National Social Assistance Program, the Indian government established the National Old Age Pension Scheme (NOAPS) in 1995 with the aim of providing pensions to the older population. This scheme is funded by both central and state governments and currently pays 200 Rs (about US$5.00) per month to those over age 65 and classified as poor or disabled (National Portal of India, 2009a). Beginning with Uttar Pradesh in 1957, several states in India have also pledged financial and in-kind assistance for the elderly, ranging from 75 to 300 Rs (about US$2.00 to US$7.50) per month. Other state wide schemes include the provision of in-kind support for the elderly people below the poverty line (Rajan*et al* 2004).

The government of India has also initiated several policies and programs such as the National ageing Policy (1999) and the Maintenance and Welfare of Parents and Senior Citizens Bill (2009). Other proposed changes to the system are being debated, and LASI will be well positioned to evaluate the effect of changing policies on the behavioral outcomes in India.

In 1999, the Government of India adopted the National Policy on Older Persons. The policy seeks to assure older persons that their concerns are national ones and that they will not live unprotected, ignored, or marginalized. The policy's goal is the well-being of older persons. It aims to strengthen their legitimate place in society and help older persons live the last phase of their life with purpose, dignity, and peace. And it envisions that the state will extend support for financial security, healthcare, shelter, welfare, protection against abuse and exploitation, and other needs of older persons. In short, it aims to provide services so that the elderly can improve the quality of their lives.

The policy values an age-integrated society and will endeavor to strengthen integration between generations, facilitate two-way flows and interactions, and strengthen the bonds between the young and the old. It believes in the development of social support systems, informal as well as formal, so that the capacity of families to take care of older persons is strengthened, allowing them to continue to live in their family. The policy:

- Recognizes that older persons are a resource who provides useful service inside and outside of the family.
- Empowers older persons so that they can acquire better control over their lives and participate in decision-making on matters that affect them, as well as being equal partners in the development process.
- Recognizes that larger budgetary allocations from the state will be needed and that the rural and urban poor will be given special attention.
- Emphasizes the need for expansion of social and community services for older persons— particularly women—and enhances their accessibility and use by removing sociocultural, economic, and physical barriers, as well as making the services client-oriented and user-friendly.

In 2007, the Indian Parliament passed the Maintenance and Welfare of Parents and Senior Citizens Bill, rendering children and property heirs responsible for the care and support of the poor elderly as well as urging state governments to set up old-age homes for the destitute elderly (National Portal of India, 2009b). However, it is important to recognize there is a considerable policy vacuum in the absence of scientific evidence on India's older population.

1.3 Health and Retirement Study: Investigating Ageing Worldwide

The global ageing situation presents policy challenges that demand science-based longitudinal data on ageing. Taking the initiative, the U.S. National Institute on Aging (NIA) and the Institute for Social Research (ISR) at the University of Michigan jointly launched the Health and Retirement Study (HRS) in 1992. The HRS was established to inform U.S. national retirement policy as population ageing became a challenge. The HRS model employs unique and in-depth interviews to cull multi-disciplinary data—spanning physical and mental health, insurance coverage, financial situations, family support systems, employment status, and

retirement planning—from a nationally representative sample of adults over the age of 50 (National Institute on Aging 2007a).

Many nations have adopted HRS-model studies and aim to measure health—and its determinants and consequences—over later portions of the life cycle of population. One of the first such efforts was the English Longitudinal Study of Ageing (ELSA), which is directly comparable to the HRS. The successes of HRS and ELSA have led to an international study that now tracks health and retirement trends in Europe: the Survey of Health, Ageing, and Retirement in Europe (SHARE). SHARE originally involved Sweden, Denmark, France, Belgium, the Netherlands, Germany, Switzerland, Austria, Spain, Italy, and Greece; follow-up waves have expanded to include other countries, and SHARE aims to include all EU member countries. SHARE, like HRS, is methodologically innovative and is designed to maximize cross-national comparisons (National Institute on Aging 2007a).

Many features of the HRS model allow for well-informed policy decisions, such as a rigorous and science-based agenda, respect for local knowledge, longitudinal focus, and public access to data. As population ageing becomes a major global policy concern in developing and developed countries alike, HRS has inspired the expansion of similar studies around the world. The Mexican Health and Ageing Study (MHAS), launched in 2001, was the first such effort in a developing country. Similar studies are also underway in East Asia. South Korea has launched the Korean Longitudinal Study on Ageing (KLoSA), and planning for HRS-model studies is well underway in China, Thailand, and Japan (National Institute on Aging 2007a).

1.4 The Longitudinal Ageing Study in India (LASI)

The Longitudinal Ageing Study in India(LASI) is a partnership between the International Institute for Population Sciences, the Harvard School of Public Health, and the RAND Corporation. Funded by the National Institute on Aging (NIA), the LASI pilot was successfully conducted in 2010 and will eventually cover a longitudinal, fully representative group of Indians aged 45 and older. LASI will address issues of great policy importance using a science-based agenda and internationally harmonized survey instruments. LASI aims to continue the HRS tradition in a setting where population ageing is a serious concern for state policy and society.

1.4.1 LASI Goals

The long-term goals of LASI are to explore the social, economic, and health experiences of older people throughout India as they grow older. Investigating the relationships between health, economic position, social participation, and support as people age is one of the most important research agendas facing the country. More needs to be known about individual experiences as people plan for, move into, and live during retirement.

Equally important is the fact that the population as a whole is ageing in India, and life expectancies are increasing greatly. Addressing the policy issues that arise when providing support (whether medical, social, or economic) for an ageing population is of increasing urgency

to governments, policy makers, and researchers. Moreover, this study also seeks to understand how greater life expectancy is associated with good health, adequate economic resources, and, ultimately, a good quality of life.

1.4.2 LASI Innovations

The LASI innovations in terms of survey, tools, technology, coverage, and process include:

Comprehensive coverage of biomarkers

The first major feature of the LASI survey instrument is the collection of biomarkers, which can be analyzed to provide researchers with quantitative data on direct indicators of the health of older populations. The National Research Council recommends that biomarkers be incorporated in social surveys to (a) capture health data from a portion of the population that otherwise would not have this type of data recorded; (b) investigate molecular determinants of common health outcomes; and (c) study interactions between biomarkers and other social conditions that may subsequently lead to declines in health outcomes (National Research Council 2001). The inclusion of biomarkers and other health assessments is particularly important for less-developed countries such as India, where access to health care tends to be limited. Because of these limitations, undiagnosed diseases are likely to be more common in less developed countries than in developed ones.

The protocol for biomarkers in the LASI pilot consisted of the collection of molecular biomarkers, anthropometry, and functional assessment. The lead Indian organization of the LASI team, IIPS, successfully completed the first wave of SAGE, which also collects biomarkers. As in HRS and SAGE, five dried blood spots (DBS) were collected by administering finger pricks to individuals. The DBS are stored for later analysis at the National AIDS Research Institute (NARI) in Pune, India, an institution of the Indian Council of Medical Research (ICMR) with high capacity freezer rooms and appropriate backup systems. While outcomes of analysis will be limited with only five specimens per respondent, our primary purpose in the pilot is to ensure that we are able to collect high-quality data from a large number of respondents and to identify any problems we have in the field so that we can improve our protocol for the full-scale LASI.

The LASI research team has joined with global DBS experts to craft a proposal to the NIA for analyzing the DBS collected during the LASI pilot. In particular, the LASI team proposes analyzing the DBS for the presence of Glycosylated hemoglobin HbA1c, C-reactive protein (CRP), Epstein-Barr virus (EBV), and hemoglobin (Hb). The DBS collected during the planned full-scale LASI project will also be analyzed by the research team at NARI. Health survey protocol in collecting anthropometric measurements was followed. For each respondent, height, weight, and waist circumference were measured. Also, established protocols of functional assessment were closely followed by collecting information on blood pressure, lung function, physical function, and vision. The cognition model departs slightly from ELSA, drawing from both HRS and SAGE.

Computer Assisted Personal Interviews (CAPI)

The second major innovation is that the LASI pilot employed computer-assisted personal interview (CAPI) techniques to record the responses of survey participants. This method requires field teams to be outfitted with laptop computers, pre-loaded with the survey questions asked of respondents in the face-to-face interview. Field teams input responses directly into a laptop computer, thereby limiting data entry processes as well as minimizing data recording and entry errors. To our knowledge, the LASI pilot is the first survey that adopted full-fledged CAPI. This portion of the LASI project was funded through a pilot grant from Harvard's Program on the Global Demography of Ageing (PGDA). The use of CAPI allows for cross-checking of data in real-time, thereby minimizing data entry errors and ensuring internal consistency.

The RAND Labor and Population Center has spearheaded the development of a comprehensive information system, MMIC™ (Multimode Interviewing Capability), building on work by CentERdata in The Netherlands. MMIC™ was used to program the CAPI survey for LASI, and it integrates various traditional modes of collecting interview data, including telephone interviewing, self-administered surveys, and personal interviewing. MMIC™ was used to manage the whole data collection process from questionnaire design, sample management, and fieldwork monitoring to final dataset production, and it is designed to overcome many of the limitations inherent in existing survey processing suites, particularly for the kind of large-scale CAPI questionnaires envisioned for the full LASI survey. MMIC™ is designed to lend greater accuracy and responsiveness to the needs of researchers.

Geographical Information System (GIS) and other tools

The third set of LASI innovations includes community level data using GIS verification, geo-coding, thematic mapping and community analysis, and the physical environment (such as land, water, indoor and outdoor air-quality, access to sanitation, and climatic conditions). LASI synchronized GIS and community information with survey data to develop community clusters based longitudinal research studies and with a survey scope expanded to include information on infectious diseases, diet, and nutritional intake.

1.4.3 Research Design

Although ageing is a subject that is being increasingly investigated, there are currently no comprehensive and comparative survey data in India that cover and connect the full range of topics necessary to understand the economic, social, psychological, and health elements of the ageing process. LASI is designed to fill this gap.

LASI is intended to be globally and conceptually comparable to the U.S. Health and Retirement Study (HRS), English Longitudinal Study of Ageing (ELSA) Survey of Health, Ageing, and Retirement in Europe (SHARE), Study of Global Ageing and Adult Health (SAGE), and its sister surveys in Asia (i.e., the Chinese Health and Retirement Longitudinal Study (CHARLS), the Japanese Health and Retirement Study (JHRS), and the Korean Longitudinal

Study of Ageing (KLoSA)), yet LASI is also meant to capture characteristics specific to India. To this end, LASI survey protocols will be tailored toward India's institutional and cultural characteristics. The international scope will mean that we can examine the impact of national policies and context through comparative, cross-national analysis.

One of the most significant surveys of ageing to date is the SAGE, carried out by the World Health Organization (WHO) and the International Institute for Population Sciences (IIPS) in Mumbai. New data are needed to conduct analyses of population ageing and to develop further mid-term and long-term policy solutions to address the challenges presented by population ageing; no sufficiently broad nationally representative dataset is currently available for investigating the economic and social factors associated with ageing in India. LASI will expand on the factors investigated by SAGE and other surveys—such as the National Family Health Survey (NFHS), also conducted by IIPS—by sampling a broader representative population of India and its states.

LASI is supported by Indian and international advisory committees, consisting of experts from various countries, to advise and revise the work carried out. The advisory committees, which also include senior government officials, met frequently to steer the project activities. The international advisory committee members include Principal Investigators of major ageing studies like HRS, SHARE, CHARLS, KLoSA, etc.

1.4.4 Individual Respondents in LASI Pilot: Who is Eligible?

LASI pilot eligible participants are those who were born before (date of interview) and their spouses. Spouse/partners do not need to have been born before January 1, 1965, but must be living at the exact same address as the selected age-eligible respondent.

A complete enumeration of everyone living within each household at the sampled address will be completed by the interviewer. This initial recoding is referred to as taking the coverscreen (CV) and household roster (HR). Any adult aged 18 and over who is residing in the selected household and could provide cover screen and roster information is called the "household key informant."

Once the complete household roster has been obtained, a determination is made as to exactly who is eligible. LASI eligible respondents include all persons aged 45 years and above. Based on information collected about "relationships," couples are also identified. Each eligible couple (that is, each couple in which one of the partners is aged 45 years or more) and each eligible single person aged 45 years and older form the eligible household sample.

The interviewers must work each of those lines and document every contact and contact attempt made on a given line. Every line will be accounted for with a final result code, which will indicate either a completed interview, a non-sample (for example, a vacant house), or a non-interview (for example, a refusal).

After the selection of eligible respondents in the household, interviews should be conducted with every eligible person whom provides consent. This means that even if the "primary" respondent (for example, a person identified on a registry) refuses, the interviewer must still attempt to conduct interviews with all other eligible household members.

Every eligible household member will be asked to complete his or her own interview, although not all sections may apply to him or her. All interviews performed in the household are linked to the household by the household sample identification number. The most common LASI eligible household types that fulfill our criteria are:

- Person(s) aged 45 and above year-old with or without younger, co-resident non-spouses (such as children). The interviewer will only need to interview persons 45 and older.
- Couples with at least one partner aged 45 and above, with or without younger co-residents. The, interviewer has to do two interviews (one with each partner).
- Couples with at least one partner aged 45 and above and one or more co-residents aged 45 and above. The interviewer will need to interview three or more members of the household.

The interviewer does not need to remember the exact criteria, because the questionnaire application is programmed to make the determination automatically.

1.4.5 Respondent Type

LASI seeks information on households and older individuals in the households. In single-respondent households, the respondent is asked all sections of the questionnaire. In multi-person households, each respondent receives a different set of questions. Questions seeking couple-level information (such as income and family structure) need only be asked of one person per couple, and questions referring to household-level information (such as housing expenses) need only be asked of one person per household. The burden of what otherwise might be a lengthy interview is consequently shared (although not necessarily evenly) between the people living together within couples and households. As a rule, the person who does the interview first in each couple will be asked the family questions.

It is often the case that within a couple-household, one person is more knowledgeable about certain aspects of daily life. Thus, one person takes charge of most of the finances and another does most of the family arrangements. To obtain the most accurate information in each of these areas, the couple is asked to decide which of them should answer the question series pertaining to each area. The following "respondent types" are designated in LASI.

***The financial respondent*:** The financial respondent should be the person *in each couple* who feels most able to answer questions about the couple's financial situation, specifically regarding income, assets, and financial transfers (both the giving and the receiving of financial contributions/gifts). The financial respondent will be asked the questions in these sections of the questionnaire: Financial Transfers and Assets.

The family respondent: The family respondent will be the person *in each couple* who does the first interview. This person will answer questions about the couple's children and grandchildren, as well as about non-monetary help or support given to or received by the family unit. The family respondent will be asked the questions in these sections of the questionnaire: Children and Social Support.

The housing respondent*:* The housing respondent should be the person *in the household* who feels most able to answer questions about the household members' housing situation, including the size and quality of the accommodation; the type of payment (mortgage or rent); the value of the accommodation (if owned); household and family consumption; expenditures for things like food, fuel, electricity, and telephone; and household income. The housing respondent, therefore, will be asked the questions in these sections of the questionnaire: Housing, Household Income, and Consumption.

Finally, of course, when the only eligible respondent is single, he or she will be asked all applicable financial and family questions. If this single person is living within a household where there are other eligible persons, however, he or she will be asked the housing questions only if he/she has been selected as the housing respondent.

1.4.6 Applying the HRS Model to India: Constructing an Appropriate Survey Instrument

The basic premise of the LASI instrument is that it should be comparable to HRS, so cross-national comparative studies can be pursued. In developing a survey harmonized with other HRS-type studies, certain domains inherently exhibit substantial country-specific heterogeneity (Harkness 1999; Johnson 2002; Lillard and Burkhauser 2006). For example, different countries have unique public and private pension systems, educational systems, financial products and institutions, and welfare programs. For these domains, strict ex-ante harmonization cannot be established. Thus, where local characteristics, particularly institutional and cultural differences, demand modification, the LASI instrument has been developed to reflect local circumstances, with ex-post harmonization still in mind. Furthermore, we have built upon the harmonized instrument by adding innovations, such as collecting data on physical environments, including land, water, indoor air quality, and access to sanitation, and expanding the survey to include information about infectious disease and a comprehensive set of biomarkers.

1.4.7 LASI Instruments

Household survey

The LASI instrument comprises the household survey, which is to be collected only once for each household by interviewing the selected key informant; the individual survey, which the interviewer will collect for each respondent; and the protocol for biomarker collection. The household survey consists of five sections:

The household roster or cover screen contains questions about the demographic composition of the household, such as the number of household members, the identity of the household head, and characteristics of household members, such as name, sex, age, and each person's relationship to the household head. The household questionnaire was administered to the head of the household or any other household member aged 18 years or older who is knowledgeable of the household. A spouse residing separately due to his or her workplace, etc., all children who reside separately, and temporarily visiting or residing friends or relatives were not considered to be household members.

The housing and environment section is asked of a respondent knowledgeable of housing and surrounding environment, identified from the household roster. This section consists of questions about the household's physical dwelling, water supply, sanitation facilities, utilities, cooking, indoor pollution, neighborhood and social environment, and residential history. As noted earlier, data on the physical environment are innovations that LASI brings into HRS-type surveys, providing researchers worldwide with new opportunities to investigate the role of the physical environment in the determination of health.

The household consumption section is asked of a respondent knowledgeable of the household finances, as identified from the household roster. This section is designed to collect expenditure data at the household level. Expenditures include two separate parts: the amount spent and the amount consumed out of the household's own production (the latter is quite common in low-income rural environments). The information on food consumption and expenditure during the past 30 days and past 12 months prior to the survey was gathered in this section.

The household income section attempts to capture the complete income and assets of all household members, as well as remittances from non-household members. Detailed income data was requested for every person in the household, differentiating between sources of income. Domestic advisors have provided further insights to fully capture India's idiosyncrasies, and an in-depth study designed to validate the income, asset, and consumption models has also been conducted.

The household assets and debts include detailed questions appropriate to the Indian context regarding any assets and debts of the entire household. These core concepts include the market value of financial and non-financial assets, household debt burden, and net worth. Apart from this, another section on the household real estate was also included that seeks information on the ownership of current residence, other housing, and rent out housing.

The section on household assets is further divided into two sections: the household agricultural assets and the household financial and non-financial assets. The household agricultural assets section consist of detailed information about the ownership of land, the land renter, farming assets, crops growing, forestry, fishing, and livestock. The household financial and non-financial assets section seeks information about the financial assets, non-financial assets, and information about personal loans. The section on household debts consists of

questions on the details of the household member's outstanding loans from banks and other sources. Detailed information about home loans, business loans, and overall economic conditions were collected in this section.

Individual survey

The individual survey consists of the following sections:

The demographic section includes standard demographic questions (birth date, age, sex, religion, caste, language, marital status, and education). Questions about education are modified to reflect the Indian educational system and questions about caste are added to this section, capturing unique social characteristics of India. We asked questions about marital history, language, religious affiliation and related activities, and early childhood experiences (including health status and family economic conditions).

The family and social networks section asks detailed questions about all immediate family members, including parents, children, and siblings, both alive and deceased. As in HRS, we ask about family members' ages (for deceased family members, age at death), marital status, educational attainment, working status, home ownership, and living arrangements. We also collect information about emotional closeness with family members. This section concludes with questions about participation in community and other organized activities.

The health section consisted of questions about the following:

(a) Overall health and specific diseases: to facilitate comparisons across studies, we adopted questions on chronic illness from HRS; however, unlike other HRS-type studies, we added questions on infectious disease because of their relatively high prevalence in India. In this section, information was collected on perception of general health and major diagnosed chronic diseases, namely hypertension, diabetes and high blood sugar, cancer, lung disease, heart disease, stroke, arthritis or rheumatism, psychiatric problems, high cholesterol, and angina.

(b) Health events: we drew on health event questions from HRS, KLoSA, and the China Health and Retirement Longitudinal Study (CHARLS) and added new questions about natural disasters such as floods and earthquakes that are known to have significant impacts in India. The specific information collected in this section regarded injuries (including those resulting from natural disaster) and falls.

(c) Functional health: we included both self-reported and performance-based measures, as they tap different constructs of physical functioning, and, although complementary, are not readily interchangeable. We collected information on incontinence, eyesight, hearing, oral health, and work-limiting health conditions.

(d) Mental health: we used all original Center for Epidemiological Studies-Depression (CESD) questions, analyzed the data, and then examined whether we could extract a subset of questions that are appropriate to the Indian context. This section seeks information on how the respondent felt and behaved during the past week, either rarely or none of the time, some or little of the time, occasionally, or most or all of the time.

(e) Anchoring vignettes: these describe the health status of hypothetical persons and ask respondents to evaluate the health of those persons using the same scale that they used to describe their own health. The use of anchoring vignettes will help account for reporting biases in self-reported measures, and adoption of this new methodology will facilitate cross national and within-country cross-cultural comparisons of self-reported health.

The health insurance and services utilization section captures both access to and use of health services. With respect to health insurance, the LASI instrument includes questions about public and private health insurance holdings, benefit coverage, and premiums. This section then asks about use of health services from public and private providers in relation to both curative and preventive care. Curative questions, including those on hospitalization, outpatient care, dental care, and nursing home care, are derived from HRS. Whereas HRS inquires only about medical checkups, we ask additional questions about immunization, given the prevalence of infectious diseases in India. Questions in this section will complete our understanding of the demand side of health care, including preferences for private or public health care providers.

The section on ***work and employment*** consists of questions about current job and employment history, which are developed for wage and salary workers and the self-employed, with separate questions for agricultural and non-agricultural workers. The questions for wage and salary workers and the self-employed parallel those in HRS, with modifications to fit the institutional situation in India. Questions on agricultural workers come from CHARLS; whereas HRS does not distinguish agricultural workers, CHARLS inquires about agricultural workers because they are common in rural areas. This section includes details about the respondent's work status, characteristics of work, employer characteristics, details about current job, wage, benefits, job search, characteristics of self-employment, and work history.

The pensions and retirement section includes questions about: (a) retirement: we collect information about official retirement for those who work in the formal sector; for those in the informal sector, the concept of retirement is assessed by asking questions regarding the ceasing or reduction of work. We expect to gain valuable insight into how work patterns change with ageing in India. (b) pensions: this module is modified to be appropriate for the system in India. As India's pension system has undergone several changes, we have ascertained the timing of respondents' employment to determine which pension law is applicable. LASI seeks detailed information about the age of retirement, details of pension from official retirees, non-official retirees, pension entitlement, commercial pension, and public pension schemes.

The section on ***expectations*** is based on the questions that all HRS-type surveys include: subjective probabilities of survival to specific ages, of working to specific ages, of leaving bequests, and of receiving inheritances. In addition to these core questions, we use visual aids to facilitate understanding of the concept of probability among less educated respondents. The information collection in this section is about respondent's expectation about likelihood of mortality, survival, work-limiting health problems, and inflationary expectations.

The biomarkers section consists of a range of biomarker information such as blood pressure and lung functions, physical functions such as grip strength, balance tests, vision tests, and anthropometric measurements such as height, weight, waist and hip circumference, and DBS (C-reactive protein (CRP), Epstein-Barr virus (EBV) antibodies, and Glycosylated hemoglobin (HbA1c) and hemoglobin Hb).

1.4.8 LASI Pilot Launch Preparations

The pre-pilot preparations include the questionnaire preparation and modification, translation of questionnaire into regional languages, training programs and pre-testing of questionnaires. To modify the questionnaire, a pre-test was conducted. The details of the pre-pilot preparation are given as follows:

Mapping and house listing workshops: The mapping and house listing workshop was held August 25–26, 2010. Its objective was to train the regional agencies about mapping and listing operations, responsibilities of field coordinators and enumerators, list of forms, location of layout maps, locating PSUs, segmentation of rural and urban areas, and listing of households.

Training of trainers workshops: The training of trainers (TOT) workshop was conducted August 31–September 9, 2010. Its objective was to train the survey team from regional agencies and IIPS research officers on the questionnaire. Apart from the IIPS team, three persons from each regional agency attended the workshop. Representatives from RAND, Harvard University, and University of Michigan also participated. The workshop started with a brief introduction about LASI design, goals, and sampling. This was followed with a presentation on the questionnaire, survey tools, CAPI, biomarkers, and the survey process. On the final day, participants were taken to a neighborhood community for field practice, followed by a debriefing on field practice. The workshop also included training on biomarkers and CAPI. The trainers included LASI health coordinators and IT experts.

Translation: The questionnaire was translated into four regional languages (Hindi, Kannada, Malayalam, and Punjabi) by the respective state agencies. The translated questionnaires sent by the regional agencies were reviewed by external experts before finalization. IIPS reviewed the translation of each language and matched the back translation of key terms to refine the language instrument.

Pre-testing the survey instrument: The pre-testing of the questionnaire was done by the doctoral students of IIPS in selected rural and urban localities in and around Mumbai. About

100 pre-test interviews were conducted from more than 60 households. The experiences and feedback from these interviews were discussed in debriefing sessions. Based on this exercise, necessary modifications were made in the questionnaire and CAPI.

Training at the state level: The regional agencies recruited and trained field staff as per the procedures laid out by the IIPS. One project coordinator and one research officer from IIPS participated in the training program as well as in field supervision. IIPS stationed one research officer throughout the survey period in each state to monitor the survey closely. The four agencies identified to conduct the survey have long-term experience in conducting large-scale household surveys in their respective states. Necessary publicity was also given through mass media to create awareness among the public about the survey's purpose and procedures. At the end of the training, IIPS representatives ensured that the field staff had received the required training and were fully equipped to conduct interviews.

METHODOLOGY 2

This chapter provides a detailed description of the sampling design adopted in the LASI pilot survey, the response rates, the protocol adopted in data cleaning, and the procedure adopted in weighting the data. The process of data analysis, including variable imputation and recoding, are also described.

2.1 Pilot Sampling Design

The sampling procedure for the LASI pilot survey was governed by the overall objectives of the survey. The objective of the LASI pilot is to test the validity of the LASI survey instrument, protocols, and adoptability of the survey processes. The following sections contain details about the sampling, including selection of states, the methodology for determining the sample size, and sampling procedure—which includes sample selection in rural and urban areas, selection of households, selection of individuals, and sample weights.

2.1.1 Sample Size

In accordance with the LASI pilot goals and sampling guidelines, the sample size for the study was to target 1,600 household-residing elders aged 45 years and above and their spouses, irrespective of their ages.

The sampling frame for the household-residing elders was drawn from the *2001 Census's Primary Census Abstract*. The LASI pilot used district listing directories of villages and towns to select a sample area within each state for the pilot project. For each village, town, urban area, and city, listing directories provided information about the number of households, population size, age composition, education, and employment by sector. A full state-representative sample was not the goal of the LASI pilot. Therefore, two districts from each state were selected randomly, and a total of eight districts were covered from within the four selected states. From each selected district, eight primary sampling units (PSUs) were randomly selected, and from each selected PSU, 25 households were selected through systematic circular sampling. Thus, a total of 400 households were selected from each state.

2.1.2 Selection of States

The LASI pilot phase of the survey was conducted in four selected states: Karnataka, Kerala, Punjab, and Rajasthan. To capture regional variation, the LASI pilot included two northern states (Punjab and Rajasthan) and two southern states (Karnataka and Kerala). The intent is for LASI to be somewhat nationally representative; thus, the four selected states in the pilot survey have characteristics that represent a wide range of Indian society. The inclusion of Kerala and Punjab demonstrates an ability to obtain a broader representation of India, where geographic variations accompanied by socioeconomic and cultural differences call for careful study and deliberation. This is especially true when preparing for the nationally representative

sampling for the subsequent baseline study. Punjab is an example of an economically developed state, while Rajasthan is relatively poor. Kerala, which is known for its relatively efficient health care system, has undergone rapid social development and is included as a potential harbinger of how the health and ageing situation might evolve in other Indian states.

2.1.3 Selection of District and PSUs

Two districts were randomly selected from the district directory of the census from each state. A total of eight districts were covered from within the four states. From each selected district, a fixed number of eight primary sampling units (PSU) were randomly selected using probability proportion to size (PPS) sampling (rural-urban stratification). That is, each district was divided into rural and urban areas and from these, the PSUs were selected using probability proportional to size sampling.

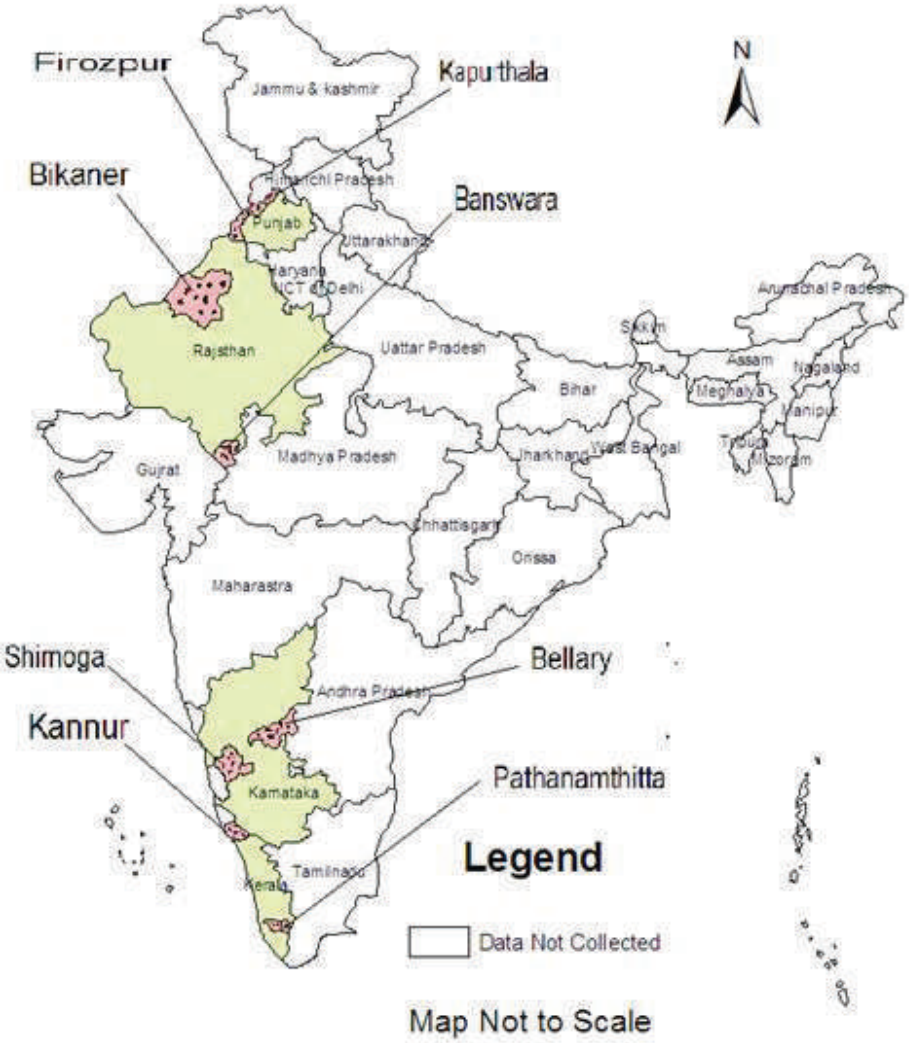
2.1.4 Sampling Procedure in Urban Areas

A three stage sampling procedure was adopted in urban areas. At the first stage, city or town wards were randomly selected using probability proportion to size (PPS) sampling. At the second stage, from each selected city ward, one census enumeration block (CEB) was selected at random. A CEB usually comprised about 150 households. At the third stage, the required number of households was selected from each selected CEB.

2.1.5 Sampling Procedure in Rural Areas

In rural areas, a two stage sampling procedure was carried out for those villages with less than 500 households and a three stage sampling procedure was used for those villages with more than 500 households. First, the required number of villages was selected using PPS sampling from each stratum of villages. If the number of households in a village was less than 500, the entire village was covered for mapping and listing. If a village had more than 500 households, then segmentation was done. That is, each large village was segmented into smaller segments, with an approximate size of 250-300 households. Of these segments, two segments were randomly selected. Map 1.1 depicts the states, districts, and PSUs selected for LASI pilot survey.

Map 2.1 LASI - Pilot Sample Survey State District and PSU in India



2.1.6 Selection of Households and Individuals

A 'Household Universe list' was created by a mapping and listing operation that was implemented in all selected village/segments/urban CEBs. Trained teams of mapping and listing operators completed this task. From the household universe list of each selected sample site (primary sampling units), 25 households were randomly selected with equal probability using systematic sampling. Of these 25 households, overall 16 LASI eligible households (LEH) had at least one LASI age eligible individual.

The sample selection protocol was programmed into CAPI for the selection of households from the household universe list. No replacement households were interviewed if a selected household was absent during data collection. The target sample size in each PSU was

25 completed interviews with persons aged 45 years and above and their spouses, irrespective of their ages.

It was expected that a PSU household universe list would have the following household composition:

- 40 percent of households will not have any member aged 45 years and above
- 30 percent will have only one member aged 45 years and above
- 30 percent will have 2 or more (mostly only 2) members aged 45 years and above

Thus, 25 households were randomly selected from each of the selected PSU. The expected distribution of these 25 randomly selected households list is as follows:

- 9 households with no person aged 45 years and above
- 8 households with one person aged 45 years and above (add spouse less than 45)
- 8 households with 2 or more members aged 45 years and above (add spouse less than 45)

All 16 LASI eligible households (all married, non-married men and women aged 45 years and above and their spouses from all LEH) were contacted. Thus, a target sample of 25 LASI eligible respondents was expected from these 16 LEH selected systematically from each of the selected PSUs. The expected target sample size in four selected states was as follows:

4(states)*2(districts)*8(PSUs)*25(individuals aged 45 years and above) = 1600 completed interviews

The probability of selecting household (p) in a state was determined by the overall probability of selecting a district in each selected state, probability of selecting a PSU, probability of selecting of a CEB/segment, and probability of selecting a household.

The probability of selecting two districts from each state was calculated using the formula:

$$p1 = \frac{2}{n}$$

Where $p1$ = the probability of selecting two districts from each state

n = number of districts in a state

The probability of selecting a PSU from a rural/urban stratum was computed as:

$$p2 = \frac{n1 * h1}{n2}$$

Where $p2$ = the probability of selecting PSU from a rural/urban stratum

$n1$ = number of urban/rural PSUs selected

$h1$ = number of households in a PSU (census)

$n2$ = number of urban/rural PSUs in district

The probability of selecting a segment/CEB from each selected PSU was computed as:

$$p3 = \frac{h2}{h3}$$

Where $p3$ = the probability of selecting segment/CEB

$h2$ = number of households in CEB/segments selected

$h3$ = number of households in selected PSU

The probability of selecting households was computed as:

$$p4 = \frac{h4}{h5}$$

Where $p4$ = the probability of selecting households in each selected CEB/segment

$h4$ = number of households selected

$h5$ = number of households listed

Thus, the overall probability of selecting household (p) in a state was computed as:

$$p = p1 * p2 * p3 * p4$$

2.1.7 Sample Weights

The basic objective of weighting sample data is to improve the representative nature of the sample in terms of the size, distribution, and characteristics of the study population. When sample units have been selected with differing probabilities, it is common to weight the results inversely proportionally to the unit selection probabilities—that is, design weight, so as to reflect the actual situation in the population. In a survey sample selected from a good frame and well implemented with high response rates, application of the design weights is all that is required. In practice, however, the situation is more complicated because of shortcomings in the selection and implementation of the sample.

In the LASI pilot, two sets of weights were in operation. One set of weights was used for generating pooled indicators and another set for producing state level indicators. Each set had the following different weights:

- Household weight
- Individual respondent's weight
- Biomarker weight

Estimation of state household weights

The basic reason for weighting primary data while estimating state level indicators was to account for un-equal probability of selection in different domains (i.e. rural and urban areas) and to account for differential non-response rates of household (HH) interviews in different domains, urban-rural areas.

To take care of non-equal probabilities of selection in different domains, design weight was computed. The design weight $W_{Di}$for the ith domain is calculated as the ratio of overall sampling fraction **(F=n/N,** where 'n' is the number of districts in a state**)** and the sampling fraction for the i^{th}domain **($f=n_i/ N_i$)**. Note that $\Sigma n_i = n$ and$\Sigma N_i = N$. To take care of differential non-response in different domains, the design weight for each domain is multiplied by the inverse of the respective response rates (**R_{Hi})**.

The HH weight **(W_{Hi})**for i^{th} domain is then:

$$W_{Hi} = W_{Di} / R_{Hi}$$

After adjustment for non-response, the weights were normalized so that the total number of weighted cases is equal to the total number of unweighted cases. This is done by multiplying W_{Hi} for each domain by the ratio of the total number of unweighted cases to the total number of weighted cases (obtained by applying weights before normalization to the number of cases in each domain).

The final state household weight is calculated as:

$$WHi = W_{Hi} * [\Sigma n_i/(\Sigma W_{Hi} * n_i)]$$

Estimation of pooled household weights

The basic reason for weighting primary data while estimating pooled indicators was:

1. To account for non-equal probability of selection in different domains within each state and to take care of differential non-response rates within each state.
2. To take care of non-equal probability of selection in different states. Irrespective of differences in state level population, a target sample size of 400 interviews in each state was fixed. In other words the state level samples were not in proportion to the state population size in the total of the four states.
3. To take care of differential non-response rates of HH interviews in different states.

As the national weight takes care of the non-equal probabilities and differential response rates within states and across the states, the overall sample weight for each household is the product of the design weight of each state and the state weight.

Let,
W_{sij} be the weight for j^{th} household in the ith domain in state (*s*), then
W^{a}_{sij}weight forj^{th} household in the ith domain in state (*s*) for the national estimate

$$= (Ps / \Sigma W_{sij}) * W_{sij}$$

Where P_s is the projected population of state (*s*).

After adjustment for non-response, the weights were normalized so that the total number of weighted cases was equal to the total number of unweighted cases.

The final normalized weight for j^{th} household in the ith domain in state (*s*) for the national estimate is:

$$Wb_{sij} = (\Sigma n_i / p) * (Ps / \Sigma W_{sij}) * W_{sij}$$

Where P is the projected population of all the states together.

<u>Estimation of state level and pooled individual respondent's weight</u>

The state level and pooled individual respondent's weights were derived by exactly same way as were their corresponding household weights. The only difference was that the response rate of the household interview is replaced by the response rate of the household interview times the response rate of the individual's interview.

The individual respondent's weight is:

$$W_{Pi} = W_{Di} / (R_{Hi} * R_{Pi})$$

Similarly, while estimating state and pooled biomarker weights, the response rate for biomarker was considered (ratio of biomarkers collected and total number of persons interviewed).

2.1.8 Response Rates

The number of household interviews, the number of interviews with age-eligible individuals, the number of biomarker interviews, and the response rates for household, individual, and bio-marker based on the dataset cleaned by IIPS are presented in Table 2.1. Overall, 950 households were interviewed out of the 1,025 households selected and the

response rate was around 93 percent. The household response rate did not vary much between urban and rural areas.

Individual interviews were completed with 1,683 LASI age-eligible individuals out of 1,761 individuals who stayed in the LEHs.The individual response rate was 96 percent in all of the areas, and the response rate was slightly higher in urban areas. With regard to biomarker response rates, 1,530 biomarker interviews were completed out of the 1,683 individuals who were eligible for the biomarker response. The overall biomarker response rate was around 91 percent. The biomarker response rate was comparatively higher in rural areas than urban areas. The number of dried blood samples (DBS) collected was 1,356 out of 1,419 whose consent was taken for DBS. The DBS response rate was 96 percent.

Table 2.1: Number of households, number of interviews with LASI age eligible individuals, number of biomarker responses, and response rates according to place of residence, covered in India, LASI - pilot , 2010

Results	Urban	Rural	Total
Household interviews			
Household selected	300	725	1025
Household interviewed	280	669	950
Household response rate[1]	**93.33**	**92.28**	**92.68**
Individual interviews			
Number of age-eligible individuals selected	495	1266	1761
Number of age-eligible individuals interviewed	472	1211	1683
Individual response rate[2]	**95.35**	**95.66**	**95.57**
Biomarker interviews			
Number of eligible biomarker selected	472	1211	1683
Number of eligible biomarker completed	423	1107	1530
Biomarker response rate [3]	**89.62**	**91.41**	**90.91**
DBS collection			
Number of DBS consent taken	366	1053	1419
Number of DBS collected	348	1008	1356
DBS response rate[4]	**95.1**	**95.7**	**95.6**

Note: This table is based on unweighted sample. Eligible individuals were persons aged 45+ years and their spouses less than 45 years

1 Indicates household Interviewed/household selected

2 Indicates number of eligible individuals interviewed/number of eligible individuals selected

3 Indicates number of eligible biomarker completed/number of eligible biomarker selected

4 indicates Number of Dried Blood Samples (DBS) collected/ Number of eligible individuals whose consent was taken

2.1.9 Standard Error

Sampling errors are usually measured in terms of standard errors for a particular estimate or indicator. Standard error of an estimate is the square root of the variance of that

estimate and is computed in the same units as the estimate. The standard error can be used to calculate confidence intervals within which the true value for the population can reasonably be assumed to fall.

2.1.10 Lessons for Main Wave

Survey data, in general, is prone to errors occurring at various stages of data collection and processing—such as preparation of survey instrument (questionnaire), sampling design, data collection, data processing, etc. The errors from all sources may collectively be termed as *total error.* The *total errors* have two broad components: *random sampling errors* (commonly sampling errors) and *non-sampling errors.* To increase the validity and reliability of survey data, one must minimize total error and its components, sampling and non-sampling error, before analysis. A technical note on possible sources of errors and data cleaning is provided in Appendix -I.

2.2 Variable Imputation and Data Processing

A range of critical background and outcome indicator variables were imputed to facilitate data analysis and use of data. The following are some of the important variables imputed at the household level. The imputed variables will be provided as part of the data set available in the public domain.

Household consumption expenditure: The household consumption section of LASI asked one respondent from each household about expenses incurred for the purchase of all food items and the value of homegrown product or in-kind transfers during the last 30 days. Questions were also asked on the household expenditure on a set of items during the last month and last 12 months. Using these variables, a set of composite variables (such as food expenditure, non-food expenditure, and total consumption expenditure per capita) were computed.

Individual income: LASI collected information on individual income amounts from work activities for each household member who held a wage/salary job, who worked alone in a self-employment activity, or who received pension payments within the last 12 months. Using these data, the variables such as income from employment, income from self-employment, income from pensions, income from rations, income from government transfers, income from remittances, income from other private transfers, other household income, and income from agricultural activities and housing rental income were created. Further, a composite variable of income at the household level was computed using these variables.

Financial and non-financial assets: An index of the economic status of the household, called the wealth index, was computed using a set of variables related to household characteristics and assets. Since the beginning of Demographic Health Surveys (DHS), the wealth index has become a popular measure to explain the economic differentials in demographic and health parameters of developing countries. The reliance on the wealth

index—based on economic proxies of household (housing quality, household amenities, and consumer durables)—was primarily owing to non-integration of direct economic measures such as consumption expenditure or household income in the population based surveys of developing countries. We have constructed the wealth index in a similar line to that of DHS, validated the estimates, and examined its linkages with population and health variables using the pilot data from Longitudinal Ageing Study in India (LASI) 2010.

A set of 44 variables were used in the construction of wealth index. These variables cover the broad domains of wealth of the household, housing, household amenities, consumer durables, and access to financial institutions. The variables were selected based on theoretical rationale and statistical significance. The principal component analyses (PCA) are used to construct the composite wealth index. The first principal component explained 22 percent of the variance and the eigen value of first component was 9.55. The factor score of the variables served as the weight in the construction of overall composite index. The factor score of the variables are in the expected direction.

For tabular analyses with the wealth index and variable of interest (health and health care utilization), the wealth quintiles were computed. The wealth quintiles were derived from the composite score and divided into five quintiles; poorest, poorer, middle, richer and richest. The quintiles are based on the distribution of the household. The population weight adjusted for household size is used in generating the wealth index and wealth quintile of the sample population.

We have examined the validity, internal coherence, reliability, and robustness of the wealth index. Internal coherence compares the mean value of each asset variable by quintiles. We found that the mean asset ownership differed by wealth group. For example, none of the households in the first wealth quintile own flush toilets compared to 19 percent in the second, 50 percent in the third, 78 percent in the fourth, and 90 percent in the fifth wealth quintile. Similar variations are observed for other variables. These differentials suggest that the wealth index reasonably captured the internal coherence of the variables. The alpha-test has been carried out to test the reliability of the estimates. It is a type of scale reliability test that justifies the validity of scale. The value of alpha was 0.9 indicating the reliability of the index.

We have computed the correlation coefficient of three sets of composite indices to understand the robustness of composite indices. These are index 1 based on housing quality and household amenities (19 variables), index 2 based on ownership of consumer durables (25 variables), and the overall index (based on 44 variables). While index 1 and index 2 include sets of independent variables, the overall index includes all those variables of index 1 and index 2. The correlation coefficient of index 1 and index 2 is 0.75, and that of index 1 and the overall index (the index that uses all variables) is 0.91. Similarly, when the index is constructed with only consumer durables (index 2), the correlation coefficient with the overall index is 0.95. Hence, adding more variables in constructing the index only increases the similarity of ranking. Thus the asset index produces very similar result when different subsets of variables are used

in its construction. The validity of the wealth index is further tested by cross-classifying the wealth quintile with consumption quintiles and subjective well-being (AD215) of the household.

Demographics: The demographics section asked about the date of birth of the respondent. If the respondent does not report about the date of birth, another question had been asked about the age in completed years. If the respondent was not able to answer the second question also, then a set of questions were asked to identify the age of the respondent. Using all these data, an aggregate variable for 'age' was computed.

Health: In this section 'duration since first diagnosis for chronic diseases' was calculated using the variable HT034_intro. The variable HT034_intro asks about 'when you were first diagnosed with a stroke?' If the respondent answered in terms of year, then the duration was computed by taking the difference between the current year and year of diagnosed. Similarly, if the respondent answered in terms of age, then the duration was computed by taking the difference between the current age and age of diagnosed.

Variable ADL (activities of daily living score) was computed using the variables HT401 HT402, HT403, HT404, HT405, and HT406. These variables asked whether the respondent has any difficulty with everyday activities because of a physical, mental, emotional, or memory problem. The answers of these questions were coded into binary and added together to get the ADL score. The ADL score was categorized into three groups: 0 difficulties resulted in a placement in the first group, 1 difficulty in the second group, and 2 and more in the third group.

Biomarker: A new variable was computed to measure the hypertension of the respondent. The variable was computed using the variables 'm_bp_sys' (blood pressure-systolic) and 'm_bp_dia' (blood pressure – diastolic). In the survey, the systolic and diastolic blood pressure was measured three times. Therefore, the systolic measurement was calculated by taking the mean of these three values. The range of systolic normally includes values less than 140, and systolic hypertension includes values greater than 140; diastolic normally includes values less than 90, and diastolic hypertension includes values greater than 90. If a person has either diastolic or systolic, then it was categorized as hypertension.

Body Mass Index (BMI) was computed using the variables height and weight, measured in kg/m^2. The variable height was converted in to meters and squared. Then, BMI was calculated using the formula:

$$BMI = weight / (height)^2$$

The variable BMI was further categorized into four categories as underweight (minimum to 18.4), normal (18.5 to 24.9), overweight (25 to 29.9), and obese (30 to maximum).

A variable weight-hip ratio was also computed using waist circumference and hip circumference.

2.3 Access to LASI Pilot Data

The purpose of cleaning, imputing, and weighting the LASI pilot data was to facilitate an easy and direct scientific analysis of LASI pilot data for researchers and data users. The cleaned and weighted LASI pilot data including imputed variables is available in the public domain through IIPS, Harvard, and RAND websites. The LASI pilot instrument will be made available to researchers who want to use LASI pilot data.

ECONOMIC WELL-BEING OF HOUSEHOLDS WITH OLDER ADULTS

3

3.1 Introduction

The economic condition of the household is a key determinant of well-being of older population in India, like that of many developing countries. The economic conditions of households are determined by type of employment of the household members, educational level of the household members, household size, and age composition of the household members. Studies suggest that out-of-pocket (OOP) expenditure on health care increases with age and that households with older adults spend significantly more on health care expenditure than do those of younger adults' households (Hwang *et al* 2001; Desmond *et al* 2007). Household wealth is also an important factor of old age expenditure. Though we have periodic information on consumption expenditure of households, little is known on income, wealth, and subjective well-being of the households particularly regarding the older population in India. This is because of the paucity of data on economic measures of households in India. In the LASI pilot, comprehensive information was collected on household income, household consumption and wealth, and information on the subjective economic well-being of households of the older population in India.

This chapter presents results on living conditions (household amenities) and the economic well-being of households with older persons age 45+. Economic well-being is assessed with respect to four critical domains: income, consumption expenditure, asset distribution, and the subjective well-being of the household of the older population. The differentials in economic well-being are examined by selected social and demographic characteristics.

3.2 Household Living Condition

The household living condition is a reflection of both the household and the community development in the population. We have presented the living condition of the households with respect to the number of rooms, availability of a kitchen facility, sanitation facilities, source of drinking water, type of cooking fuel, and availability of electricity in the households. The average number of living rooms in the study population was 2.4. The distribution of rooms showed that 11 percent of the households lived in one room, 50 percent lived in two to three rooms, 29 percent lived in four to five rooms and 10 percent had five or more rooms (Table 3.1). About 79 percent households own a separate kitchen. The distribution of households by type of toilet facility showed that two-fifths of the households do not have any toilet facility; two-fifths had flush toilets; and one-fifth had other toilet facilities. The distribution of households by source of drinking water showed that 45 percent of households use piped water, 19 percent use a tube well/bore well, 28 percent use a dug well, and eight percent use other sources of water. While 85 percent of households were electrified, 59 percent used solid fuel for household cooking. The

availability of a toilet facility, improved drinking water, and electricity is significantly higher in urban areas than in rural areas of the study population.

Table 3.1: Percent distribution of households by number of rooms in the household, separate room for kitchen, toilet facility, source of drinking water, electricity, cooking fuel and any communication, India, LASI-pilot, 2010

Household characteristics	Urban	Rural	Total
Average no. of rooms in the household	2.5	2.3	2.4
1 room	10.0	11.3	10.9
2 - 3 rooms	45.3	51.6	49.8
4 - 5 rooms	29.9	28.6	29.0
More than 5 rooms	14.9	8.5	10.3
Separate room for kitchen			
Yes	93.0	73.8	79.2
No	7.1	26.3	20.8
Toilet facilities			
Flush toilet			
-Flushed to sewer	32.2	7.6	14.5
-Flushed to septic tank	29.2	22.4	24.3
-Flushed elsewhere	0.5	1.6	1.3
Other type of toilet	30.6	18.8	22.2
No facility	7.5	49.6	37.7
Source of drinking water			
Piped water	73.2	33.8	44.9
Tube well/borehole	7.6	23.3	18.8
Dug well	17.7	32.4	28.2
All other	1.6	10.6	8.04
Electricity			
Yes	97.1	79.7	84.6
No	2.9	20.3	15.4
Cooking fuel			
Solid fuel[1]	26.7	72.3	59.4
Non solid fuel[2]	73.3	27.7	40.6
Any communication			
Yes	11.7	25.8	21.8
No	88.4	74.2	78.2
Total(pooled)	**100**	**100**	**100**
N (No. of cases)	**281**	**669**	**950**

Note:
[1]Solid fuel includes coal/lignite, charcoal, crop residue, burning wood, and dung cakes
[2]non solid fuel includes natural gas, liquefied petroleum gas, biogas, kerosene, and electric.

3.3 Household Income and Consumption Expenditure

Household income and household consumption expenditure are two direct economic measures that reflect the economic status of a household. In India, data on household consumption expenditure are regularly collected by the National Sample Survey Organization (NSSO) and used for estimating the poverty and inequality in the country. However, data on household income are not usually collected in large scale population based surveys, NSSO included.

In LASI, information on the consumption expenditure of the household and on the income of each members of the household was collected. Based on the information of total

household consumption expenditure and the household size, the mean per capita consumption expenditure (MPCE) was computed. Similarly, information on the income of each household member and household aggregate income were summed up to derive the aggregate household income. The missing values of income and consumption expenditure were adjusted using the hotdeck imputation method. Estimates are presented in Indian rupees and in US dollars (Table 3.2). The coefficient of variation (SD/mean) is computed to understand the differentials in income and consumption expenditure of the households.

Starting with consumption, the mean MPCE of the four states was estimated to be rupees 4,710 while the median MPCE was rupees 3,195. The MPCE is significantly higher in urban areas and among households with less than three members. For example, the mean MPCE among households with one to two members was rupees 5,664 compared with rupees 3,695 among households with six members and more. The differentials in MPCE by age of the head of the household suggest that the MPCE declined as people age (rupees 4,884/ among those households where age of the head is less than 60 years, rupees 4,503/ for age 60-74 year, and rupees 4,043/ among those households with household head age of 75year and above). There are no significant differences in mean MPCE by sex of the head of the household. The differentials in MPCE by marital status showed that it is highest among never married/divorced/separated older persons' households compared to currently married and widowed/widower persons' households. The state differentials in MPCE suggest that the mean MPCE is highest in the state of Kerala, followed by Punjab, Karnataka, and Rajasthan. The coefficient of variation varies largely across states and by place of residence. The mean MPCE is much higher due to the lower sample size and extreme observations. We have not attempted to truncate the extreme observation in the data set.

Similarly, the mean household income was estimated to be rupees 3,689 for all four states, lower than the corresponding consumption expenditure. This is owing to the underreporting of income and the fact that a significant proportion of income was missing in the data. However, the differential in consumption expenditure by social and demographic characteristics indicated a similar pattern as that of household income. The mean income is highest in the state of Kerala and lowest in the state of Karnataka. The differential in mean household income by age of household showed a similar pattern for those households with persons aged below 60 years and those aged 75 years and above, and it was relatively higher for persons in age 60-74 year age group.

Information on 25 durables (such as television, mobile, refrigerator, two-wheeler, and car) were collected from each household. It was found that the mean number of assets owned by the household was six, which varied by social and demographic characteristics. The mean number of assets in rural areas was six, compared with eight in urban areas. Among the states, the mean number of assets owned by household varied from the lowest of four in Rajasthan (six in Karnataka, nine in Punjab) to a high of 10 in Kerala.

Table 3.2: Mean monthly per capita expenditure (MPCE) and mean household income and mean number of assets by selected background characteristics, India, LASI-pilot, 2010

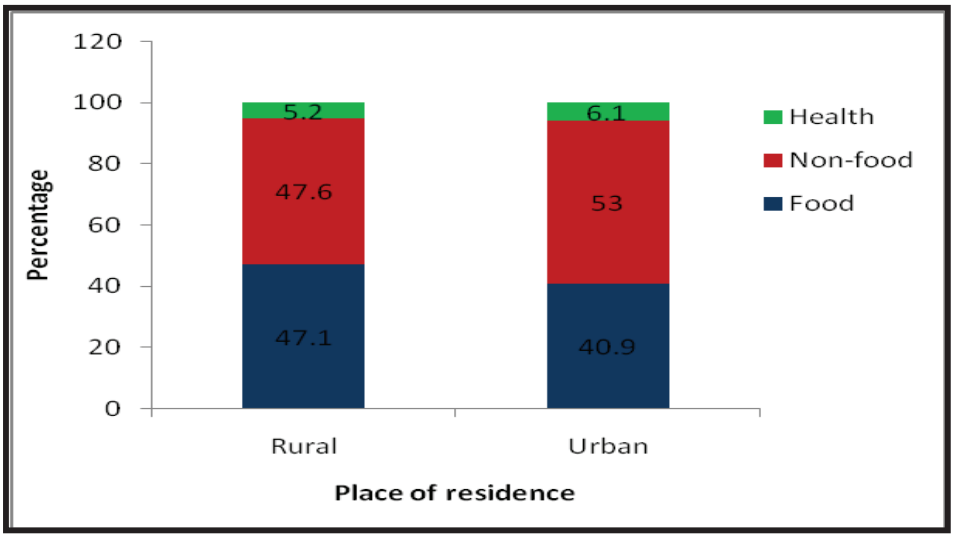
State/background characteristics	Mean MPCE[1] in rupees	Mean MPCE in $	C.V	Mean HH income[2] in rupees	Mean HH income in $	C.V	Mean number of assets[3]	C.V[4]	No. of cases
State									
Punjab	5032	112	0.8	4508	100	1.4	9	0.3	222
Rajasthan	3088	69	0.9	2870	64	2.2	4	0.9	230
Kerala	5765	128	1.5	5629	125	1.7	10	0.3	261
Karnataka	5322	119	1.3	2671	59	2.0	6	0.7	237
HH head Age									
<60	4884	109	1.3	3548	79	1.8	6	0.7	603
60-74	4503	100	1.5	4045	90	2.2	7	0.6	254
75+	4043	90	0.9	3662	82	1.4	7	0.6	92
Sex									
Male	4707	105	1.3	3808	85	1.9	6	0.7	744
Female	4731	105	1.5	3258	73	1.1	7	0.6	205
Marital Status									
Currently married	4822	107	1.3	3851	86	1.9	6	0.7	724
Never married/separated/divorced	5876	131	1.1	4472	100	1.3	6	0.7	21
Widowed/widower	4176	93	1.5	3045	68	2.0	6	0.7	204
Residence									
Rural	4473	100	1.4	3292	73	1.8	6	0.6	669
Urban	5310	118	1.2	4661	104	2.0	8	0.5	281
Caste									
Scheduled castes/Scheduled tribes	2919	65	0.9	1803	40	1.1	3	1	254
Other backward castes	5114	114	1.3	3497	78	1.7	7	0.6	347
Others	5784	129	1.3	5598	125	1.8	8	0.5	348
Household size									
1-2	5664	126	1.4	5240	117	2.2	6	0.7	157
3-4	5572	124	1.2	3961	88	1.6	7	0.6	315
5-6	4045	90	0.9	3330	74	1.6	6	0.7	267
6+	3695	82	1.7	2688	60	2.5	5	0.8	210
Median	**3195**			**1560**			**7**		
N(Household)	**950**			**950**			**950**		**949**
Total (pooled)	**4710**			**3689**			**6**		

Note: [1] is the monthly per capita consumer expenditure,
[2] is the household monthly income,
[3] includes the consumer durables assets;
[4] CV is the coefficient of variation
HH Household

3.4 Differentials in Consumption Expenditure Pattern by Food, Non-Food, and Health Expenditure

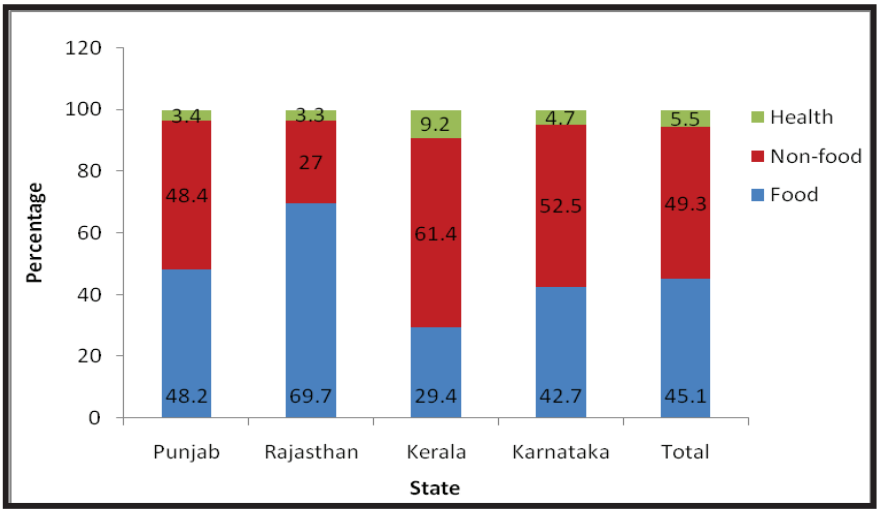
Detailed information on food items (such as staple food, pulses, milk and milk products, and vegetables) and non-food items (such as utilities, fuel, transport, entertainment, clothing and bedding) were collected from the sampled households in a reference period. The differentials in consumption expenditure of households by three major categories such as food, non-food, and health are shown in Table 3.3. Note that our data for both wealth and consumption goes from poorest (quintile 1), to poorer (quintile 2), to middle (quintile 3), to richer (quintile 4), and to richest (quintile 5).

Figure 3.1: Percentage of Food, Non-Food and Health Expenditure by Residence, India, LASI-pilot, 2010



The differential in expenditure pattern shows that about 45 percent of household expenditures were on food, 49 percent were on non-food, and five percent were on health expenditure. Rural households spent a higher proportion of their expenditure on food compared to urban households (47 percent versus 41 percent), while urban households spent a higher proportion of their expenditure on non-food than food (53 percent versus 48 percent). As for health, outlays were 6 percent in urban households compared to5 percent in rural areas. (Figure 3.1)

Figure 3.2: Percentage of Food, Non-Food and Health Expenditure by States, India, LASI-pilot, 2010



The state-wise differentials are revealing(Figure 3.2). In Kerala, 29 percent of consumption expenditures are spent on food, compared with 70 percent in the state of

Rajasthan, 48 percent in Punjab, and 43 percent in Karnataka. The proportion of expenditure on non-food items was highest in Kerala (61 percent), followed by 53 percent in Karnataka, 48 percent in Punjab and 27 percent in Rajasthan. With respect to health expenditure, about 9 percent of total consumption expenditure in Kerala are spent on health care, compared to 5 percent in Karnataka and 3 percent each in Punjab and Rajasthan, which are relatively poorer states. A large proportion of out-of-pocket expenditure on health reduces access to health care, affects health status, and reduces expenditure on other necessities.

The differentials in the consumption expenditure by wealth quintile suggests that the proportion of expenditure spent on food expenditure declines with wealth quintile while that of non-food and health care expenditure increases with wealth quintile (see Table 3.3). About 81 percent of consumption expenditure among households in the poorest wealth quintile is spent on food compared with 31 percent among the richest quintile. On the other hand, only 17 percent of expenditure of the poorest wealth quintile is spent on non-food items compared with 63 percent among the richest quintile. This corroborates the fact that poor people spent a larger proportion of their consumption expenditure on food compared to other expenditure. The proportion of expenditure on health also increases with wealth quintile—from 2 percent of consumption expenditure in the poorest quintile to 6 percent of expenditure in the richest quintile.

The differentials in expenditure pattern by caste showed that among scheduled castes (SC)/scheduled tribes (ST), 62 percent expenditure is spent on food compared with 45 percent among other backward class (OBC) and 38 percent among “others”. The expenditures on non-food items are largest among “others,” followed by OBCs and SC/STs. The differentials in expenditure pattern also suggest that the state differentials in spending pattern are large.

Table 3.3: Mean per capita consumption expenditure (MPCE) and percentage of MPCE by food, non-food and health expenditure by states and background characteristics, India, LASI-pilot, 2010

State/background characteristics	Mean Expenditure in rupees			Mean MPCE	Percentage of food, non-food & health on total		
	Food	**Non-food**	**Health**		**Food**	**Non-food**	**Health**
State							
Punjab	2426	2434	172	5032	48.2	48.4	3.4
Rajasthan	2153	832	103	3088	69.7	27.0	3.3
Kerala	1694	3542	529	5765	29.4	61.4	9.2
Karnataka	2275	2794	253	5322	42.7	52.5	4.7
HH head Age							
<60	2174	2519	190	4884	44.5	51.6	3.9
60-74	2009	2064	429	4503	44.6	45.8	9.5
75+	2116	1644	283	4043	52.3	40.7	7.0
Sex							
Male	2508	2290	259	4707	45.9	48.7	5.5
Female	2006	2461	264	4731	42.4	52.0	5.6
Residence							
Rural	2109	2130	234	4473	47.1	47.6	5.2
Urban	2170	2817	323	5310	40.9	53.0	6.1
Caste							
Scheduled caste/scheduled tribes	1800	929	190	2919	61.7	31.8	6.5
Other backward castes	2316	2529	269	5114	45.3	49.5	5.3
Others	2174	3301	309	5784	37.6	57.1	5.3
Wealth quintile							
Poorest	1671	354	48	2073	80.6	17.1	2.3
Poorer	2009	1103	110	3222	62.4	34.2	3.4
Middle	2171	1531	156	3858	56.3	39.7	4.0
Richer	2230	3032	452	5715	39.0	53.1	7.9
Richest	2468	5035	457	7960	31.0	63.3	5.7
Total (pooled)	**2126**	**2324**	**260**	**4710**	**45.14**	**49.34**	**5.52**

Note: 'Other' castes indicates those who do not belong to scheduled caste/scheduled tribes, and other backward castes

3.4.1 Distribution of Household Wealth

Though income and consumption are direct economic measures of households, the wealth of the households, particularly among the elderly, provides economic security and consumption opportunities later in life. In the LASI pilot survey, detailed information on household wealth including housing quality, valuation of house, household amenities, and consumer durables were collected. We constructed a wealth index similar to that of the Demographic and Health Survey (DHS), validated the estimates, and examined its linkages with population and health variables using the pilot data from the Longitudinal Ageing Study in India (LASI) 2010.

A set of 44 variables have been used in the construction of the wealth index. These variables cover the broad domain of wealth of the household; housing, household amenities, consumer durables; and access to financial institutions. The variables were selected based on theoretical rationale and statistical significance. The theoretical rationale refers to the ability of the variables to reflect the economic condition of the household. For example, the variables like cot or bed are not selected in the analysis as most of the households own these. Also, land and valuation of domestic animals were not included as they showed a negative factor score. The

variables with missing data were assigned a value of zero. Similarly, the variables with a low standard deviation (all household own these particular variables or no households own these variables) were not included in the analyses (agricultural variables, for instance, would significantly lower the sample size).

The variables included in the construction of the wealth index are;

i) **Housing quality:** person per room, separate kitchen, valuation of house
ii) **Household amenities:** water facility in the household, toilet facility, electricity, cooking fuel, telephone, mobile
iii) **Consumer durables:** bicycle, pressure cooker, motorized vehicle, car, truck, any other automobiles (motorcycle/moped/scooter), refrigerator, washing machine, sewing machine, television (black and white), (television color), radio, computer, stereo, camera, air-conditioner, mixer, clock, pressure cooker, electric fan
iv) **Others:** Bank account (saving/current), bond/stock.

We used Principal Component Analyses (PCA) to construct a wealth index, and the first principal component was used in the analyses. A number of studies demonstrate that wealth index is a good proxy of economic status (Filer and Pritchet 2001; Wagstaff and Watanabe 2003; Rutstein and Johnson 2004). As a first step, all selected variables were recoded into binary form (1=yes and 0=no), as PCA works better when the variables are in binary forms. In the second step, PCA was used to generate the factor score. The factor score served as a weight in the construction of the overall composite index. The mean, standard deviation, and the factor score of variables used in the construction of the wealth index is shown in Appendix II.

Figure 3.3: Distribution of Wealth Index, India, 2010

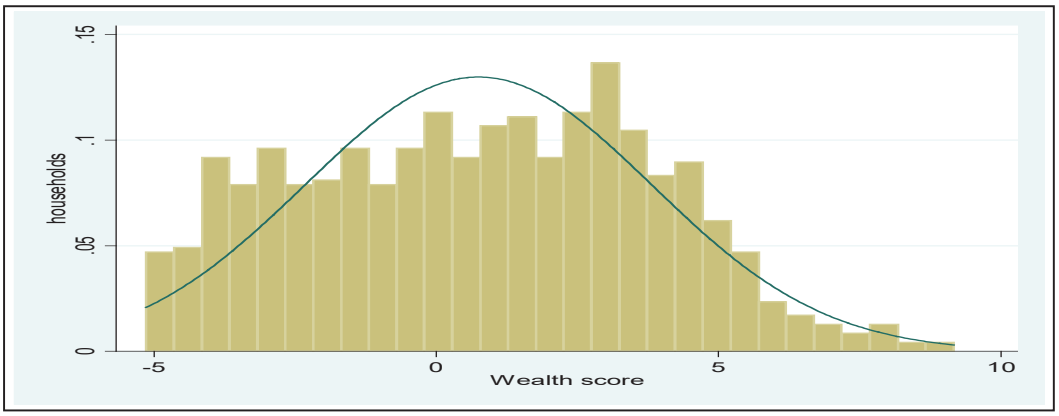


Figure 3.3 shows the distribution of the composite wealth index, which has a normal curve. It also reflects that the clumping (clustering of households in a small number of clusters) and truncation (more even distribution of wealth index but spread in a narrow range) is minimal.

Generally, a variable with a positive factor score is associated with higher socio-economic status (SES) and a variable with a negative factor score is associated with a lower SES. For example, the factor score of those households with a flush toilet was 0.219 compared with -0.004 for a pit toilet and -0.230 for no toilet. The validity, internal consistency and reliability

of the wealth index were checked. The first principal component explains 22 percent of the variance and the Eigen value of the first component is 9.55.

3.4.2 Mean Percapita Consumption Expenditure (MPCE) and Wealth Quintile

For tabular analyses of economic variables with a variable of interest (health and health care utilization), MPCE quintiles and wealth quintiles were computed. The wealth quintiles were derived from the composite score and the MPCE quintiles were derived from the MPCE. The quintiles are divided into five: poorest, poorer, middle, richer and richest. The quintiles were based on the distribution of the household population rather than on the distribution of household. Population weight was used in generating the wealth index and the wealth quintile of the sample population. (Figure 3.4 shows the box plot of MPCE by number of consumer durables.)

At least four properties of the wealth index, namely, (i) internal coherence (ii) validity (iii) reliability, and (iv) robustness have been checked. Internal coherence compares the mean value of each asset variable by quintiles (Table 3.4). We found that the mean asset ownership (selected variables are shown) differed by wealth group. For example, none of the households in the first (lowest) wealth quintile own a flush toilet compared with 19 percent in the second, 50 percent in the third, 78 percent in the fourth, and 90 percent in the fifth (highest) wealth quintile. Similar variations are observed for other variables. These differentials suggest that the wealth index reasonably captures the internal coherence of the variables.

Table 3.4 presents the distribution of wealth quintile by states and place of residence. It is evident from the table that the wealth quintile and consumption quintile varied significantly by states and place of residence. For instance, the proportion of households in richer or richest wealth quintile was higher in Punjab and Kerala and lower in Karnataka. Further, more than half of the households in Punjab were in richer or richest consumption quintile. The proportion of households in the richer or richest consumption quintile was lower in Rajasthan (27.6 percent).

Table 3.4: Percent distribution of wealth quintile by states and place of residence, India, LASI-pilot, 2010

State/place of residence	Wealth quintile					Consumption quintile					
	Poorest	Poorer	Middle	Richer	Richest	Poorest	Poorer	Middle	Richer	Richest	Average all
State											
Punjab	0.9	10.0	14.7	28.4	46.0	4.0	19.6	24.0	21.8	30.6	100
Rajasthan	41.6	24.0	17.4	13.3	28.2	34.9	20.8	16.7	17.3	10.3	100
Kerala	0.2	2.5	13.3	47.0	36.9	10.9	26.0	19.9	17.9	25.3	100
Karnataka	13.9	28.9	28.2	15.0	14.0	14.0	16.3	21.5	23.8	24.4	100
Residence											
Rural	26.9	22.3	20.7	17.7	12.4	21.2	21.2	21.2	18.4	18.0	100
Urban	2.4	13.8	17.4	25.7	40.6	17.3	17.5	15.5	24.4	25.3	100
Total	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**100**
N(Households)	**193**	**190**	**188**	**189**	**190**	**193**	**190**	**188**	**189**	**190**	**949**

Note: N- Total unweighted cases

3.5 Agreement of Consumption Expenditure, Household Income, and Wealth Index

To understand the agreement of direct economic measures and economic proxies, the consumption expenditure, household income, and wealth index were tabulated (Table 3.5). The agreement of the consumption quintiles with the wealth quintiles is higher than that with the income quintiles. For example, among households in the poorest quintile of consumption expenditure, about 46 percent are also classified in the poorest quintile of wealth, whereas only about 19 percent are also classified in the poorest quintile of income.

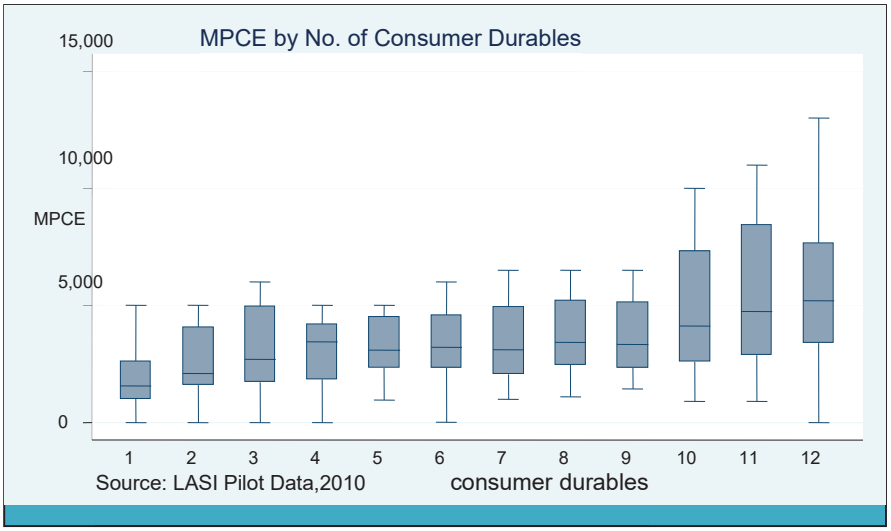
Looked at another way, when comparing MPCE and wealth quintiles, it was found that about 31 percent of households remain in a similar quintile, while 40 percent moved to the adjacent quintile, about 21 percent moved to the second adjacent quintile, and 8 percent to the two farthest quintiles. This is suggestive that there is no one-to-one correspondence of consumption with wealth quintiles of the households. However, it is a closer relationship than for MPCE and income—with 26 percent of households remaining in a similar quintile, while 32 percent moved to the adjacent quintile, about 23 percent moved to the second adjacent quintile, and 19 percent to the two farthest quintiles.

Table 3.5: Percent distribution of households by MPCE, Income and wealth quintile, India, LASI-pilot, 2010

MPCE quintile	Income quintile					
	Poorest	Poorer	Middle	Richer	Richest	N
Poorest	19.4	23.1	24.7	22.3	10.5	108
Poorer	14.4	26.4	23.0	23.0	13.2	164
Middle	19.4	13.2	21.4	28.2	17.9	166
Richer	21.2	18.2	16.4	18.8	25.4	178
Richest	12.6	16.3	14.0	14.9	42.2	197
Total(pooled)	**17.3**	**19.1**	**19.4**	**21.2**	**23.1**	**813**
	Wealth quintile					
Poorest	45.9	29.0	15.8	6.5	2.9	145
Poorer	21.0	21.7	23.9	24.4	9.0	183
Middle	18.8	17.2	18.7	31.5	13.8	184
Richer	9.7	19.6	21.4	22.7	26.5	208
Richest	1.1	11.1	13.8	28.2	45.8	229
Total(pooled)	**17.9**	**19.2**	**18.6**	**23.1**	**21.1**	**949**

Note: N- Total unweighted cases

Figure 3.4: Box Plot of MPCE and Consumer Durables



3.6 Differentials in Wealth Quintile and Consumption by Socio-Demographic Characteristics

Since wealth quintile and consumption quintiles are used as background variables in the social and health sections, the differentials in wealth quintile by socio-demographic characteristics of the study population are shown. The wealth quintile by education shows that wealth is positively related to education. Among older persons (60 and over) without schooling, 14 percent were in the poorest quintile compared to 9 percent among those with less than primary, 4 percent among those with primary completed, and 2 percent among those with middle school completed (Table 3.7). On the other hand, 6 percent of older persons with no schooling were in the richest quintile compared to 16 percent with less than primary, 28 percent with primary completed and 46 percent with higher secondary and above. Such differences are relatively lower by consumption quintile than by wealth quintile.

Table 3.6: Linkage between consumption quintile, wealth quintile and income quintile, India, LASI-pilot, 2010

Consumption quintile	Income quintile	Wealth quintile	Difference of income/wealth quintile
HH in the same quintile	26.3	31.0	30.5
HH in the Adjacent Quintile	31.9	39.7	36.1
HH 2nd adjacent Quintile	23.0	21.0	18.9
HH 3rd adjacent Quintile	14.4	7.5	10.4
HH Farthest Quintile	4.5	0.8	3.8
N	**813**	**949**	**813**
Correlation coefficient	**0.3626**	**0.3443**	

Table 3.7: Percent distribution in subjective measures of economic wellbeing with current economic condition by states and background characteristics, India, LASI-pilot, 2010

Subjective well being	Current economic condition									N
	Living comfortably/doing alright	Just getting by	Finding it difficult or very difficult	Improved	Worsened	Remained same	Below average	Above average	Well off	
State										
Punjab	69.8	24.9	5.4	66.2	13.5	20.3	38.31	51.8	9.9	222
Rajasthan	60.6	28.5	10.9	39.0	35.0	26.0	43.98	46.9	9.1	230
Kerala	52.0	32.4	15.6	35.7	20.9	43.5	35.54	58.3	6.1	260
Karnataka	83.6	5.3	11.1	48.1	22.1	29.8	57.8	35.5	6.7	237
HH head age										
<60	69.4	19.7	11.0	46.5	24.7	28.8	48.4	44.9	6.7	588
60-74	63.9	24.7	11.5	41.3	24.8	33.9	40.8	48.5	10.7	249
75+	66.6	19.9	13.5	42.8	23.8	33.4	44.4	48.7	6.9	89
HH head sex										
Male	67.7	21.5	10.8	44.8	27.6	27.6	48.3	44.6	7.1	744
Female	67.9	18.9	13.2	44.8	13.2	42.0	37.5	52.3	10.2	205
Residence										
Urban	74.2	17.3	8.5	51.2	18.3	30.6	50.0	41.1	8.8	280
Rural	65.1	22.5	12.4	42.4	27.2	30.5	44.5	48.2	7.3	669
Caste										
SC/ST	57.2	28.6	14.3	31.2	35.3	33.5	43.2	47.0	9.9	248
OBC	74.1	16.0	9.9	49.5	20.2	30.3	51.3	43.7	5.0	335
Other	68.9	20.6	10.6	50.7	21.0	28.3	42.2	48.6	9.3	343
Number of elderly in HH										
1	65.2	22.4	12.6	43.1	25.4	31.6	47.7	45.0	7.3	376
2	70.9	18.9	10.2	46.1	24.5	29.3	45.1	47.1	7.9	499
3+	59.2	28.7	12.1	46.1	21.3	32.6	44.0	46.7	9.3	74
HH members										
1-2	70.7	16.8	12.5	33.7	24.5	41.9	45.9	45.8	8.3	158
3-4	67.8	20.0	12.3	49.3	21.7	29.0	47.9	43.8	8.4	315
5-6	65.1	24.2	10.7	47.1	24.1	28.8	45.2	50.8	3.9	267
6+	68.6	21.5	10.0	44.1	29.4	26.5	44.8	44.2	11.0	210
Rooms in HH										
One room	44.2	30.0	25.8	33.1	33.6	33.3	45.9	40.2	13.9	90
2-3 rooms	70.0	19.1	10.9	40.8	29.8	29.5	50.7	43.7	5.7	436
4-5 rooms	71.7	20.5	7.9	51.9	17.2	30.9	43.6	50.1	6.3	307
More than 5 rooms	70.9	21.9	7.2	57.2	11.5	31.4	30.8	54.1	15.1	117
Wealth quintile										
Poorest	46.6	31.0	22.4	22.5	45.4	32.1	39.6	46.1	14.3	131
Poorer	66.7	21.1	12.2	33.4	39.1	27.5	50.3	41.1	8.6	143
Middle	72.2	14.0	13.8	43.6	23.1	33.3	55.2	41.7	3.2	159
Richer	63.3	27.7	9.1	47.5	15.9	36.7	44.9	52.7	2.4	248
Richest	87.0	11.2	1.8	70.3	7.1	22.7	41.5	47.1	11.3	245
Consumption quintile										
Poorest	48.0	33.5	18.5	18.8	47.7	33.5	42.5	44.2	13.3	127
Poorer	55.3	30.0	14.7	36.0	29.8	34.2	41.5	51.7	6.9	182
Middle	64.9	22.8	12.3	44.4	21.7	34.0	41.7	51.3	7.1	182
Richer	78.6	12.6	8.9	44.7	23.4	31.9	50.8	44.2	5.0	208
Richest	82.9	11.8	5.3	69.7	9.0	21.2	51.4	40.7	7.9	227
Total(pooled)	**67.7**	**21.0**	**11.3**	**44.8**	**24.7**	**30.5**	**46.1**	**46.2**	**7.7**	**926**

Note: N – Total unweighted cases, HH – Household.

3.7 Subjective Measures of Economic Well-being

This section describes the economic well-being of the households using the subjective measures. The differentials in subjective well-being are assessed by selected characteristics. Three questions on current economic condition of the household were asked. Table 3.8 shows the results for two of the questions.

First, respondents were asked how they would say their household is managing financially these days? The differentials by consumption quintile showed that a significantly higher proportion of households in the richer and richest quintile reported that they are living comfortably or doing alright compared with the proportion of poorest and poorer households reporting similarly. On the other hand, the proportion of households reporting that they are finding it difficult or very difficult declines with the increased economic status of households. Among those in the poorest consumption quintile, 19 percent reported that they find it difficult or very difficult to manage their households compared with 5 percent in the richest quintile. Similarly, while 48 percent of the households in the poorest consumption quintile reported that they are living comfortably, 83 percent did so in the richest consumption quintile. The pattern in wealth quintile distribution is similar to that of the consumption quintile.

Second, respondents were asked whether their economic condition has remained the same or improved or worsened over two years. A higher proportion of poorest and poorer households reported that their economic condition has worsened compared to richer and richest quintiles. For example, among those in the poorest quintile of the wealth index, 45 percent reported that their economic conditions have worsened compared to 7 percent in the richest wealth quintile. On the other hand, while 23 percent of households among the poorest quintile reported that their economic conditions have improved, 70 percent did so among the richest wealth quintile. Here, too, the same pattern holds for consumption quintiles. However, less pronounced differences were found for household size and number of household members. More rural than urban households reported a deterioration in their economic condition.

Third, respondents were asked how they consider their household compared to other households in the community? On this question, it was difficult to derive inferences because the geographical locations of households matter. It is possible that households have similar economic strata clusters as their neighbors, and therefore the inferences may not be useful.

Table 3.8: Percent distribution of wealth quintile and consumption quintile by selected background characteristics, India, LASI-pilot, 2010

State/background characteristics	Wealth Quintile					Consumption Quintile					Average all
	Poorest	Poorer	Middle	Richer	Richest	Poorest	Poorer	Middle	Richer	Richest	
HH head age											
<60	17.9	22.4	18.0	22.0	19.8	16.3	17.8	20.2	21.9	23.8	100
60-74	16.5	12.4	19.0	26.0	26.1	21.6	21.7	13.8	20.5	22.5	100
75+	16.6	11.7	19.8	24.3	27.6	12.8	20.1	26.0	26.5	14.6	100
HH head sex											
Male	18.0	19.0	17.6	22.5	22.8	17.7	18.9	17.7	22.0	23.7	100
Female	16.9	18.4	19.0	23.8	21.9	17.2	19.2	20.1	21.9	21.7	100
Living arrangement											
living alone	15.0	18.8	19.1	27.1	19.3	24.8	9.8	21.4	18.2	25.7	100
living with spouse only	13.7	24.0	15.6	24.4	22.3	12.3	16.5	17.7	28.6	24.9	100
living with children only	17.8	18.3	25.7	20.7	17.5	18.0	24.4	22.7	19.0	15.9	100
Living with spouse and children	18.1	17.8	17.2	23.3	23.6	17.6	19.1	18.3	21.7	23.3	100
Education											
No schooling	32.6	29.2	19.4	12.9	5.9	26.9	21.6	20.0	19.0	11.6	100
primary/middle	5.0	12.1	19.7	35.3	28.0	9.1	20.9	19.2	24.6	26.3	100
High school & above	0	3.03	13.6	28.6	54.8	7.3	9.2	14.1	25.0	44.4	100
Caste											
SC/ST	48.1	25.0	12.0	9.7	5.2	27.7	23.9	20.5	19.1	8.8	100
OBC	6.7	19.1	23.8	29.4	21.0	15.0	16.4	19.4	24.5	24.8	100
Other	5.4	11.2	17.4	25.5	40.6	10.4	17.4	16.9	22.7	32.6	100
No. of children											
1	14.2	15.4	17.2	30.6	22.6	11.1	14.5	22.8	25.3	26.3	100
2 to 3	12.3	15.5	18.3	26.4	27.4	11.7	17.2	19.9	22.5	28.7	100
3+	25.8	23.0	19.1	16.3	15.8	26.2	24.7	15.5	21.0	12.7	100
Household size											
1-2	15.0	19.6	16.9	30.0	18.5	16.5	12.4	17.6	26.5	27.0	100
3-4	10.2	17.2	17.9	27.1	27.6	11.2	17.1	17.6	27.4	26.7	100
5-6	18.6	17.0	16.7	23.4	24.4	16.0	22.0	20.2	19.0	22.9	100
6+	26.1	21.8	21.9	14.8	15.4	27.2	21.8	20.5	16.0	14.6	100
Total	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**100**
N (Individual)	**229**	**267**	**289**	**439**	**458**	**257**	**332**	**327**	**364**	**402**	**1682**

Note: N – Total unweighted cases, HH – Household.

FAMILY AND SOCIAL NETWORKS OF OLDER POPULATION

4

4.1 Introduction

Family is the most-cherished institution in India and the most important non-formal social security for the older population. Most of the older persons in India live with their families, and it is the most preferred living arrangement of older persons. Family background shapes the health and economic outcomes throughout life. Families continue to be the central organizing unit for economic support and for providing care for those physically unable to care for themselves. In the absence of institutions that provide social insurance, India's older populations are forced to rely on their families and social networks. Social networks are an important resource in older people's lives as these networks improve the elders' psychological well-being. Traditionally family has been the key institution that provided psychological, social, and economic support to the older adults. However, the structures of the family, intergenerational relationships, and the role of women in the family are changing, affecting the care and welfare of older people. In many instances, families are unable to meet the needs of the aged, thereby creating a need to look for other support services. India's National Policy on Older Persons (1999) reiterates that programs will be developed to promote family values and sensitize the young on the necessity and desirability of intergenerational bonding and continuity. It is important that the family support system continues to be functional and that the ability of the family to discharge its caring responsibilities is strengthened.

4.2 Socio-Demographic Characteristics

Given the importance of family and social relationships in the Indian society, particularly in caring for and supporting older persons, the LASI pilot survey gathered information on socio-demographic profile of the households and individual respondents. This section provides the distribution of households and individual characteristics—namely, age, sex, marital status, education, religion, caste, literacy, wealth status, residence, and living arrangement. Table 4.1 presents the percent distribution of respondents with these background characteristics. Nearly three-fourths of the sample respondents are from rural areas. About 57 percent of the respondents are females. The marital status of the elderly assumes a special significance in the context of care in old age, as it is believed that married persons fare better in all economic and social aspects as compared to persons who are single. There is an association between family status and well-being. Loving and happy marriages have been found to be more effective for motivating regular medical check-ups and attention to health related behavior (Berkman, 1995; Umberson, 1987).

Table 4.1: Percent distribution of older persons by states and background characteristics, India, LASI-pilot, 2010

States/background characteristics	Punjab	Rajasthan	Kerala	Karnataka	All four states	N
Age						
<60	65.2	61.1	57.5	75.3	65.6	1084
60-74	25.6	28.8	31.5	21.0	26.4	453
75+	9.2	10.1	11.0	3.7	8.1	144
Sex						
Male	47.7	45.9	40.4	41.0	43.3	734
Female	52.3	54.1	59.6	59.0	56.8	949
Marital status						
Currently married	83.0	83.2	77.9	78.6	80.5	1,356
Never married/separated/divorced	0.8	2.4	4.7	3.0	2.9	47
Widowed/widower	16.3	14.4	17.4	18.4	16.7	280
Residence						
Urban	29.9	20.2	23.8	34.4	27.0	472
Rural	70.1	79.8	76.2	65.6	73.0	1211
Living arrangement						
Living alone	2.8	4.3	10.2	4.2	5.4	93
Living with spouse only	12.6	8.2	14.1	13.2	11.8	203
Living with children only	16.3	13.2	13.3	17.6	15.1	253
Living with spouse & children	68.4	74.3	62.4	64.9	67.7	1,134
Literacy						
Literate	40.1	20.9	88.7	52.1	49.1	866
Illiterate	59.9	79.1	11.4	47.9	50.9	816
Educational status						
No schooling	58.8	78.4	7.2	43.5	48.2	771
Primary/middle	28.0	13.1	58.5	37.8	33.5	586
High school & above	13.2	8.6	34.4	18.7	18.4	325
Religion						
Hindu	34.2	83.9	71.1	87.9	76.1	1,167
Muslim	0.0	15.6	4.5	8.4	8.7	121
Christian	0.8	0.0	24.4	2.5	6.5	122
Sikh	56.8	0.2	0.0	0.0	7.2	230
Other	8.3	0.2	0.0	1.2	1.5	39
Caste						
SC/ST	30.3	43.1	7.2	25.7	27.6	429
OBC	12.6	30.0	45.3	60.6	41.5	611
Other	57.1	26.9	47.6	13.7	30.9	595
Wealth quintile						
Poorest	1.5	43.6	0.2	10.4	17.4	229
Poorer	11.4	23.8	2.6	27.4	18.7	267
Middle	14.5	15.1	12.6	26.9	18.4	289
Richer	27.5	9.2	46.0	19.5	23.5	439
Richest	45.1	8.3	38.6	15.8	22.3	458
Total (pooled)	**100**	**100**	**100**	**100**	**100**	**1683**

Marriage is associated with higher economic situation, less instances of reported depression, and health advantages. The health and retirement study (HRS) found that marital disruption results in substantial loss of both income and assets (NIA, 2007). A comparison of married and unmarried participants of all ages found that married women were less likely than their unmarried counterparts to report symptoms of depression and that the mental health benefits of marriage were even greater for men than for women (Earle *et. al*, 1998). More than three-fourths (81 percent) of the respondents in LASI survey were currently married and 17 percent were widowed at the time of the survey.

There is a growing concern about the increasing proportion of widows among older persons. The two main reasons for the significant gender disparity in widowhood are the longer life span of women compared to men and the general tendency in India for women to marry men older than themselves. It is also true that widowed men are much more likely to remarry than widowed women. The loss of one's spouse is a major concern in old age and those persons require adequate social safety nets, irrespective of gender. The death of a spouse often causes deprivation of the primary provider of social and emotional support, leading to social isolation. Widowed elderly experience lower morale and a higher incidence of mental problems compared with married older persons (Greene and Sheila, 1989).

An almost equal number of literates and illiterates were in our sample. Nearly half of respondents have no formal education and only 18 percent have their educational attainment more than high school level. Three-fourths of the respondents are Hindus. Muslims, Christians and Sikhs (mainly from Punjab), and each constitutes less than 10 percent. Nearly one-third of respondents (28 percent) belong to a SC/ST category, 42 percent are from other backward classes (OBC), and the remaining belong to other categories.

The living arrangement is an important component of the analysis of the welfare of the elderly. Since the elderly are less able to remain independent, they need the care and support of others in several aspects. In other words, the care and support enjoyed by the older persons are linked to the place of their residence. Some 68 percent of sample respondents are living with spouse and children, 15 percent living with children only, 12 percent with spouse only, and . only 5 percent are living alone. However, with large numbers of women surviving their spouses as compared to men, increasing the dependency of women on men for economic means and social support, the economic vulnerability of women is much higher in the Indian context. The economic status of the households is categorized into five wealth quintiles. The lowest quintile constitutes the poorest households and highest quintile represents the richest households. The sample respondents are almost equally distributed among the five wealth quintiles.

4.3 Social Activities

The LASI pilot survey enquired about the social activities of the respondents. The social activities included going to the cinema, eating out of the house, going to the park/beach, playing cards or games, visiting relatives/friends, attending cultural performances/shows, and attending religious functions /events (outside home). The percent distributions of the elderly engaged in any of the social activities mentioned above according to background characteristics are presented in Table 4.2.

Table 4.2: Percent distribution of social activities of older population by states and background characteristics India, LASI-pilot, 2010

States/background characteristics	Quite often[1]	Rarely[2]	N
State			
Punjab	78.4	21.6	381
Rajasthan	14.6	85.4	375
Kerala	59.7	40.3	427
Karnataka	55.4	44.6	392
Age			
<60	47.5	52.5	1058
60-74	47.8	52.2	412
75+	38.2	61.8	104
Sex			
Male	47.7	52.3	695
Female	46.5	53.5	880
Marital status			
Currently married	47.3	52.7	1,291
Never married/separated/divorced	52.7	47.4	39
Widowed/widower	44.8	55.2	245
Residence			
Urban	50.1	49.9	459
Rural	45.8	54.2	1119
Education			
No schooling	34.2	65.8	698
Primary/middle	55.0	45.0	559
High school & above	63.8	36.2	318
Religion			
Hindu	42.0	58.0	1,090
Muslim	35.5	64.5	108
Christian	72.2	27.8	116
Sikh	86.7	13.3	219
Other	62.6	37.4	38
Wealth quintile			
Poorest	17.0	83.0	210
Poorer	39.1	60.9	243
Middle	47.2	52.9	262
Richer	58.1	41.9	418
Richest	64.3	35.7	441
Total (pooled)	**47.0**	**53.0**	**100.0**
N	**825**	**750**	**1575**

Note: [1] Those who involved in social activities twice a month, or once a month or every few months are considered as quite often

[2] Those who reported as involved in social activities about once or twice a year, or less than a year are considered as rarely

N – Total unweighted cases

Among the states, 78 percent of the elderly in Punjab engaged in social activities quite often, followed by Kerala (60 percent) and Karnataka (55 percent). However, in Rajasthan, the frequency of these activities is relatively low (15 percent). Rajasthan is generally considered to be one of the most traditional and conservative societies among Indian states. Half of the elderly among the age group 60-74 years are engaged in social activities quite often, as compared to 38 percent among those in the age group 75 years and above. The participation in social activities is slightly higher in urban areas than in rural areas. However, there are no considerable gender differentials with regard to involvement in social activities/events. It seems that never married/separated/divorced elderly are more likely to engage in social activities quite

often (53 percent) than others. The education of respondents had a strong association with their engagement in social activities. Among those having no schooling, the active involvement is only 34 percent. Then it increases to 64 percent among the respondents having education of more than high school level. According to religious affiliation, elderly Sikhs show the most involvement in social activities, followed by Christians. As expected, those belonging to higher economic categories are more inclined towards social activities. Among the respondents coming under richest wealth quintile, 64 percent of them are quite often involved in social activities, compared with only 17 percent among the people from poorest wealth quintile.

The elderly are usually involved in or participate in some social organizations, clubs, or societies. The LASI pilot survey collected the information from the elderly about the membership in social organizations like farmers' associations/environmental groups/political parties/senior citizen's clubs, tenant groups, neighborhood watches, community/caste organizations, NGOs, co-operatives, *mahila*mandals (women's groups), social clubs, sport clubs, exercise classes, etc. Table 4.3 provides information regarding the membership in various organizations/societies. Among the states, Kerala has the highest participation level, with about 17 percent of respondents having membership in one organization only and 4 percent in more than one, followed by Karnataka with about 16 percent in one organization only and about 1 percent in more than one. However in Punjab and Rajasthan, any older person's membership in organizations is almost absent. Urban residents are more likely to get involved in organizations (12 percent) as compared to their rural counterparts (10 percent).

With an increase in educational level, the membership and involvement in more than one organization/association increases. The same is true with regard to the economic status of the respondents or their households. Those belonging to higher wealth quintile households are more likely to have membership in one or more organizations than those belonging to lower wealth quintile households.

Table 4.3: Percent distribution of membership of older persons in any organization by states and background characteristics, India, LASI-pilot, 2010

States/background characteristics	Involved in one organization only	Involved in more than one organization	Not involved in any organization	N
State				
Punjab	1.2	0.3	98.5	402
Rajasthan	0.7	0.0	99.3	417
Kerala	16.7	4.4	78.9	432
Karnataka	15.5	0.8	83.8	402
Age				
<60	87.1	11.8	1.2	1117
60-74	92.8	5.6	1.6	433
75+	98.1	1.2	0.7	131
Sex				
Male	6.6	1.8	91.6	728
Female	11.4	0.9	87.8	955
Marital status				
Currently married	88.8	9.7	1.5	1,356
Never married/separated/divorced	90.9	7.7	1.4	47
Widowed/widower	92.1	7.9	0.0	280
Residence				
Urban	10.7	1.1	88.2	472
Rural	8.8	1.3	89.9	1211
Education				
No schooling	96.9	3.1	0.0	771
Primary/middle	84.0	14.1	2.0	586
High school & above	79.7	16.9	3.4	325
Religion				
Hindu	10.5	1.3	88.2	1,167
Muslim	4.0	0.0	96.1	121
Christian	13.7	3.7	82.6	122
Sikh	2.1	0.4	97.4	230
Other	0.0	0.0	100.0	39
Wealth quintile				
Poorest	2.8	0.0	97.1	229
Poorer	5.9	0.4	93.7	267
Middle	10.4	0.3	89.3	289
Richer	14.5	1.3	84.2	439
Richest	10.9	3.8	85.3	458
Total (pooled)	**9.3**	**1.3**	**89.4**	**100.0**
N	**147**	**24**	**1,512**	**1683**

4.4 Financial Support Given to or Received from Family and Friends

LASI asked questions about household financial help given to or received from family members and friends. Financial help includes giving money, helping pay bills, covering the cost of medical care or insurance, schooling, marriages, religious events, rent for housing, etc.

Table 4.4 presents the financial help received by the elderly according to background characteristics, although only a small proportion reported having received financial help during the past 12 months (Only 91 older adults out of 1683 received financial help).

Table 4.4: Median value of financial help (in Indian rupees) received annually by the respondents by states and background characteristics, India, LASI–pilot, 2010

States/background characteristics	Spouse/ partner	Son/daughter/son-in-law/daughter-in-law/grand child	Parent/parent-in-law	Other relatives/friends	Median value	N
State						
Punjab	15000	20000	28000	4500	20000	30
Rajasthan	2000	NA	NA	NA	2000	1
Kerala	250	15000	15000	35000	15000	47
Karnataka	NA	10000	25000	7500	10000	13
Age						
<60	12000	10000	20000	10000	12000	57
60-74	NA	18000	5000	NA	18000	29
75+	250	2000	NA	NA	2000	5
Sex						
Male	22,000	20,000	15,000	35,000	20,000	47
Female	9,000	10,000	20,000	7,500	10,000	44
Marital status						
Currently married	9000	18000	15000	10000	15000	79
Never married/separated/divorced	NA	1000	NA	NA	1000	1
Widowed/widower	NA	10000	26000	NA	10000	11
Residence						
Urban	36,000	10,000	7,500	2,000	10,000	24
Rural	9,000	15,000	20,000	10,000	15,000	67
Living arrangement						
Living alone	NA	110,000	NA	NA	110,000	2
Living with spouse only	250	20,000	NA	NA	18,000	13
Living with children only	96,000	9,000	26,000	NA	10,000	13
Living with spouse & children	9,000	10,000	15,000	10,000	10,000	63
Education						
No schooling	2000	10000	26000	5000	6000	13
Primary/middle	12000	16000	25000	10000	16000	59
High school & above	22500	20000	15000	35000	20000	19
Wealth quintile						
Poorest	NA	NA	NA	5,000	5,000	2
Poorer	NA	10,000	20,000	NA	10,000	4
Middle	2,000	14,000	25,000	2,000	14,000	8
Richer	5,000	18,000	15,000	35,000	16,000	38
Richest	22,000	10,000	15,000	25,000	15,000	39
Total(pooled)	**9,000**	**15,000**	**20,000**	**10,000**	**15,000**	**91**

Note: Financial help includes giving money, helping pay bills, covering the cost of medical care or insurance, Schooling, marriages, religious events, rent for housing, etc.
NA – Not available
One US dollar is equivalent to about 45 Indian Rupees.

The median value of financial help received by male respondents was rupees 20,000 and for female respondents, it was rupees 10,000 in the last year. Those living alone received more money compared with those living with a spouse and children. The median value of financial help was much higher in rural areas (rupees 15,000) compared with urban areas (rupees 10,000). According to this survey, the support came from various sources. The median value of help received annually was highest (rupees 20,000) from parent and parent-in-law. A lesser amount was received from son or daughter (including son-in-law/daughter-in-law) as

compared to parent and parent-in-law. The median value of financial help received from the spouse was rupees 9,000.

The median value of financial help provided to others by the elderly was also collected in the survey (Table 4.5, 117 persons said they provided financial help to others while all others did not.) respondents reported as providing financial help to others during the last one year.

Table 4.5: Median value of financial help (in Indian rupees) given annually by the respondents by states and background characteristics, India, LASI-pilot, 2010

States/Background characteristics	Spouse/ partner	Son/daughter/son-in-law/daughter-in-law/grand child	Parent/parent-in-law	Other relatives/ friends	Median value	N
State						
Punjab	5000	4000	5000	10000	5000	67
Rajasthan	NA	750	NA	NA	750	2
Kerala	2500	15000	3000	5000	5000	38
Karnataka	NA	1500	3000	9000	3000	10
Age						
<60	5000	3500	3000	5000	4000	77
60-74	NA	8000	5000	15000	8000	36
75+	2500	0	NA	2500	1500	4
Sex						
Male	2,500	6,000	5,000	10,000	6,000	77
Female	5,000	2,500	2,500	4,000	3,000	40
Marital status						
Currently married	5000	4500	3000	6000	5000	105
Never married/separated/divorced	NA	1500	NA	4000	1500	2
Widowed/widower	NA	6000	NA	3000	3000	10
Residence						
Urban	2,500	4,000	5,000	19,000	4,500	45
Rural	5,000	4,000	3,000	5,000	4,500	72
Living arrangement						
Living alone	NA	8,000	NA	4,000	4,000	3
Living with spouse only	2,500	5,000	10,000	6,000	5,000	14
Living with children only	NA	1,500	0	NA	1,500	10
Living with spouse & children	5,000	4,000	3,000	10,000	4,500	90
Education						
No schooling	5000	1500	5000	NA	2000	33
Primary/middle	2500	6000	5000	3000	5000	40
High school & above	NA	6000	2500	15000	5000	44
Wealth quintile						
Poorest	NA	750	NA	NA	750	2
Poorer	NA	1,500	NA	NA	1,500	9
Middle	NA	8,000	2,500	30,000	6,000	14
Richer	2,500	5,000	3,000	15,000	5,000	32
Richest	5,000	5,000	5,000	4,000	5,000	60
Total(pooled)	**5,000**	**4,000**	**3,000**	**5,000**	**4,500**	**117**

Note: Financial help includes giving money, helping pay bills, covering the cost of medical care or insurance, Schooling, marriages, religious events, rent for housing, etc.
NA – Not available
One US dollar is equivalent to about 45 Indian Rupees.

The median value of help given by the male respondents was double that of the female respondents. The median value of financial help was the same among rural and urban residents (rupees 4,500). With an increase in the levels of education, the median value of money given to others also increased. The median value of assistance given to a spouse/partner and friends and other relatives was rupees 5,000 followed by son/daughter (including son-in-law/daughter-in-law) (rupees 4, 000). The median financial support extended to parents/parents-in-law was rupees 3, 000 annually.

4.5 Relationship with Spouse/Partner

Many researchers see a link between advancing age and decreased subjective well-being because of the social, physical, and psychological losses that accompany the transition into old age.

Major life events experienced in the ageing process have profound impacts on the life satisfaction of the elderly. According to George *et. al.* (1985), the relationship between age and subjective well-being is weak and varies in direction across studies. A negative relationship between happiness and age was demonstrated by survey results in the 1950s and 1960s, but no relationship at all emerged in surveys conducted during 1970s (Campbell, 1981). By examining major life events in the ageing process such as retirement, deterioration of health, and loss of spouse, Chen (2001) found that life satisfaction among the elderly decreased as age increased beyond 65 years.

Satisfaction in life depends upon relationships and interactions with others. So the relationship with one's spouse/ partner is an important factor within a family. A set of questions were included in the survey to measure the extent of satisfaction with life and current situation. One question was about the respondent's relationship with his or her spouse. The responses were categorized into three groups: completely/very satisfied, somewhat satisfied, and not satisfied (Table 4.6). Males were slightly more likely to be completely and very satisfied on the relationship with spouse than females. There were not many differences observed within the relationship with the respondent's spouse or partner according to his or her place of residence (that is, urban versus rural). Those living with spouse and children reported highest level of satisfaction (87 percent). People belonging to higher wealth quintile households also showed higher levels of satisfaction on their relationship with spouse. Overall, 82 percent are well satisfied on their relationship with spouse and only 8 percent stated as 'not satisfied'—with the highest percentage of 'not satisfied' among the age group 60-74 years.

Table 4.6: Percent distribution of respondent's perception on relationship with Spouse/partner by states and background Characteristics, India, LASI-pilot, 2010

States/background characteristics	Completely/very satisfied[1]	Somewhat satisfied	Not satisfied[2]	N
State				
Punjab	91.8	3.3	5.0	367
Rajasthan	86.8	7.0	6.2	373
Kerala	91.9	4.0	4.07	397
Karnataka	68.3	19.9	11.9	387
Age				
<60	81.7	10.9	7.3	1035
60-74	82.7	8.3	9.1	383
75+	82.2	13.2	4.5	105
Sex				
Male	85.3	9.0	5.7	682
Female	79.4	11.6	9.1	842
Residence				
Urban	81.7	10.5	7.8	423
Rural	82.1	10.4	7.5	1,101
Living arrangement				
Living alone	55.4	16.5	28.1	52
Living with spouse only	83.0	8.6	8.5	197
Living with children only	59.7	19.2	21.1	176
Living with spouse & children	86.7	9.1	4.3	1099
Education				
No schooling	77.8	13.1	9.1	688
Primary/middle	83.9	8.1	7.9	534
High school & above	89.0	8.0	3.0	302
Wealth quintile				
Poorest	76.9	11.6	11.5	206
Poorer	70.2	19.1	10.7	240
Middle	82.2	11.8	6.1	266
Richer	86.4	6.9	6.8	390
Richest	91.0	4.9	4.1	422
Total(pooled)	**82.0**	**10.4**	**7.6**	**100.0**
N	**1,289**	**132**	**103**	**1,524**

Note: [1] Those who reported as 'completely satisfied' and 'very satisfied' are included in this category

[2] Those who reported as 'not very satisfied' and 'not at all satisfied' are included in this category

N – Total unweighted cases

The LASI pilot also sought to determine how satisfied the elderly were with their health conditions. There is not much difference in this assessment between males and females and in rural and urban areas. The majority (56 percent) are completely/very satisfied with their health condition, 28 percent were 'somewhat satisfied,' and only 16 percent were 'not satisfied' (Table 4.7).

Table 4.7: Percent distribution of respondent's perception about their health condition by states and background Characteristics, India, LASI-pilot, 2010

States/background characteristics	Completely satisfied/very satisfied[1]	Somewhat satisfied	Not satisfied[2]	N
State				
Punjab	71.7	19.8	8.5	377
Rajasthan	60.4	27.0	12.6	412
Kerala	39.5	32.1	28.4	446
Karnataka	56.0	29.4	14.7	388
Age				
<60	60.1	26.3	13.6	1062
60-74	47.7	30.6	21.7	438
75+	41.7	35.7	22.7	122
Sex				
Male	57.1	27.3	15.6	706
Female	54.5	28.7	16.9	917
Residence				
Urban	59.5	25.1	15.4	451
Rural	54.2	29.2	16.7	1172
Living arrangement				
Living alone	41.0	27.6	31.5	85
Living with spouse only	49.6	28.3	22.1	197
Living with children only	45.2	33.1	21.7	240
Living with spouse & children	60.0	27.0	13.0	1,101
Education				
No schooling	57.6	28.9	13.5	738
Primary/middle	48.5	29.2	22.3	568
High school & above	63.2	24.0	12.8	317
Wealth quintile				
Poorest	55.7	30.22	14.1	225
Poorer	50.2	30.01	19.8	254
Middle	61.5	27.3	11.3	280
Richer	51.3	27.79	20.9	420
Richest	59.4	25.72	14.9	443
Total(pooled)	55.6	28.06	16.3	100.0
N	**913**	**443**	**267**	**1,623**

Note: [1] Those who reported as 'completely satisfied' and 'very satisfied' are included in this category
[2] Those who reported as 'not very satisfied' and 'not at all satisfied' are included in this category

Regarding what they think about their 'life as a whole these days?', 57 percent reported that they are completely or very much satisfied, 31 percent feel 'somewhat satisfied,' and only 11 percent feel 'not satisfied' (Table 4.8).

Table 4.8: Percent distribution of respondent's perception on their life as a whole by states and background Characteristics, India, LASI-pilot, 2010

States/background characteristics	Completely satisfied/very satisfied[1]	Somewhat satisfied	Not satisfied[2]	N
State				
Punjab	71.9	21.8	6.4	377
Rajasthan	58.0	31.8	10.2	410
Kerala	55.8	34.9	9.4	444
Karnataka	52.2	32.1	15.7	387
Age				
<60	58.5	30.8	10.7	1061
60-74	55.8	30.9	13.3	434
75+	51.1	38.4	10.5	122
Sex				
Male	57.1	31.7	11.2	708
Female	57.4	31.1	11.5	910
Residence				
Urban	56.6	32.3	11.2	449
Rural	57.5	31.0	11.5	1169
Living arrangement				
Living alone	47.3	29.4	23.3	82
Living with spouse only	53.5	32.4	14.2	195
Living with children only	48.4	36.8	14.8	240
Living with spouse & children	60.6	30.1	9.3	1,101
Education				
No schooling	55.3	31.7	13.0	734
Primary/middle	54.3	33.8	11.9	568
High school & above	67.7	26.0	6.4	316
Wealth quintile				
Poorest	49.1	35.4	15.5	225
Poorer	50.7	31.9	17.4	252
Middle	58.5	31.9	9.6	280
Richer	54.0	35.0	10.9	419
Richest	71.3	23.5	5.1	441
Total(pooled)	57.3	31.4	11.4	100.0
N	**956**	**493**	**169**	**1,618**

Note: [1] Those who reported as 'completely satisfied' and 'very satisfied' are included in this category
[2] Those who reported as 'not very satisfied' and 'not at all satisfied' are included in this category

Loneliness is one of the disturbing problems experienced by the elderly and has negative implications for individuals and society. Loneliness is related to many health problems and depression (Prince, 1997; Creecy, 1985). According to one study (Holmen, 1999), nearly 40 percent of the aged suffers from loneliness or social isolation, and this is even more prevalent among women. The respondents were asked a question "How often do you feel lonely?" About

8 percent reported as 'often' and 28 percent as 'some of the time'. Feeling lonely is slightly higher among females and also those who are widowed (Table 4.9).

Table 4.9: Percent distribution of elderly who felt lonely by states and background Characteristics, India, LASI-pilot, 2010

States/background characteristics	Hardly ever or never	Some of the time	Often	N
State				
Punjab	51.1	39.8	9.1	375
Rajasthan	61.3	28.6	10.0	389
Kerala	72.6	24.1	3.3	445
Karnataka	67.4	24.9	7.7	378
Age				
<60	67.0	26.5	6.5	1035
60-74	60.4	29.9	9.7	428
75+	59.5	31.1	9.4	123
Sex				
Male	67.1	26.3	6.7	687
Female	62.9	28.9	8.2	900
Marital status				
Currently married	69.1	24.7	6.2	1,285
Never married/separated/divorced	53.4	34.8	11.8	41
Widowed/widower	45.0	41.6	13.4	261
Residence				
Urban	63.5	29.1	7.4	442
Rural	65.1	27.3	7.6	1145
Living arrangement				
Living alone	52.2	35.8	12.0	83
Living with spouse only	63.5	26.6	9.9	191
Living with children only	41.7	44.4	14.0	238
Living with spouse & children	70.9	23.7	5.4	1,075
Education				
No schooling	60.7	29.4	9.9	716
Primary/middle	66	27.9	6.1	561
High school & above	72.6	23.2	4.2	310
Wealth quintile				
Poorest	59.0	31.4	9.6	217
Poorer	64.3	24.9	10.8	246
Middle	63.7	28.1	8.2	275
Richer	65.6	29.4	5.0	415
Richest	69.2	25.3	5.5	433
Total(pooled)	**64.7**	**27.8**	**7.6**	**100.0**
N	**1008**	**461**	**118**	**1,587**

4.6 Ill-Treatment of Elderly within the Family

Elder abuse and neglect are increasingly acknowledged as social problems internationally, and India is no exception. The responsibility of caring of elderly in India is traditionally borne by the immediate family and most often by sons. However, with a changing trend toward the nuclear family set-up, the vulnerability of the elderly is considerably increasing.

Table 4.10: Percent distribution of elderly who felt ill-treated within the family by States and background characteristics, India, LASI-pilot, 2010

States/background characteristics	Hardly ever or never	Some of the time	Often	N
State				
Punjab	77.1	19.7	3.2	375
Rajasthan	65.7	23.4	10.9	360
Kerala	81.5	16.8	1.6	446
Karnataka	74.3	17.4	8.3	373
Age				
<60	75.7	18.1	6.2	1026
60-74	68.6	22.9	8.6	413
75+	75.0	18.7	6.4	114
Sex				
Male	73.6	19.0	7.4	674
Female	74.0	19.6	6.4	880
Marital status				
Currently married	75.7	18.5	5.8	1258
Never married/separated/divorced	64.3	18.2	17.5	41
Widowed/widower	66.3	23.8	10.0	255
Residence				
Urban	75.3	19.2	5.5	441
Rural	73.3	19.4	7.3	1113
Education				
No schooling	68.1	23.7	8.2	685
Primary/middle	76.8	16.1	7.1	559
High school & above	82.3	14.6	3.1	310
Wealth quintile				
Poorest	64.4	24.1	11.5	201
Poorer	67.2	20.4	12.4	236
Middle	71.8	21.7	6.6	265
Richer	77.6	19.8	2.6	417
Richest	83.5	12.8	3.7	434
Total(pooled)	**73.8**	**19.3**	**6.8**	**100.0**
N	**1164**	**300**	**90**	**1554**

The elderly expect more time and too much support from the younger family members, but most often it is not received (Sebastian and Sekher, 2011). As a result, there may be friction within the family that often results in abuse and neglect of the elderly. Even though there is a general perception about the mistreatment perpetrated on older adults, the exact magnitude and nature of abuse is still unknown in India. A recent study (Sebastian and Sekher, 2010) observed that female elderly, especially widows, those in oldest-old age group (80+ years), and physically immobile, are more vulnerable to abuse than others. This susceptibility affects not only the poor

but also the rich. Chokkanathan and Lee (2006) found that the prevalence of mistreatment was 14 percent among older adults in an urban setting in India. The mistreatment of elderly persons is multi-dimensional and multi-layered, emerging from differences in gender, economic position, and physical condition. The general perception that the families are the safest place for the aged in India has been questioned by micro-level studies in recent years.

The LASI pilot also asked, “How often do you feel ill-treated within your family?” About 7 percent stated as ‘often,’ and 19 percent responded as ‘some of the time,’ and about 74 percent stated as ‘hardly ever or never’ (Table 4.10). However, no significant difference was observed between males and females or between rural and urban areas. Those reported as often ill-treated were more likely to be among lower income groups and to be among the less educated.

The findings of this survey are in tune with the earlier studies, reiterating the increasing incidences of mistreatment on elderly within the family.

4.7 Communication with Friends

If the respondent reported having friends, he or she was asked, “On an average, how often do you do each of the following (meet up, speak on phone) with any of your friends?” This section describes how often the older respondents maintain the close relationships with their friends through meeting or speaking over the phone with them. The responses given were grouped into three categories: frequently, sometimes, and rarely (Table 4.11). Nearly 85 percent of the elderly reported meeting up with a friend frequently. Only 7 percent responded as ‘rarely.’ Meeting with a friend frequently is relatively less among urban residents and among females. Nearly half of the older respondents (47 percent) talk with their friends over the phone frequently. Among the older population, speaking over the phone is not as frequent as meeting friends. Half of the males and 42 percent of the females speak with their friends frequently. Speaking frequently over the phone is more prevalent among higher economic groups and those with better educations. For those in the richest wealth quintile, it is 60 percent whereas for those in poorest quintile, it is only 21 percent.

Table 4.11: Percent distribution of respondents regarding meeting up and speaking over phone to Friends by states and background characteristics, India, LASI-pilot, 2010

States/background characteristics	Meeting with friends			Speaking over phone with friends		
	Frequently[1]	**Sometimes[2]**	**Rarely[3]**	**Frequently[1]**	**Sometimes[2]**	**Rarely[3]**
State						
Punjab	94.9	2.5	2.5	57.4	35.3	7.3
Rajasthan	93.7	4.7	1.6	44.5	36.7	18.8
Kerala	88.7	8.9	2.5	63.8	27.3	8.9
Karnataka	73.3	11.0	15.7	31.1	51.9	17.0
Age						
<60	85.0	8.2	6.8	45.3	41.1	13.6
60-74	85.0	7.7	7.2	50.5	36.3	13.3
75+	93.3	3.3	3.3	54.1	34.2	11.7
Sex						
Male	87.9	7.2	4.9	49.8	35.8	14.4
Female	82.2	8.8	9.0	42.4	45.5	12.2
Marital status						
Currently married	85.7	8.2	6.2	48.1	38.8	13.0
Never married/separated/divorced	81.0	6.9	12.1	52.5	24.3	23.2
Widowed/widower	84.0	6.5	9.5	33.3	51.3	15.5
Residence						
Urban	82.4	8.5	9.1	44.9	48.7	6.4
Rural	86.5	7.7	5.8	48.0	33.9	18.1
Living arrangement						
Living alone	87.8	1.6	10.6	50.9	39.8	9.3
Living with spouse only	78.1	11.5	10.4	41.5	45.4	13.1
Living with children only	82.9	8.4	8.7	35.2	48.5	16.4
Living with spouse & children	87.1	7.5	5.4	49.2	37.4	13.4
Education						
No schooling	89.2	4.0	6.8	34.3	44.6	21.1
Primary/middle	83.7	8.1	8.2	39.4	44.1	16.5
High school & above	83.2	12.3	4.5	62.1	32.2	5.7
Wealth quintile						
Poorest	89.4	6.9	3.7	20.6	29.5	49.9
Poorer	80.8	6.3	12.9	23.6	63.7	12.7
Middle	86.9	6.7	6.5	33.0	45.2	21.9
Richer	88.7	5.1	6.2	47.8	36.6	15.6
Richest	82.1	12.6	5.4	59.8	35.1	5.2
Total (pooled)	**85.34**	**7.91**	**6.8**	**46.8**	**39.77**	**13.46**
N	**636**	**54**	**40**	**205**	**153**	**49**

Note: [1] Frequently - Includes 'daily', 'three or more times a week' and 'once or twice a week'
[2] Sometimes - Includes 'once or twice a month' and 'every few months'
[3] Rarely - Includes 'once or twice a year' and 'less than once a year'

4.8 Perception about Life Achievement

Major life events experienced by an individual in the process of ageing may have profound impact on one's life satisfaction. It is also argued that there is a link between advancing age and decreased subjective well-being because of the social, physical, and psychological losses that accompany a person's transition to old age. The 'empty nest' feeling

may arise owing to children moving away from home, making the elderly feel more lonely. Above all, the loss of one's spouse in old age would deprive the elderly of a longstanding emotional bond that provided a certain level of security. In general, it was felt that taking all of these factors into consideration, the elderly living with spouse and children could achieve better emotional adjustment than those living alone or widowed. In this context, it is relevant to know the mediating effect of family and social networks on the relationship between ageing and psychological well-being. Though both older men and women face these problems, the financial dependence and decreased physical strength magnifies the difficulties of women. In other words, aged men experience less alienation than aged women. According to Kant (1996), there are significant differences between males and females regarding life satisfaction, with females experiencing lower satisfaction than males.

The LASI pilot survey asked five questions to find out the extent of satisfaction in achievement in life of individuals. The questions were: "In most ways my life is close to ideal," "The conditions of my life are excellent," "I am satisfied with my life," "So far, I have gotten the important things I want in life," "If I could live my life, I would change almost nothing." The value ranges from 1 for strongly disagree to 7 for strongly agree. These values have been converted into composite scores with a range of 0-100 (Table 4.12).

Table 4.12: Percent distribution of respondents with life achievement by States and background characteristics, India, LASI-pilot, 2010

States/background characteristics	Low Satisfaction	Medium Satisfaction	High Satisfaction	Total	N
State					
Punjab	12.4	31.4	56.1	100	376
Rajasthan	22.0	28.0	50.0	100	273
Kerala	20.6	34.9	44.5	100	423
Karnataka	25.9	28.7	45.5	100	383
Age					
<60	21.6	29.6	48.8	100	973
60-74	23.5	32.6	43.9	100	379
75+	17.3	30.9	51.8	100	102
Sex					
Male	24.1	27.5	48.5	100	639
Female	20.1	32.6	47.3	100	816
Marital Status					
Currently married	21.8	28.7	49.5	100	1,185
Never married/separated/divorced	44.9	24.2	30.8	100	36
Widowed/widower	18.1	49.8	42.1	100	234
Residence					
Urban	21.1	27.6	51.3	100	429
Rural	22.1	31.5	46.4	100	1,026
Living arrangement					
Living alone	25	34.1	40.9	100	74
Living with spouse only	17.8	29.1	53.1	100	179
Living with children	23.7	37.0	39.4	100	214
Living with spouse & children	21.9	28.9	49.2	100	988
Education					
No schooling	23.5	32.7	43.8	100	612
Primary/middle	18.9	30.9	50.2	100	538
High school & above	23.2	24.5	52.2	100	305
Religion					
Hindu	23.2	32.4	44.4	100	976
Muslim	25.3	20.9	53.8	100	106
Christian	15.1	24.3	60.6	100	113
Sikh	12.2	29.9	57.9	100	221
Other	12.5	18.8	68.7	100	35
Caste					
SC/ST	23.8	38.3	37.9	100	344
OBC	20.1	30.5	49.4	100	545
Other	19.7	24.2	56.1	100	523
Wealth quintile					
Poorest	23.9	39.2	37	100	143
Poorer	23.8	31.8	44.4	100	219
Middle	28.5	29.8	41.7	100	261
Richer	18.7	34.4	46.9	100	403
Richest	17.1	21.3	61.6	100	428
Total(pooled)	**21.8**	**30.4**	**47.8**	**100**	**1454**

Note: Low satisfaction (0-40 score), medium satisfaction (40.1-70 score), high satisfaction (70.1-100 score)

According to the overall score received, the respondents were grouped into three categories: those having low satisfaction (0-40), medium satisfaction (40.1-70), and high satisfaction (70.1-100). About half (48 percent) of the respondents are highly satisfied with their

lives. Those under the low satisfaction category are only 22 percent. Those who are living with their spouses and also those living with their spouses and children recorded high satisfaction. With an improvement in economic condition, the satisfaction in life also increases. The same is true for educational achievement.

4.9 Overall Satisfaction in Life

Happy ageing is characterized by satisfaction with one's present life and a psychological state of happiness and contentment with one's existing condition. Becoming old is part of the growing process and happens to all. The degree to which one accepts these changes as natural and takes them in one's stride is the extent to which one feels satisfied and contented. In an Indian context, the majority live with their family and hence have a web of socio-familial interactions. It is also relevant to mention here that most Indians have a belief in Karma philosophy, that there is a continuity of life beyond death in an afterlife, which gives a meaning and purpose to life.

To examine the overall satisfaction of individuals in various aspects of life—including family life, financial situation, housing condition, health status, and relationship with spouse and children, ten questions were asked to each respondent and asked him/her to answer the level of satisfaction that ranges from 'completely satisfied' (5) to 'not at all satisfied' (1). The questions are: "The condition of your house," "The condition of your neighborhood," "Your village, city, or town," "Your daily life and leisure activities," "Your family life," "Relationship with your spouse," "Relationship with your children," "Your present financial situation," "Your health," and "Your life as a whole these days" (table 4.13).These values have been converted to a composite score with a range of 0 to 100. Those who scored 0 to 40 were considered to have 'low satisfaction,' 40.1 to 70 were considered to have 'medium satisfaction,' and 70.1 to 100 were considered to have 'high satisfaction.'

About 63 percent of the respondents were 'highly satisfied' in their life as a whole. Around 34 percent fell under the category of 'medium satisfaction.' It is important to note that only four percent consider themselves to have 'low satisfaction' in life as a whole. Males are slightly more likely than females to have high satisfaction. Married life is a strong predictor of overall satisfaction in life (66 percent of married compared to 44 percent of widowed). Those who are staying with their spouses and children, as well as those staying with their spouses only, made up a higher proportion among the 'highly satisfied' category. Interestingly, this analysis did not show any significant rural-urban differentials. With an increase in educational level of the individuals and economic status of the households, the proportion who consider themselves as 'highly satisfied' in life increases significantly (Table 4.13)

Table 4.13: Percent distribution of respondents by their perception on overall Satisfaction in life by states and background characteristics, India, LASI-pilot, 2010

States/background characteristics	Low satisfaction	Medium satisfaction	High satisfaction	Total	Number
State					
Punjab	0.3	20.1	79.7	100	364
Rajasthan	2.5	26.5	71.0	100	361
Kerala	0.6	18.9	80.6	100	388
Karnataka	8.4	53	38.6	100	381
Age					
<60	4.1	33.9	62.0	100	1,011
60-74	4.0	32.4	63.5	100	379
75+	1.3	32.7	66.0	100	103
Sex					
Male	2.4	31.8	65.9	100	670
Female	5.1	34.8	60.1	100	824
Residence					
Urban	3.9	34.5	61.6	100	410
Rural	3.9	33.1	63.0	100	1,084
Marital Status					
Currently married	3.6	30.5	65.8	100	1,290
Never married/separated/divorced	14.0	46.1	40.1	100	26
Widowed/widower	4.3	52.1	44.0	100	178
Living arrangement					
Living alone	7.0	43.5	49.5	100	49
Living with spouse only	6.4	33.6	60.0	100	182
Living with children only	5.4	52.7	41.9	100	173
Living with spouse & children	3.1	29.9	67.0	100	1,090
Education					
No schooling	5.6	38.5	55.9	100	673
Primary/middle	3.0	32.7	64.3	100	525
High school & above	1.1	22.3	76.6	100	296
Religion					
Hindu	4.1	36.5	59.4	100	1,029
Muslim	7.6	28.6	63.7	100	105
Christian	0.9	16.8	82.3	100	108
Sikh	0.0	18.7	81.4	100	216
Other	0.0	57.1	42.9	100	32
Caste					
SC/ST	5.2	45.0	49.8	100	392
OBC	4.6	37.5	57.9	100	534
Other	2.2	19.2	78.7	100	523
Wealth quintile					
Poorest	6.8	42.0	51.2	100	198
Poorer	8.5	41.1	50.4	100	233
Middle	1.1	41.3	57.5	100	264
Richer	3.1	31.2	65.7	100	382
Richest	1.1	16.6	82.3	100	417
Total(pooled)	**3.9**	**33.5**	**62.7**	**100**	**1,494**

Note: Low satisfaction (0-40 score), medium satisfaction (40.1-70 score), high satisfaction (70.1-100 score)

Note: The Constitution of India contains a schedule of castes (SCs) and tribes (STs) eligible to receive special benefits, including welfare services, scholarships, and guaranteed places in educational institutions, civil service, and Parliament. These provisions were made for the educational and economic augmentation of weaker sections and to protect them from social injustice and all forms of exploitation.

HEALTH AND HEALTH CARE OF OLDER POPULATION

5

5.1 Introduction

Health is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity (WHO, 1948). According to International Classification of Impairment, Disability, and Handicap (1980), overall health of the elderly is concerned with the structural aspect of the health disorder. Natural accidental impairment leads to impairment of physiological and psychological functions of the body, which leads to disability to perform normal activities, and both these abnormalities limit the social and family roles of an individual through the economic and demographic conditions.

The demographic transition and subsequent epidemiological transition in India has shifted a major share of the country's burden of disease to the older population. Until recently infectious and parasitic diseases contributed to a major proportion of total burden of disease in India. However, overtime with advancement in the medical sciences and adoption of preventive approaches to public health, as well as improvements in the overall socioeconomic condition and subsequent health transition, this pattern is changing. The communicable diseases are being replaced by the non-communicable chronic diseases and injuries/disabilities as major contributors to the overall burden of disease. However, the infectious/parasitic diseases are still posing significant challenges to public health, making India bear a double burden of disease.

The ageing population in the country is resulting in an overall increased burden of disease, particularly that of chronic diseases. It is projected that, by 2030, 45 percent of Indians' health burdens will be borne by the older population with a high burden of non-communicable diseases. The increasing burden of non-communicable chronic diseases among the adults and the older population is fuelled by the high prevalence of four main behavioral risk factors: tobacco use, insufficient physical activity, harmful use of alcohol and unhealthy diet, and poor access to good quality health care. A large share of non-communicable diseases is preventable through reduction of these four behavioral risk factors (WHO, 2010).

The health section is a major component of the LASI pilot instrument. It contained four sub sections, namely (a) self-reported morbidity, (b) functional health, (c) biomarker, and (d) health care utilization. In this chapter on health and health care, results from the LASI pilot survey are presented on three domains: self-reported diagnosed morbidity prevalence, functional health, and health care use pattern. The results of biological markers of health are presented in the following chapter.

5.2 Chronic Diseases

The LASI pilot survey collected detailed information on the prevalence of diagnosed chronic diseases—such as hypertension, diabetes, and high blood sugar, cancer, lung disease, heart disease, stroke, and arthritis and rheumatism. The question asked for each disease was that (a) 'Has any health professional ever told you that you have (diabetes)? We present results in terms of prevalence of chronic diseases, cardio vascular diseases, and injury/fall/conditions due to natural disaster. The purpose is to show separately the prevalence of any chronic disease, any cardio vascular disease and any injury/fall among older people. Table 5.1 presents results on (i) prevalence of any chronic disease, (ii) any cardiovascular disease, and (iii) any injury/fall among older population.

Overall, about 27 percent of the respondents reported that they were diagnosed with at least one chronic disease. By states, the prevalence was highest in Kerala (55 percent), with the lowest prevalence in Rajasthan (13 percent). Around a fourth in rural areas reported that they were diagnosed with at least one chronic disease compared with a third in urban areas.

Chronic diseases affect all older adults with the highest prevalence in the age group 60-74 years (42 percent), compared with those aged 75+ (39 percent) and less than 60 years old (20 percent).. The diagnosed prevalence of any chronic disease was slightly higher among females (28 percent) compared with males (26 percent). Older people who stayed alone reported a very high prevalence of chronic diseases (44 percent) compared with those staying with their spouse and children (23 percent). The prevalence of chronic diseases was highest among persons with high school and above education, and it rose with increasing wealth—highest among those in the richest wealth quintile (45 percent) and lowest among those in the poorest wealth quintile (7 percent). Prevalence of chronic diseases also increased from the lowest to highest consumption quintile (21 percent to 35 percent, respectively). Overall, socioeconomic—such as education and wealth and consumption quintiles—showed strong positive gradients on the prevalence of chronic diseases.

Table 5.1: Prevalence (in percent) of any chronic disease, any cardiovascular disease and Injury/fall/conditions due to natural disaster by states and background characteristics, India, LASI-pilot, 2010.

States/ background characteristics	Diagnosed with any chronic disease (%)	Diagnosed with any cardio vascular diseases (%)	Any injury/fall/ conditions due to natural disaster(%)	N
State				
Punjab	27.7	20.2	11.8	402
Rajasthan	12.5	6.1	11.2	417
Kerala	55.2	35.2	17.3	462
Karnataka	21.3	13.7	10.4	402
Age				
<60	19.7	11.6	11.6	1,084
60-74	41.3	28.2	12.4	453
75+	39.9	24.4	19.2	144
Sex				
Male	26.3	16.0	11.3	734
Female	27.7	17.8	13.2	949
Residence				
Urban	33.6	20.6	10.7	472
Rural	24.7	15.7	13.0	1211
Living arrangement				
Living alone	43.6	28.8	26.9	93
Living with spouse only	32.6	23.9	12.3	203
Living with children only	34.6	22.0	19.1	253
Living with spouse & children	23.2	13.8	9.8	1134
Education				
No schooling	16.4	8.8	12.1	771
Primary/middle	37.1	24.2	12.5	586
High school & above	36.6	25.1	12.8	325
Caste				
SC/ST	12.7	6.7	11.1	429
OBC	29.7	18.9	14.1	611
Other	34.2	23.8	9.7	595
Wealth quintile				
Poorest	6.8	3.0	14.4	229
Poorer	14.4	8.3	13.8	267
Middle	24.1	14.9	8.6	289
Richer	37.1	21.6	11.2	439
Richest	45.3	32.2	13.9	458
Consumption quintile				
Poorest	21.2	11.6	15.2	257
Poorer	25.9	13.3	9.5	332
Middle	26.7	17.7	10.0	327
Richer	25.6	17.3	12.2	364
Richest	34.5	23.6	14.9	402
Total (pooled)	**27.1**	**17.0**	**12.4**	**1683**

Note:

1 Prevalence is given in percentage. Prevalence = (No. of diagnosed cases/population)*100
2 Percentages are weighted.
3 Any chronic diseases include hypertension, diabetes, cancer, lung disease, heart disease, stroke and arthritis.
4 Cardiovascular diseases include hypertension, heart disease and stroke.
5 Consumption quintiles are based on monthly per capita consumer expenditure (MPCE).
6 The caste category 'other' means the castes other than scheduled castes, scheduled tribes and other backward castes

Cardiovascular Diseases

Cardiovascular diseases are the class of diseases that involve the heart or blood vessels and the term technically refers to any disease that affects the cardiovascular system. It is well recognized that premature onset of cardiovascular diseases increases the health risk of Indian adults and the older population. The LASI pilot survey results indicate that 17 percent of the older population were diagnosed with at least one cardiovascular disease. Kerala has the highest (35 percent) proportion of the older population diagnosed with any cardiovascular disease while Rajasthan has the lowest prevalence (6 percent). The prevalence of cardiovascular disease increases with age. socioeconomic characteristics of education, household wealth, and consumption quintile indicated strong positive gradients on the prevalence of cardiovascular diseases.

Injury/fall/conditions due to Natural Disaster

The LASI Pilot gathered data on the prevalence of injuries or falls. Around 12 percent of the older population reported that they suffered from injury/fall or conditions owing to natural disaster. Among states, Kerala has the highest (17 percent) proportion of older population reporting an injury or fall. The reported prevalence of injuries increased with age of older respondents.

5.3 Prevalence of Chronic Diseases

Table 5.2 presents the prevalence of individual chronic disease such as hypertension, diabetes, heart disease, lung function, and arthritis by states and background characteristics.

Hypertension

Hypertension is persistently high arterial blood pressure. It may have no known cause or may be associated with other primary diseases, and it may or may not be adequately treated, but it is very common in older persons. Hypertension is present when only one of the two measures is elevated, either the upper number (systolic) or the lower number (diastolic). Overall, around 15 percent of the older population have reported that they were diagnosed with hypertension. Larger variations are indicated by states with the highest reported prevalence (32 percent) of hypertension in Kerala and the lowest prevalence (5 percent) in Rajasthan. About 19 percent of the older population in urban areas have reported that they were diagnosed with hypertension compared with more than 14 percent in rural areas.

Table 5.2: Prevalence of chronic diseases by states and background characteristics, India, LASI-pilot, 2010.

States/background characteristics	Hypertension (Blood Pressure)	Diabetes	Heart diseases	Lung diseases	Arthritis	N
State						
Punjab	19.4	6.6	1.3	1.5	2.3	402
Rajasthan	5.4	3.0	1.0	4.8	1.7	417
Kerala	31.8	18.7	7.8	7.9	22.3	462
Karnataka	11.8	5.6	3.0	2.3	4.0	402
Age						
<60	10.5	5.3	1.9	2.1	5.4	1084
60-74	25.0	14.3	6.5	7.6	10.5	453
75+	21.7	6.9	3.8	10.7	11.5	144
Sex						
Male	13.6	8.1	4.2	5.4	5.4	734
Female	16.5	7.7	2.5	3.4	8.7	949
Residence						
Urban	19.2	12.9	3.2	4.8	8.1	472
Rural	13.7	6.0	3.3	4.1	6.9	1211
Living arrangement						
Living alone	27.4	15.5	6.0	6.5	8.1	93
Living with spouse only	21.5	9.4	5.2	6.0	5.5	203
Living with children only	20.6	6.3	2.7	6.9	12.9	253
Living with spouse & children	12.1	7.4	2.8	3.2	6.2	1134
Education						
No schooling	7.3	3.0	1.8	3.0	3.3	771
Primary/middle	21.9	11.3	4.4	5.7	11.0	586
High school & above	23.7	14.7	4.8	4.9	10.5	325
Caste						
SC/ST	5.7	3.3	1.5	3.0	3.5	429
OBC	17.2	8.8	3.5	4.5	8.3	611
Other	21.4	9.5	4.4	5.4	7.9	595
Wealth quintile						
Poorest	2.3	1.4	0.9	3.1	0.9	229
Poorer	6.7	2.9	2.2	1.4	3.5	267
Middle	12.8	3.2	2.9	4.7	4.7	289
Richer	19.8	11.2	3.9	6.8	11.0	439
Richest	29.7	17.5	5.6	4.6	13.3	458
Consumption quintile						
Poorest	9.5	4.3	3.0	5.0	3.6	257
Poorer	11.9	8.0	2.0	4.9	8.9	332
Middle	14.5	6.3	4.4	5.1	6.0	327
Richer	15.3	7.3	3.3	2.2	7.8	364
Richest	23.1	12.4	3.5	4.4	9.1	402
Total (pooled)	**15.2**	**7.9**	**3.3**	**4.3**	**7.2**	**1683**

Note:

1. Prevalence is given percent. Prevalence = (No. of diagnosed cases/population)*100
2. Percentages are weighted.
3. Consumption quintiles are based on monthly per capita consumer expenditure (MPCE).

Hypertension affects all ages although its reported prevalence is slightly lower among those aged less than 60 years. The reported prevalence of hypertension is higher among females (17 percent) compared with males (14 percent). The prevalence of hypertension was

highest among the older population of a higher socioeconomic strata. The prevalence of hypertension increases with education, wealth quintile, and consumption quintile. Notable differentials were found by co-residence characteristics. While 27 percent of older persons who live alone have reported hypertension, just about 12 percent of the older population living with spouse and children have reported that they were diagnosed with hypertension.

Diabetes

Diabetes (mellitus) is a disease of the body's metabolism where blood sugar is high and there is often sugar in the urine. Diabetes is emerging as a serious health challenge in India. Around 8 percent of older persons have reported that they have been diagnosed with diabetes. The reported prevalence of diabetes ranges from a highest of 19 percent in Kerala to lowest of 3 percent in Rajasthan. The prevalence of diabetes is more than doubled for older adults in urban areas (13 percent) compared with that for older adults in rural areas (6 percent).

By age, the prevalence of diabetes was highest in the age group 60–74 years (14 percent) compared with those aged 75+ (7 percent) and those below 60 years old (5 percent), .Older males reported a slightly higher prevalence of diabetes compared with older females. The prevalence of diabetes is highest among older persons living alone and lowest among those living with their children. The reported prevalence of diabetes increases with education, wealth quintile, and MPCE quintile, indicating strong positive gradients of socioeconomic factors on diabetes prevalence.

Heart Diseases

The LASI pilot survey included questions on heart diseases such as heart attack, coronary heart disease, angina, congestive heart failure, or any other heart problems. Overall, 3 percent of the older population reported that they were diagnosed with any of these heart diseases. However, considerable variation emerged in the prevalence of heart disease by background characteristics. The reported prevalence of heart disease was highest in the state of Kerala (8 percent) and lowest (1 percent) in Rajasthan.

Over 7 percent of the older population in age 60–74 years reported that they were diagnosed with heart diseases. The prevalence of heart diseases declined to 4 percent for those aged 75+. The prevalence of heart diseases was relatively higher among older males (4 percent) compared with older females (3 percent). Older persons living alone had a higher prevalence of heart disease compared with those living either with children or with a spouse and children. The prevalence of heart disease increased with education and wealth quintiles, indicating positive gradients of socioeconomic factors on the prevalence of heart disease.

Lung Diseases

Lung diseases include problems with breathing, usually including cough and sputum production. They do not include asthma. The LASI Pilot survey included questions on chronic

lung diseases such as chronic bronchitis or emphysema. Around 4 percent of the older population reported that they were diagnosed with lung diseases. The prevalence of reported lung disease was highest in Kerala (8 percent) and lowest in Punjab (2 percent).

The prevalence of lung diseases increased sharply to 10 percent among older persons aged 75+ compared with just about 2 percent for those aged less than 60 years. A higher percentage (5 percent) of older males reported that they were diagnosed with lung diseases compared with females (3 percent). By co-residence, the prevalence of lung diseases was highest among older persons staying with their spouses and children (7 percent) and lowest among those living with other members (3 percent).The prevalence of lung disease did not indicate any clear patterns of variations by socioeconomic characteristics.

Arthritis

Rheumatoid arthritis is inflammation, pain, or restricted movement of the joints or the back area. Rheumatism is often used as a synonym for arthritis. The LASI Pilot survey collected information on self-reported arthritis. About 7 percent of the older population reported that they were diagnosed with it. More than a fifth of the older population in Kerala reported that they were diagnosed with arthritis, but the prevalence in other states was much lower. The prevalence of arthritis increased with wealth and consumption quintiles suggesting positive gradients of socioeconomic characteristics.

5.4 Sources of Diagnosis of Reported Chronic Diseases

In the LASI Pilot survey, for respondents whom reported that they were ever diagnosed with any chronic diseases, information was also collected on who diagnosed the disease. The sources include (a) doctor with MBBS degree; (b) ayurvedic, unani, or homeopathic doctor; RMP; sidda; and (c) others.

Table 5.3 gives information about the percentage of older persons reporting chronic diseases that were diagnosed by an MBBS doctor by background characteristics. More than 90 percent of all chronic diseases except arthritis were diagnosed by an MBBS doctor. Almost all of the cases of heart disease were diagnosed by an MBBS doctor suggesting critical attention to heart diseases. State level differentials indicate that the proportion of the older population diagnosed for all chronic diseases except heart disease by an MBBS doctor is lowest in Rajasthan, suggesting poor access to modern medical care.

Table 5.3: Percentage of older persons reporting chronic disease diagnosed by MBBS doctor by states and background characteristics, India, LASI-pilot, 2010.

States/background characteristics	Hypertension (Blood pressure)	Diabetes	Heart diseases	Lung disease	Arthritis
	Percent	**Percent**	**Percent**	**Percent**	**Percent**
State					
Punjab	89.9	100.0	100.0	100.0	89.0
Rajasthan	78.1	76.6	100.0	79.7	56.1
Kerala	96.5	100.0	97.0	94.7	82.8
Karnataka	100.0	95.6	100.0	100.0	81.2
Age					
<60	97.8	97.6	100.0	96.2	83.7
60-74	89.5	96.0	96.9	90.3	77.9
75+	98.3	86.8	100.0	81.8	77.9
Sex					
Male	95.1	97.6	97.2	87.8	76.5
Female	93.8	94.9	100.0	93.8	82.8
Residence					
Urban	95.1	95.8	100.0	96.9	83.0
Rural	93.9	96.4	97.8	87.8	79.8
Living arrangement					
Living alone	95.0	90.2	100.0	100.0	65.9
Living with spouse only	97.5	100.0	100.0	100.0	93.7
Living with children only	90.8	76.4	100.0	88.7	67.7
Living with spouse & children	94.5	100.0	97.2	86.8	86.3
Education					
No schooling	85.9	78.7	94.2	78.8	69.8
Primary/middle	97.7	100.0	100.0	97.2	84.0
High school & above	95.5	100.0	100.0	95.4	83.6
Caste					
SC/ST	87.5	83.1	100.0	80.4	62.5
OBC	93.8	97.9	96.2	93.4	81.4
Other	97.4	100.0	100.0	95.3	84.8
Wealth quintile					
Poorest	68.5	68.3	100.0	71.2	50.0
Poorer	94.7	70.9	100.0	71.1	62.0
Middle	89.3	87.3	100.0	90.8	86.3
Richer	94.5	100.0	94.1	94.1	76.5
Richest	97.7	100.0	100.0	100.0	88.5
Consumption quintile					
Poorest	81.8	69.2	100.0	68.6	66.5
Poorer	91.8	95.3	100.0	91.8	77.6
Middle	93.9	100.0	93.7	94.5	79.8
Richer	98.8	100.0	100.0	100.0	80.6
Richest	96.8	100.0	100.0	100.0	88.3
Total (pooled)	**94.3**	**96.1**	**98.4**	**90.5**	**80.8**

Note: Consumption quintiles are based on monthly per capita consumer expenditure (MPCE).

The percentage of older persons diagnosed by an MBBS doctor was higher in urban areas for all diseases except for diabetes. Overall, the proportion diagnosed by an MBBS doctor, was highest for older adults less than age 60 years. The proportion of older persons who reported any chronic diseases and who were diagnosed with hypertension and diabetes by an MBBS doctor was higher among males. The corresponding proportions for heart diseases, lung

diseases, and arthritis were higher among females. The percent of older population diagnosed by a MBBS doctor, among those who reported chronic disease increased with education, wealth, and consumption quintiles, indicating a positive correlation among these factors.

5.5 Current Medication for Diagnosed Chronic Diseases

The LASI pilot survey gathered information about current medication for all those who reported that they were diagnosed with chronic diseases at the time of survey. Table 5.4 gives information about the current medication for diagnosed cardio vascular diseases (CVD) and non-cardio vascular diseases (non-CVD). Overall, 80 percent of the respondents whom reported any cardio vascular diseases were currently medicated and nearly three-fourths of the respondents whom reported any non-cardio-vascular diseases were taking medication.

Among the states, Karnataka has the highest (87 percent) percentage of respondents who were under current medication for cardio vascular diseases. The proportion under current medication for any non-cardio vascular diseases was highest in Punjab (85 percent). The percentage of the older population taking current medication for both CVD and non-CVD was higher in urban areas than in rural areas. The percentage of older adults under current medication for both CVD and non-CVD increased with age.

A higher percentage of older females were under current medication for CVD; in the case of non-CVD, the proportion was higher among older males. By co-residence, the proportion under current medication for any CVD was higher for those living with their spouses only whereas the proportion of older people who went for medication for any non-CVD was higher among those living alone. Overall, the proportion under current medication of the CVD and non-CVD increased with education, wealth, and consumption quintiles.

Table 5.4: Percentage of older persons under current medication for diagnosed cardiovascular diseases (CVD) and non-cardiovascular diseases (Non-CVD) by states and background Characteristics, India, LASI-pilot, 2010.

States/ background characteristics	Current medication			
	Any CVD	**N**	**Any non-CVD**	**N**
State				
Punjab	85.1	81	85.4	41
Rajasthan	57.5	26	65.2	35
Kerala	79.6	161	72.3	181
Karnataka	87.4	55	80.2	45
Age				
<60	78.1	140	66.1	144
60-74	81.4	128	80.9	141
75+	82.7	33	81.7	38
Sex				
Male	79.1	132	78.5	129
Female	80.8	191	70.6	173
Residence				
Urban	81.2	104	76.7	110
Rural	79.5	219	72.6	192
Living arrangement				
Living alone	82.7	29	78.8	24
Living with spouse only	90.1	56	75.8	41
Living with children only	79.6	63	65.4	57
Living with spouse & children	76.8	175	75.9	180
Education				
No schooling	77.4	83	65.3	68
Primary/middle	78.4	152	77.1	148
High school & above	85.3	87	76.8	86
Caste				
SC/ST	74.4	39	63.3	40
OBC	79.4	122	78.6	119
Other	83.0	154	73.2	123
Wealth quintile				
Poorest	41.4	7	59.1	12
Poorer	65.7	24	70.5	20
Middle	78.1	49	74.8	35
Richer	84.4	96	72.9	108
Richest	83.7	147	77.5	127
Consumption quintile				
Poorest	71.5	34	66.8	35
Poorer	76.4	50	70.9	64
Middle	73.2	62	67.0	52
Richer	83.0	76	74.7	63
Richest	87.3	101	82.9	88
Total(Pooled)	**80.1**	**323**	**74.0**	**302**

Note:

1 Cardiovascular diseases (CVD) include hypertension, heart diseases and stroke.
2 Non-cardiovascular diseases (non-CVD) include diabetes, cancer, lung disease
3 Consumption quintiles are based on monthly per capita consumer expenditure (MPCE).

5.6 Near and Distance Vision

The LASI pilot survey gathered information about the distance and near vision of the older population. The information on reported vision was categorized into five groups: very good, good, fair, poor, and very poor. For analysis, they were further recoded into three categories namely good, fair, and poor. The category 'good' includes good and very good and the category 'poor' includes poor and very poor. Table 5.5 gives information about the percent distribution of the older population whom reported distance vision and near vision according to background characteristics.

A majority (64 percent) of the older population reported good *distance vision*, and only 8 percent reported poor distance vision. The highest proportion of older adults whom reported good distance vision was in Karnataka (73 percent), and the lowest proportion who reported good distance vision was in Kerala (56 percent). A higher proportion of the older population in urban areas (69 percent) reported good distance vision compared with rural areas (62 percent). By age, three-fourths of the young olds (less than 60 years) reported good distance vision, but only a fourth of those aged 75+ reported good distance vision. Around half of older adults aged 75+ reported fair distance vision and more than a fourth reported poor distance vision. The proportion of older persons whom reported good distance vision was higher among those living with their spouses and children. The percentage of older adults whom reported good distance vision increased with education and consumption quintiles.

As for *near vision*, around 63 percent of the older population reported good near vision, 30 percent reported fair near vision, and 8 percent reported poor near vision. The pattern in reported near vision was similar to that of reported distance vision according to socioeconomic variables and state.

Table 5.5: Percentage distribution of older population who reported distance and near vision by states and background characteristics, India, LASI-pilot, 2010.

States/background characteristics	Reported distance vision			Reported near vision			
	Good	**Fair**	**Poor**	**Good**	**Fair**	**Poor**	**N**
State							
Punjab	67.6	28.2	4.2	61.6	33.9	4.5	400
Rajasthan	58.0	34.0	8.0	58.6	32.5	8.9	413
Kerala	56.0	30.9	13.1	55.8	33.2	11.0	457
Karnataka	72.6	21.6	5.8	71.3	22.6	6.2	393
Age							
<60	72.4	24.1	3.4	70.9	24.7	4.4	1,069
60-74	53.7	32.9	13.5	53.3	35.2	11.6	452
75+	25.1	48.6	26.3	25.4	50.4	24.2	141
Sex							
Male	65.3	28.1	6.6	61.2	34.0	4.8	725
Female	62.3	28.7	9.0	63.5	26.2	10.3	938
Residence							
Urban	69.2	23.7	7.1	65.0	26.4	8.6	470
Rural	61.5	30.2	8.3	61.6	30.8	7.7	1,193
Living arrangement							
Living alone	42.8	41.3	16.0	46.0	34.9	19.1	88
Living with spouse only	62.7	29.3	8.1	61.8	31	7.2	197
Living with children only	47.6	35.5	17.0	50.9	32.6	16.5	249
Living with spouse & children	68.8	25.8	5.4	66.4	28.3	5.3	1,129
Education							
No schooling	58.8	32.4	8.8	58. 5	32.2	9.4	757
Primary/Middle	65.9	26.4	7.7	64.8	28.4	6.8	582
High School& above	72.1	21.7	6.2	69.0	24.8	6.2	323
Caste							
SC/ST	59.8	33.4	6.9	56.4	36.2	7.5	426
OBC	66.7	24.5	8.8	65.6	26.0	8.4	605
Other	63.2	29.1	7.7	64.2	28.6	7.3	590
Wealth quintile							
Poorest	57.7	33.8	8.5	55.0	35.3	9.7	227
Poorer	61.6	31.0	7.4	62.5	29.7	7.8	258
Middle	68.0	26.1	5.9	69.1	24.4	6.5	284
Richer	64.2	26.8	9.0	61.8	28.1	10.1	436
Richest	65.8	25.7	8.5	63.9	30.7	5.4	457
Consumption quintile							
Poorest	56.6	31.6	11.8	56.4	30.5	13.1	249
Poorer	57.5	33.0	9.45	57.5	32.7	9.8	331
Middle	63.9	27.6	8.47	60.8	30.1	9.1	322
Richer	65.3	29.3	5.4	64.5	32.0	3.5	360
Richest	72.2	22.0	5.82	71.0	23.3	5.7	400
Total (pooled)	**63.6**	**28.4**	**7.95**	**62.5**	**29.6**	**7.9**	**1663**

Note:

1 The information on reported vision was collected on five point scale very good, good, fair, poor, and very poor.
2 In the table, good category include 'very good' and 'good' and poor include 'vary poor' and 'poor'.
3 Consumption quintiles are based on the monthly per capita consumer expenditure.

5.7 Hearing and Oral Health

The LASI pilot survey also gathered information about difficulty in hearing normal voice from an average distance with or without any hearing aid as well as the ability to chew solid food, like chapattis, apples, guavas, or nuts from the respondents. Table 5.6 provides the percentage of respondents reporting difficulty in hearing a normal sound from an average

distance and in chewing solid food (only two categories are considered: (i) could not chew well and (ii) could not chew at all) by state and background characteristics.

Table 5.6: Reported difficulty in hearing and eating solid food by states and Background characteristics, India, LASI-pilot, 2010.

States/background characteristics	Percentage of respondents reporting		
	Hearing	**Chewing solid food**	**N**
State			
Punjab	50.5	7.9	402
Rajasthan	50.0	8.0	416
Kerala	26.0	14.8	459
Karnataka	40.1	3.2	401
Age			
<60	39.9	2.9	1078
60-74	40.7	13.8	453
75+	55.2	29.0	142
Sex			
Male	40.9	7.5	733
Female	41.7	8.2	945
Residence			
Urban	42.4	5.8	471
Rural	41.0	8.7	1207
Living arrangement			
Living alone	47.0	19	93
Living with spouse only	39.0	7.6	201
Living with children only	45.3	18.4	252
Living with spouse & children	40.4	4.8	1132
Education			
No schooling	52.3	9.2	769
Primary/middle	33.3	8.1	585
High school & above	27.0	3.8	323
Caste			
SC/ST	49.4	8.0	428
OBC	41.2	6.7	609
Other	31.6	8.6	593
Wealth quintile			
Poorest	48.2	9.1	228
Poorer	51.3	7.6	266
Middle	45.5	7.5	288
Richer	35.7	8.6	438
Richest	30.3	6.8	457
Consumption quintile			
Poorest	43.6	13.8	257
Poorer	44.8	10.3	331
Middle	44.0	6.1	326
Richer	41.3	5.2	363
Richest	34.6	5.5	400
Total (pooled)	**41.4**	**7.9**	**1678**

Note:

1 Persons having problem in hearing include persons who have reported having problem in hearing whether or not he use hearing aid.

2 Information on ability to chew solid foods is collected on five point scales very well, pretty well, fair, not well and not at all. In the table, person having problem in chewing solid food include persons who have reported either 'not well' or 'not at all'.

3 Consumption quintiles are based on the monthly per capita consumer expenditure (MPCE).

Starting with hearing, overall about 41 percent of the respondents reported difficultly in hearing. Among states, the problem was highest in Punjab (51 percent) and lowest in Rajasthan (50 percent). Hearing difficulties increased with age, rising from 40 percent in those below 60-years-old to 54 percent in those 75+. Education is positively associated with lowering hearing difficulty, with 52 percent of older persons with no schooling have hearing difficulty compared with 27 percent for those with high school and above education. Half of the respondents of the poorest and poorer wealth quintiles reported hearing problems compared with less than a third of respondents in the richest wealth quintiles.

As for eating difficulties, overall about 8 percent of the respondents reported difficulty in chewing. Among states, the problem was highest (15 percent) in Kerala. Chewing difficulty increased with age, with only 3 percent of those below age 60 have difficulty in chewing solid food compared with 29 percent of those 75+. The percentage of respondents reporting problems in eating solid food was lower among older people who were highly educated and in highest wealth and consumption quintiles.

5.8 Health Risk Behavior

The LASI Pilot collected information on health risk behavior of the older population such as whether the respondents ever smoked tobacco, current consumption of tobacco and alcohol, and the frequency of such consumption. Table 5.7 provides information on the current consumption of tobacco and alcohol by state and background characteristics. Overall, 16 percent of the respondents reported currently consuming tobacco and around 8 percent reported currently consuming alcohol.

By state, alcohol and tobacco use is more prevalent in the two south Indian states of Karnataka and Kerala. For instance, nearly 20 percent of the respondents in Karnataka and Kerala use tobacco while the corresponding proportion for Punjab and Rajasthan was 4 percent and 15 percent, respectively. The prevalence of alcohol consumption was highest in Kerala (11 percent) and lowest in Rajasthan (7 percent).

Table 5.7: Health risk behavior: Prevalence of tobacco and alcohol consumption by states and background characteristics, India, LASI-pilot, 2010.

States/background characteristics	Percent of respondents reporting Current Consumption		N
	Tobacco	**Alcohol**	
State			
Punjab	3.5	8.5	402
Rajasthan	14.5	4.6	416
Kerala	18.5	11	459
Karnataka	19.1	9.4	401
Age			
<60	15.2	8.4	1080
60-74	16.2	9.2	453
75+	16.5	3.1	143
Sex			
Male	29.7	17.5	733
Female	4.7	1.0	945
Residence			
Urban	11.8	6.1	471
Rural	16.9	8.9	1207
Living arrangement			
Living alone	11.4	6.5	93
Living with spouse only	16.7	10.1	201
Living with children only	13.9	4.4	252
Living with spouse & children	16.0	8.8	1132
Education			
No schooling	14.3	6.5	769
Primary/middle	20.8	10.2	585
High school & above	9.2	8.7	323
Caste			
SC/ST	16.5	10.1	428
OBC	18.2	7.5	609
Other	11.5	7.4	593
Wealth quintile			
Poorest	17.8	5.9	228
Poorer	19.0	10.8	266
Middle	16.6	7.9	288
Richer	17.2	9.7	438
Richest	8.2	6.2	457
Consumption quintile			
Poorest	15.5	5.6	257
Poorer	18.4	9.2	331
Middle	17.0	8.6	326
Richer	15.2	8.0	363
Richest	12.2	9.0	400
Total (pooled)	**15.5**	**8.2**	**1678**

Note: Consumption quintile is based on monthly per capital consumer expenditure (MPCE).

Use of tobacco and alcohol is more prevalent in rural areas than in urban areas. By age, the use of tobacco registers between 15–16 percent for all the age groups. However, for the use of alcohol, those 75+ have a much lower level (3 percent) than the other groups (around 8–9 percent). Around 30 percent of the males use tobacco and about 18 percent consume alcohol, with only 5 percent of females consuming tobacco and only 1percent consuming alcohol. In

terms of living arrangements, the highest proportion consuming tobacco (17 percent) as well as alcohol (10 percent) was among those who lived with their spouses only. The older population of the poorer wealth quintile showed a higher prevalence of tobacco and alcohol consumption than other wealth quintiles.

5.9 Functional Health: Activities of Daily Living (ADL)

Activities of Daily Living (ADL) give a composite measure of the above human physiological and psychological abnormalities and their consequences on day-to-day life course activities. In the LASI pilot, six questions were asked to assess difficulties with the activities of daily living (ADL): dressing and wearing chappals, walking across room, bathing, eating or chewing chapatti, getting in and out of bed, and using the toilet. Table 5.8 shows the results in terms of three categories: none, one, and two or more.

Overall, 88 percent of respondents do not have any ADL difficulties, while 6 percent reported one ADL difficulty and 7 percent reported two or more ADL difficulties. By state, the highest level of no difficulty (93 percent) was reported in Rajasthan compared with a low of 81 percent in Kerala. For two or more difficulties, the highest level was in Kerala (11 percent) and the lowest in Punjab (3.7 percent). The percentage of respondents with at least one ADL difficulty increased with age (4 percent for those aged less than 60 to 10 percent for those aged 75+) and with wealth quintile.

Table 5.8: Activities of daily living (ADL): Percent distribution by number of ADL limitations by states and background characteristics, India, LASI-pilot, 2010.

States/background characteristics	Problems in ADL			N
	None	**One**	**Two or more**	
State				
Punjab	91.4	4.9	3.7	402
Rajasthan	92.6	2.2	5.3	417
Kerala	80.5	9.1	10.5	462
Karnataka	86.6	7.5	6.0	402
Age				
<60	92.3	4.0	3.7	1084
60-74	83.8	9.3	6.9	453
75+	63.4	9.6	27.1	144
Sex				
Male	88.6	5.9	5.4	734
Female	86.9	5.8	7.3	949
Residence				
Urban	87.5	6.3	6.2	472
Rural	87.7	5.7	6.6	1211
Living arrangement				
Living alone	77.7	7.4	15.0	93
Living with spouse only	84.8	6.4	8.8	203
Living with children only	78.4	8.9	12.7	253
Living with spouse & children	91.0	5.0	4.0	1134
Education				
No schooling	88.3	4.4	7.3	771
Primary/Middle	85.2	7.7	7.1	586
High School& above	90.8	6.3	2.9	325
Caste				
SC/ST	90.2	4.1	5.7	429
OBC	86.2	7.1	6.8	611
Other	87.9	5.9	6.2	595
Wealth quintile				
Poorest	91.8	2.3	5.9	229
Poorer	91.6	3.2	5.2	267
Middle	88.1	6.7	5.2	289
Richer	83.9	8.5	7.6	439
Richest	84.7	7.4	7.8	458
Consumption quintile				
Poorest	88.8	5.0	6.2	257
Poorer	85.8	5.2	9.0	332
Middle	90.4	5.9	3.8	327
Richer	88.2	4.9	6.9	364
Richest	85.6	8.0	6.4	402
Total (pooled)	87.7	5.8	6.5	1683

Note:

1 In LASI pilot, activities of daily living (ADL) have collected for difficulty in six items namely.

2 Dressing, walking across room, difficulty with eating, difficulty with bathing, getting in or out of bed, and using toilet.

3 The above table is based on reported difficulty in activities of daily living (ADL).

4 Consumption quintiles are based on monthly per capital consumer expenditure (MPCE).

5.10 Health Care

In the LASI pilot, the information was collected to measure health care utilization during the last 30 days by socioeconomic status, illness or injury, visit of any medical facilities, and type of health care facility visited. The information about the health care utilization of older population by state and background characteristics is shown in Table 5.9.

Overall, 8 percent of the respondents reported that they were ill or sustained an injury during the past 30 days. By state, Kerala had the highest proportion (16 percent) of older persons who reported ill health during the past 30 days, and Rajasthan had the lowest proportion (5 percent). The reported prevalence of ill health during the past 30 days was slightly higher in urban areas (9ine percent) than in rural areas (8 percent).The proportion who reported ill health increased with age, and it was substantially higher (15 percent) among those living with children only than those living with spouse and children (7 percent). There was no clear pattern in the prevalence of ill health according to socioeconomic status.

Among the group that reported ill health, more than 65 percent had visited a medical facility (or pharmacists, or health care providers). By states, health care utilization was the highest in Karnataka (86 percent) and lowest in Rajasthan (25 percent). The proportion of older persons who visited a medical facility was higher (67 percent) in urban areas than in rural areas (64 percent). There was no clear pattern in health care utilization according to age. However, older females (69 percent) were more likely to visit a medical facility than older males (60 percent). In terms of living arrangements, 89 percent of those living alone visited a medical facility than those (58 percent) living with spouse and children. Visiting a medical facility was higher among those who in rich consumption quintiles, but the other socioeconomic variables did not show any clear pattern.

Table 5.9 Health care utilization of older population by state and background characteristics, India, LASI-pilot, 2010.

States/background characteristics	Last 30 days			
	Percentage of older population who were ill	N	Percentage of older population who visited medical facility for any illness	N
State				
Punjab	6.7	402	66.4	27
Rajasthan	4.8	416	24.7	20
Kerala	15.7	455	67.7	72
Karnataka	7.3	401	86.0	29
Age				
<60	7.1	1,077	68.3	81
60-74	8.7	452	56.0	45
75+	16.9	143	69.6	22
Sex				
Male	8.2	733	60.1	63
Female	8.3	941	68.9	85
Residence				
Urban	9.4	469	67.4	48
Rural	7.9	1,205	64.0	100
Living arrangement				
Living alone	6.7	93	88.9	8
Living with spouse only	7.9	200	79.2	17
Living with children only	14.8	252	70.1	39
Living with spouse & children	7.0	1129	58.2	84
Education				
No schooling	6.5	769	54.9	49
Primary/middle	11.2	583	71.7	70
High school & above	7.7	321	69.7	29
Caste				
SC/ST	7.3	427	49.1	36
OBC	9.3	607	74.2	60
Other	7.0	592	65.1	42
Wealth quintile				
Poorest	7.0	228	30.9	16
Poorer	7.3	266	77.1	18
Middle	5.7	287	81.6	19
Richer	12.8	435	67.6	58
Richest	7.7	457	65.9	37
Consumption quintile				
Poorest	5.9	257	43.2	16
Poorer	9.8	329	64.9	37
Middle	7.6	325	57.4	23
Richer	8.2	362	72.2	33
Poorest	9.6	400	74.8	39
Total (pooled)	**8.3**	**1674**	**65.1**	**148**

Note: Consumption quintiles are based on monthly per capital consumer expenditure (MPCE).

BIOLOGICAL MARKERS OF AGEING AND HEALTH OF OLDER POPULATION

6

6.1 Introduction

Biological markers (also known as biomarkers) of population health provide a measurement tool for observing physiological processes (including disease processes), physiological changes related to ageing, and the ageing process as a whole. Although biomarker based health research is advancing rapidly, in many ways it is still in its early stages.

In recent times, researchers have begun to realize the importance of collecting biomarker data in population and community based surveys for the greater understanding of physiological processes that change with age, diseases whose onset appears linked to age, and the ageing process. The main force behind the integration of the biomarker's data collection in the large scale health surveys is the urge and need to gain an understanding of the role of specific biological systems in health conditions—including an understanding of the role of biological systems in association with other socio-demographic, behavioral, pharmacological, psychosocial, and genetic contributions to health outcomes.

The inclusion of biological markers is important for large-scale health surveys in which assessment of health was previously based solely on the respondents' reported health; biomarkers can improve the precision of self-reported morbidity of the population (Goldman, 2007), identify risks to health, and monitor interventions, and it can be utilized to generate quantitative measures/indices of health for the study population. Additionally, biomarkers allow for the assessment of the relationship between the disease and risk factors, treatment interventions, and prevention programs.

Recent technological advancements in the medical field have made diagnostic tests logistically convenient, relatively inexpensive, and feasible in the field settings for the large scale surveys being conducted in even remote areas of the developing countries. Biomarkers on chronic diseases become more important in the case of developing countries, since data on self-reported morbidity in these countries is much less reliable owing to reporting bias (mainly because of the ignorance and illiteracy of the population) and undiagnosed diseases (mainly because of limited access to the health care facilities).

Thus, the inclusion of biomarkers is particularly important for India, where access to health care tends to be limited. India's adult and ageing population is at risk for undiagnosed diseases. With a low literacy level in this age group a significant level of self-reporting bias exists. In recent times, a large body of research on ageing, health, and their predictors has focused on the biomarkers of cardiovascular, metabolic, endocrine, and immune systems (Gruenewald*et al.* 2006; Crimmins*et al*., 2008). Anthropometric biomarkers and markers of

functional status (blood pressure and lung functions) have also been extensively used in the population based health surveys and research. The need for direct health examination—based on biomarkers to relate with self reported health information, as well as technological advancement in biomarker data collection—provided the necessary basis for incorporating a major module of biomarker-based health assessment.

In the LASI pilot survey, a range of biomarker information has been gathered. These include biomarkers of physiology (blood pressure and lung functions), physical functions (grip strength, balance tests, vision tests, etc.), anthropometric (height, weight, waist and hip circumferences), and DBS (C - reactive protein, Apo lipoproteins A-1 and B, Epstein-Barr virus (EBV) antibodies, Glycosylated hemoglobin (HbA1c)). Table 6.1 provides the list of biomarkers along with associated descriptions and health risks beyond normal limit levels of each biomarker adopted and implemented in the LASI pilot.

Table 6.1: LASI biomarkers: Biological characteristics and associated health risk outcomes, India, LASI-pilot, 2010

Name of biomarker	Description of biomarker	Health risk outcomes associated with the levels beyond normal limits
	Physiology	
Systolic blood pressure (SBP)	Index of cardiovascular activity: maximum pressure in an artery when the heart is pumping blood throughout the body.	Cardiovascular diseases (CVD), stroke, coronary heart disease (CHD) and mortality
Diastolic blood pressure (DBP)	Index of cardiovascular activity: lowest pressure in an artery when the heart is resting	Cardiovascular death, stroke, Coronary heart diseases, mortality
Resting pulse rate	Indicator of heart functioning and measure of overall fitness	Coronary heart diseases, mortality
Lung Function (Spirometry)		
a) Forced vital capacity(FVC)	The total volume of air that a person can forcibly exhale in one breath	Chronic obstructive pulmonary disease(COPD) and Asthma
b) Forced expired volume in one second(FEV1)	The volume of air that a person is able to exhale in the first second of forced expiration	
c) FEV1 %	The ratio of FEV1 to FVC expressed as a percentage	
	Physical functions	
Grip strength	Indicator of hand muscle strenght: measured in Kilogram	Loss of hand muscle strength, fall and other functional limitation, inflammation
Balance tests(Semi tandem, full tandem, side by side)	Indicators of static balance: measured progressively starting from semi-tandem the either side by side or full tandem	Disability, fall, inflammation, mortality

Name of biomarker	Description of biomarker	Health risk outcomes associated with the levels beyond normal limits
Timed walk	Measure of functional capacity	Self-reported health, disability, recurrent falls and inflammation
Vision tests	Measure of impairment of visual functioning (best-corrected visual acuity less than 6/18)	Functional disability, Glaucoma etc
	Body shape	
Body mass index (BMI)	Indicator of the balance between energy intake & energy expenditure	Cardio vascular diseases, diabetes mellitus, stroke, mortality, some cancers, osteoarthritis
Waist-to-hip ratio	Indicator of abdominal obesity	Hypertension, Coronary Heart Diseases, noninsulin dependent diabetes and stroke
	DBS markers	
C-reactive protein	An enzyme in blood: essential for interpretation of several micronutrient biomarker	Predictor of both acute and chronic inflammation
Apo lipoproteins A-1 and B	(Apo B/Apo A-I ratio)Indicator of cholesterol: Apo lipoprotein (apo) B is present in atherogenic lipoproteins, apo A is present in non-atherogenic lipoprotein	Cardiovascular diseases
Epstein-Barr virus (EBV) antibodies	Antibodies for Epstein-Barr virus to detect recent or current infection also an old infection from EBV	Fever, sore throat, and swollen lymph glands
Glycosylated hemoglobin(HbA1c)	Integrated measure of glucose metabolism over the previous 30-90 days	High levels of HbA1c are associated with diabetes mellitus, Cardio vascular diseases, disability and mortality

Sources: Information collected from various research papers

6.2 Physiological Functions

6.2.1 Blood Pressure (Systolic and Diastolic)

Table 6.2 gives mean values of measured systolic and diastolic blood pressure by sex and different socioeconomic characteristics. Mean systolic and diastolic blood pressure varies across the states, with the highest average level for males and females in Punjab, and the lowest for males in Kerala and for females in Karnataka. Rural-urban differences in mean systolic and diastolic blood pressure are more pronounced for females than for males. Overall, older males have higher mean systolic blood pressures while older females have higher diastolic blood pressures. Mean systolic blood pressure is six points higher and mean diastolic blood pressure is four points higher for females in the urban compared with rural areas. Co-residence of older persons with their spouses and children is associated with lowest mean systolic blood pressure. Both male and female older adults with high school and above

education were measured with lower mean systolic and diastolic blood pressure compared with the older adults with no education. Household wealth quintile and monthly consumption expenditure did not indicate much variation in mean systolic and diastolic blood pressure.

Table 6.2: Blood pressure: Mean of measured systolic and diastolic blood pressure by statesand background characteristics, India, LASI-pilot, 2010.

States/Background characteristics	Systolic blood pressure				Diastolic blood pressure			
	Male	**N**	**Female**	**N**	**Male**	**N**	**Female**	**N**
State								
Punjab	140.4	158	135.3	179	90.4	158	87.2	179
Rajasthan	133.2	168	133.5	203	84.4	168	85.1	203
Kerala	131.0	168	129.2	251	81.0	168	84.3	251
Karnataka	131.5	146	127.8	215	83.5	146	84.8	215
Age								
<60	128.6	370	125.5	586	83.6	370	83.8	586
60-74	139.7	213	140.5	201	85.6	213	86.9	201
75+	140.3	57	150.9	60	83.0	57	92.6	60
Residence								
Urban	132.1	162	135.2	251	85.0	162	87.8	251
Rural	133.5	478	128.8	597	84.0	478	84.0	597
Living arrangement								
Living alone	134.9	24	139.5	55	83.6	24	87.0	55
Living with spouse only	140.1	86	134.5	96	85.5	86	86.3	96
Living with children only	139.1	43	139.6	186	84.4	43	89.3	186
Living with spouse & children	131.5	487	125.7	511	84.0	487	83.1	511
Education								
No schooling	133.9	241	130.8	431	83.9	241	84.2	431
Primary/middle	134.8	250	132.4	278	84.9	250	87.3	278
High school & above	129.3	149	126.7	139	83.7	149	83.7	139
Caste								
SC/ST	134.5	167	130.2	211	84.9	167	83.6	211
OBC	132.7	223	130.3	323	83.7	223	86.0	323
Other	132.9	234	131.7	291	84.6	234	85.2	291
Wealth quintile								
Poorest	133.1	94	133.6	110	83.7	94	84.9	110
Poorer	132.0	96	128.3	135	83.1	96	84.4	135
Middle	133.2	103	131.2	150	85.1	103	86.0	150
Richer	135.9	165	128.0	230	84.8	165	84.8	230
Richest	131.5	181	133.2	223	84.2	181	85.3	223
Consumption quintile								
Poorest	134.4	100	133.4	127	84.3	100	84.1	127
Poorer	134.2	126	129.8	165	83.7	126	83.7	165
Middle	134.0	110	134.1	174	83.4	110	87.9	174
Richer	133.4	143	127.3	188	85.2	143	84.4	188
Richest	130.9	160	129.5	194	84.2	160	85.1	194
Total (pooled)	**133.2**	**640**	**130.7**	**848**	**84.2**	**640**	**85.1**	**848**

Table 6.3 presents the percentage of older adults with measured high systolic blood pressure, high diastolic blood pressure, and both high systolic and diastolic blood pressure by states and background characteristics.

Table 6.3: Measured blood pressure: Percentage of older population with high measured systolic, diastolic and both systolic & diastolic blood pressure by states & Background characteristics, India, LASI-pilot, 2010.

States/background characteristics	Systolic hypertension	Diastolic hypertension	Both systolic & diastolic hypertension	N
State				
Punjab	37.9	43.1	29.7	337
Rajasthan	31.5	30.2	19.4	371
Kerala	27.8	24.3	19.1	419
Karnataka	25.8	28.0	18.8	361
Age				
<60	22.0	27.6	16.6	956
60-74	43.1	34.9	27.9	414
75+	46.6	29.8	26.9	117
Sex				
Male	32.5	29.6	21.0	640
Female	27.3	29.9	20.0	848
Residence				
Urban	32.0	33.4	22.7	413
Rural	28.6	28.4	19.6	1,075
Living arrangement				
Living alone	37.1	31.4	25.9	79
Living with spouse only	40.5	36.6	27.1	182
Living with children only	38.5	40.0	29.0	229
Living with spouse & children	25.1	26.1	17.0	998
Education				
No schooling	28.5	26.8	18.5	672
Primary/middle	34.0	33.8	24.5	528
High school & above	24.2	30.1	17.9	288
Caste				
SC/ST	30.4	27.9	20.1	378
OBC	28.3	29.6	19.6	546
Other	30.7	31.8	22.3	525
Wealth quintile				
Poorest	31.4	29.2	22.8	204
Poorer	28.8	25.9	16.2	231
Middle	26.4	28.4	18.8	253
Richer	28.3	29.5	20.5	395
Richest	32.8	34.8	23.5	404
Consumption quintile				
Poorest	35.5	28.2	23.3	227
Poorer	30.0	28.5	20.8	291
Middle	30.8	29.7	20.9	284
Richer	27.8	32.1	19.5	331
Richest	25.5	29.7	18.5	354
Total (pooled)	29.6	29.8	20.5	1,487

Note: limits for high blood pressure

a. Systolic limits: 140 to maximum= Systolic hypertension

b. Diastolic limits: 90 to maximum=Diastolic hypertension

'Systolic and diastolic both' represents persons with both systolic and diastolic Blood pressure.

Overall, 30 percent of the older adults were measured with either high systolic or diastolic blood pressure, while 21 percent had both. Punjab had the highest percentage of high systolic or diastolic blood pressure or both, whereas the prevalence in other states was considerably lower. High blood pressure (systolic, diastolic and systolic & diastolic both)is more prevalent among older adults in urban than in rural areas. The percentage of the older

population measured with high systolic blood pressure more than doubled for oldest persons sampled, in age-group 75 and above, compared with persons in age group less than 60. About a third of older males had high systolic blood pressure compared with one fourth of older females. The prevalence of high systolic blood pressure is much lower among older persons living with spouses and children compared with those living with spouses only or children only. Older adults with a high school and above education had lower prevalence of high measured blood pressure than those without this education.

6.2.2 Lung Function Examination (Spirometry)

In the LASI pilot, a lung function examination has been carried out through spirometry to obtain the markers of airflow obstruction in lung function among the older adults in India. The collected markers are forced vital capacity (FVC), forced expired volume in one second (FEV1), FEV1 as the percentage of FVC (FEV1%), peak expiratory flow (PEF), forced expired flow 25-75 percent (FEF 25-75), and forced expiratory time (FET). These markers have been used as clinically applied physiological measures of respiratory function. Poor respiratory flow is associated with increased mortality from chronic lung disease (Peto*et al*., 1983). More recent evidence suggests that low forced expiratory volume in one second (FEV1) is a risk factor in cardiovascular disease (Persson*et al*., 1986; Cook *et al*., 1988), stroke (Wellin et. al., 1987), and lung cancer (Kullar*et al*., 1990). The strong inverse relations found between mortality and FEV1 in each of these diseases suggest that poor respiratory function has a predictive or even causal role in a wide range of conditions, not limited to the respiratory diseases. In the analysis, we have used only three important markers of lung functions namely FVC, FEV1 and FEV1%.

Table 6.4 presents the mean values of measured indicators of lung function by states, background characteristics, and sex. The indicators presented are Forced Vital Capacity (FVC), Forced Expired Volume in one second (FEV1), and the ratio of FEV1 to FVC expressed as a percentage (FEV1%).

The mean FVC, FEV1, and FEV1% values of lung function varied greatly across states and between males and females. Older adults in Punjab have the highest mean values of FVC—the higher, the better—followed by Kerala for males and Rajasthan for females. However, the mean value of FEV1% is higher for females in Kerala than that for any other state. Mean values of all three lung function indicators showed less pronounced rural-urban differences. Mean values of lung function capacity indicate FVC and FEV1 declined with age for both male and female. Co-residence, socioeconomic characteristics, education, wealth quintile, and consumption expenditure quintile indicate much less variation in mean values of lung function indicators.

Table 6.4: Lung function examination (spirometry) : Mean of measured FVC, FEV1 and FEV1% by sex, States and background characteristics, India, LASI-pilot, 2010.

States/background characteristics	Male				Female			
	FVC	**FEV1**	**FEV1 %**	**N**	**FVC**	**FEV1**	**FEV1 %**	**N**
State								
Punjab	2.3	1.7	74.3	79	1.8	1.2	73.7	80
Rajasthan	1.7	1.2	67.1	95	1.5	1.0	68.8	88
Kerala	1.8	1.2	69.5	139	1.3	1.0	76.1	187
Karnataka	1.6	1.0	68.9	123	1.3	0.9	73.5	170
Age								
<60	1.8	1.2	69.3	278.0	1.4	1.0	74.4	394
60-74	1.6	1.1	71.3	127.0	1.2	0.9	78.5	108
75+	1.4	1.0	70.7	30.0	1.1	0.9	79.2	21
Residence								
Urban	1.7	1.1	68.8	122	1.3	0.9	72.6	157
Rural	1.7	1.2	69.3	314	1.4	1.0	73.5	368
Living arrangement								
Living alone	1.6	1.0	64.0	14	1.3	1.0	72.4	30
Living with spouse only	1.7	1.2	71.8	57	1.2	0.9	75.1	53
Living with children only	1.5	1.0	66.9	24	1.4	1.0	73.2	111
Living with spouse & children	1.7	1.2	69.0	341	1.4	1.0	73.1	331
Education								
No schooling	1.7	1.2	69.9	125	1.4	1.0	72.1	214
Primary/middle	1.7	1.2	69.1	197	1.3	1.0	74.9	206
High school & above	1.7	1.1	68.1	114	1.3	0.9	72.9	105
Caste								
SC/ST	1.6	1.2	70.1	97	1.4	1.0	72.4	115
OBC	1.7	1.1	67.3	168	1.3	0.9	74.1	217
Other	1.8	1.3	70.6	159	1.5	1.0	72.9	180
Wealth quintile								
Poorest	1.6	1.1	67.9	59	1.5	1.0	75.7	57
Poorer	1.6	1.0	66.6	58	1.3	0.9	69.8	71
Middle	1.6	1.2	72.6	69	1.4	1.0	74.9	99
Richer	1.9	1.3	70.5	117	1.3	0.9	73.5	151
Richest	1.8	1.2	67.8	133	1.4	1.0	72.7	147
MPCE quintile								
Poorest	1.6	1.2	73.8	63	1.3	1.0	74.6	73
Poorer	1.7	1.2	69.6	82	1.4	1.0	75.5	101
Middle	1.8	1.1	64.1	70	1.4	1.0	71.4	103
Richer	1.8	1.2	69.5	98	1.3	1.0	74.5	121
Richest	1.7	1.2	68.7	123	1.4	1.0	71.1	127
Total (pooled)	1.7	1.2	69.1	436	1.4	1.0	73.3	525

Note:

1. FVC (Forced Vital Capacity) - FVC is the maximum volume exhaled or expired after maximum inspiration (inhalation) during a forced maneuver.
2. FEV1 (Forced expired volume in one second) – FEV1 is the volume of air expired in the first second of maximal expiration after a maximal inspiration and is a useful measure of how quickly full lungs can be emptied.
3. FEV1%- FEV1/FVC is the FEV1 expressed as the percentage of FVC and gives a clinically useful index of airflow limitation

Table 6.5 presents percentage distribution of older adults by different levels of chronic obstructions in lung function for selected background characteristics. The level of chronic obstruction in lung functions was categorized into four measurable levels: normal, mild, moderate, and severe according to WHO classification.

Overall, about 40 percent of older adults suffer from chronic obstruction in lung function with different levels of severity: mild, moderate, or severe. Among the states, the overall prevalence of chronic obstruction in lung functions was highest in Rajasthan (45 percent) and the lowest in Punjab (36 percent). Chronic obstruction in lung functions was more prevalent among older males (47 percent) than older females (36 percent). Separating out the mild cases, Karnataka had the highest percent of the older population with severe (16 percent) and moderate (13 percent) chronic obstruction in lung functions while Punjab had the lowest prevalence of severe (9 percent) and moderate (11 percent). Urban areas had much higher prevalence (17 percent) of the older population with severe chronic obstruction in lung function than do rural areas (12 percent). However, rural areas had a higher prevalence of older persons with mild and moderate obstruction (16 percent and 13 percent respectively) than urban areas (14 percent and 11 percent, respectively).

The prevalence of mild chronic obstruction in lung function increased with age. Mild and moderate chronic obstructions in lung functions were more prevalent among older males than among older females, whereas severe chronic obstruction was more prevalent among females (14 percent) than among males (13 percent)..Socioeconomic characteristics, education, caste, wealth quintile, and consumption expenditure quintile indicated less pronounced differences in chronic obstructions in lung function.

Table 6.5: Lung functions (chronic obstruction):Percentage of older population with specific level of chronic obstruction in lung functions by states and background Characteristics, India, LASI-pilot, 2010.

States/background characteristics	Normal	Mild	Moderate	Severe	N
State					
Punjab	64.1	16.4	10.7	8.8	159
Rajasthan	54.7	19.1	10.9	15.3	183
Kerala	61.8	15.5	11.4	11.3	326
Karnataka	58.7	12.3	13.3	15.7	293
Age					
<60	61.8	13.6	11.1	13.5	672
60-74	58.6	16.4	12.3	12.8	235
75+	63.2	14.9	15.6	6.4	51
Sex					
Male	52.6	19.8	14.2	13.4	436
Female	64.5	11.2	10.2	14.1	525
Residence					
Urban	58.3	13.8	10.6	17.3	279
Rural	59.4	15.6	12.6	12.4	682
Living arrangement					
Living alone	55.2	11.0	21.0	12.8	44
Living with spouse only	58.5	18.6	9.9	13.1	110
Living with children only	59.2	13.5	11.7	15.6	135
Living with spouse & children	59.4	15.1	11.9	13.7	672
Education					
No schooling	59.6	15.4	12.9	12.2	339
Primary/middle	60.1	13.3	11.8	14.8	403
High school & above	56.5	17.8	10.7	15.0	219
Caste					
SC/ST	59.7	16.4	13.3	10.6	212
OBC	58.0	13.2	11.9	16.9	385
Other	60.6	16.8	10.8	12.0	339
Wealth quintile					
Poorest	57.2	22.0	12.1	8.7	116
Poorer	55.0	11.5	13.9	19.6	129
Middle	67.3	12.0	9.7	11.0	168
Richer	59.5	12.8	14	13.8	268
Richest	55.9	18.2	10.5	15.4	280
Consumption quintile					
Poorest	66.4	15.4	8.2	10.1	136
Poorer	60.5	15.8	10.2	13.6	183
Middle	58.3	12.4	15.1	14.2	173
Richer	58.6	16.2	11.0	14.3	219
Richest	54.5	15.4	14.6	15.6	250
Total (pooled)	**59.1**	**15.1**	**12.0**	**13.8**	**961**

Note: Normal-FEV1/FVC>=70;Mild- FEV1/FVC<70% & FEV1>=.8 of predicted FEV1; Modetrate-FEV1/FVC<70% & .5<=FEV1<.8 of predicted FEV1; Severe- FEV1/FVC<70% & .3<=FEV1<.5 of predictedFEV1;Very severe- FEV1/FVC<70% & FEV1<.3 of predicted FEV1;
In the table severe and very severe have been clubbed together to form severe category.
The classification is according to the guidelines of National institute for clinical excellence (NICE) guidelines.

6.3 Physical Functions

6.3.1 Grip Strength

Grip strength is a widely used indicator of physical functions and represents various features of the ageing process and elderly health. Several studies have shown it to be strongly associated with the muscle strength and functional ability of the ageing individuals (Giampaou*et al*., 1999; Rantanen*et al.*, 1999). Studies have also revealed that grip strength is a predictor of morbidity and mortality (Snih*et al*., 2002). It has also been used as an indicator of frailty. In the LASI pilot survey 'grip strength' has been used as a marker of physical functional ability, and it has also been used as a marker of physical capacity to carry out everyday functions, such as raising the body weight or holding heavy objects. The grip strength has been measured in kilograms for both hands. Table 6.6 presents the mean of measured grip strength in kilograms for both hands and sex by different background characteristics.

Measured grip strength for males and females indicates significant variations by states and socioeconomic characteristics. Measured mean grip strength for males was highest (both hands) for respondents in Kerala followed by Karnataka, but mean grip strength for females was higher for respondents in Karnataka. Measured mean grip strength for both females and males was higher for older adults in urban than in rural areas. Age is a strong gradient for measured mean grip strength. Mean measured grip strength of both males and females fell by a third in age group 75 and above, compared with those 45 to 60 years in age. Measured mean grip strength was much higher for older adults residing with their spouses and children compared with those living alone and living children only.

Measured grip strength function improved with the education of older adults. Grip strength function improved significantly with economic status of the household (wealth quintile and consumption expenditure quintile). Measured mean grip strength function improved sharply for older adults of richer wealth and expenditure quintiles compared with those in poorer wealth and expenditure quintiles..

Table 6.6: Grip strength; Mean of measured grip strength in kilograms for both hands by states and Background characteristics, India, LASI-pilot, 2010.

States/background characteristics	Left hand				Right hand			
	Male	**N**	**Female**	**N**	**Male**	**N**	**Female**	**N**
State								
Punjab	23.3	150	16.5	168	25.6	150	18.7	167
Rajasthan	17.9	165	12.5	196	19.9	166	13.5	196
Kerala	26.6	158	17.4	225	27.8	159	18.7	222
Karnataka	25.8	145	17.7	208	27.2	145	19.2	209
Age								
<60	25.4	358	17.3	566	27.3	359	18.8	564
60-74	20.3	205	13.0	181	21.7	205	14.1	180
75+	16.8	55	9.7	49	18.0	56	10.6	49
Residence								
Urban	24.4	157	16.3	228	26.3	158	18.0	229
Rural	22.6	461	15.8	569	24.2	462	17.0	565
Living arrangement								
Living alone	19.5	22	14.0	50	20.1	23	15.5	50
Living with spouse only	22.6	84	16.0	91	23.2	84	17.4	91
Living with children only	18.7	40	13.9	169	19.2	40	14.7	167
Living with spouse & children	23.5	472	16.8	487	25.6	473	18.4	486
Education								
No schooling	18.6	234	14.4	411	20.4	235	15.5	411
Primary/middle	25.6	243	17.6	256	27.2	242	19.1	252
High school & above	26.6	141	18.2	130	28.1	143	20.1	131
Caste								
SC/ST	19.5	162	14.6	201	21.9	163	15.8	202
OBC	25.0	219	16.4	297	26.9	218	18.1	296
Other	23.4	222	16.5	277	24.2	224	17.7	274
Wealth quintile								
Poorest	16.8	91	13.9	111	18.7	92	14.8	111
Poorer	20.5	95	13.8	130	22.5	95	15.2	130
Middle	23.5	99	16.2	136	24.8	100	17.6	136
Richer	25.6	152	17.3	210	27.5	153	18.7	207
Richest	26.9	180	17.6	210	28.4	179	19.5	210
Consumption quintile								
Poorest	16.3	92	12.6	123	18.4	92	13.7	122
Poorer	21.6	121	16.7	152	23.1	120	17.8	151
Middle	24.1	105	15.7	160	26.3	107	17.0	160
Richer	23.8	139	16.4	179	25.5	139	18.0	179
Richest	27.4	160	17.6	183	28.5	161	19.3	182
Total (pooled)	**23.0**	**618**	**15.9**	**797**	**24.7**	**620**	**17.3**	**794**

6.3.2 Vision

Visual function has an important role in the quality of life in older ages as it has been proved to be an important predictor of functional and cognitive abilities among the elderly population. Results from a number of studies indicate that visual impairment is associated with a higher prevalence of chronic health condition (Crews *et al.*, 2006), death (Lee *et al*., 2002), falls and injuries (Ivers*et al.*, 2000), depression (Jones *et al.,* 2009), and social isolation (Horowitz, 2003). In the LASI pilot survey, both distance and near visual acuity have been measured for the elderly for both eyes.

Table 6.7 presents the percentages of older adults with low measured near and distance visual acuity by states and background characteristics. Overall, about 29 percent of older adults have low distance vision acuity and 61 percent have low near vision acuity. Among states, Karnataka has a high prevalence of low vision for both distance (32 percent) and near vision (66 percent) while the difference in the prevalence of low vision acuity among the other three states is not profound. Urban areas have a slightly lower prevalence of low distance vision compared with the rural areas, while urban areas have a higher prevalence of near low vision.

Age is a prominent factor affecting visual acuity; prevalence of both low near and low distance vision increased with age. Sex differential in the prevalence of low vision is not very pronounced. Older adults living with their spouses and children both have the lowest prevalence of both low near and low distance vision. Socioeconomic characteristics of education, wealth quintiles, and consumption quintiles show negative gradients in the prevalence of low distance and near vision.

Table 6.7: Percent of population with measured low distance and near vision by state and background characteristics, India, LASI-pilot, 2010.

States/background characteristics	Measured low vision		N
	Distance	**Near**	
State			
Punjab	26.7	58.0	321
Rajasthan	29.5	56.9	355
Kerala	26.5	62.8	413
Karnataka	32.1	66.4	315
Age			
<60	22.8	60.5	918
60-74	38.2	61.6	385
75+	55.8	70.2	100
Sex			
Male	30.0	60.9	612
Female	28.6	61.8	792
Residence			
Urban	27.4	62.7	375
Rural	29.9	61.0	1029
Living arrangement			
Living alone	28.3	63.1	69

States/background characteristics	Distance	Near	N
Living with spouse only	31.5	66.1	177
Living with children only	42.4	64.5	200
Living with spouse & children	26.2	59.9	958
Education			
No schooling	32.8	61.6	620
Primary/middle	29.9	63.0	508
High school & above	18.9	58.2	276
Caste			
SC/ST	32.5	57.1	354
OBC	29.3	63.3	512
Other	26.9	62.8	503
Wealth quintile			
Poorest	33.5	58.1	199
Poorer	35.2	64.8	212
Middle	26.3	62.4	233
Richer	25.6	64.1	371
Richest	27.2	57.9	388
Consumption quintile			
Poorest	42.2	70.1	210
Poorer	28.2	62.6	282
Middle	31.3	60.4	260
Richer	24.4	59.0	305
Richest	23.2	57.3	346
Total (pooled)	**29.2**	**61.4**	**1404**

Note: Low vision include blind vision
Limits for low vision: a person has low measured distance or near visionif measured visual acuity is .25 or less for either of the eye (left or right).

6.4 Body Shape

6.4.1 Height, Weight and Body Mass Index (BMI)

Body Mass Index (BMI) is an indicator of obesity and is probably the earliest and most widely used biomarker in social science research. Obesity is associated with metabolic risk factors—such as high blood pressure, blood fat abnormality, and glucose intolerance—which may influence the morbidity and mortality of cardiovascular diseases (Folsom *et al.*, 1994; Lapidus*et al.*, 1984; Larsson *et al.*, 1984; McKeigue*et al.*, 1991). It has been proved that both excess fat and accelerated loss of lean body mass are associated with the acute and chronic conditions and subsequent mortality (Allison *et al.* 1997; Seidell and Visscher 2000).

Table 6.8 presents the means of measured height, weight, and body mass index (BMI) of the respondents by states, selected background characteristics, and sex. Comparative assessment of height, weight, and BMI indicates that mean height and weight are higher for males than for females while mean BMI values are significantly higher for females than males. This pattern is found across all four states and socioeconomic characteristics indicating overall higher obesity risk for older females than males.

Table 6.8 Height, weight and body mass index (Mean of height, weight and body mass index (BMI)) By sex, states and background characteristics, India, LASI-pilot, 2010.

States/background characteristics	Height				Weight				Body mass index (BMI)			
	Male	**N**	**Female**	**N**	**Male**	**N**	**Female**	**N**	**Male**	**N**	**Female**	**N**
State												
Punjab	167.9	162	155.4	183	69.9	159	63.4	179	24.8	159	26.3	179
Rajasthan	164.3	180	153.1	211	56.0	177	52.3	200	20.8	177	22.3	200
Kerala	163.4	169	151.2	255	62.8	168	57.2	253	23.6	168	25.0	253
Karnataka	164.0	151	152.6	219	60.0	150	56.1	218	22.3	150	24.1	218
Age												
<60	165.4	383	153.5	600	61.7	377	56.9	589	22.5	377	24.2	589
60-74	163.2	220	151.6	204	59.6	218	55.4	198	22.4	218	24.1	198
75+	163.4	59	149.0	63	57.1	59	50.3	62	21.4	59	22.7	62
Residence												
Urban	164.8	166	153.2	257	64.3	163	59.7	249	23.6	163	25.4	249
Rural	164.4	496	152.6	611	59.4	491	54.7	601	22.0	491	23.5	601
Living arrangement												
Living alone	164.9	24	150.4	55	60.4	24	56.8	52	22.3	24	25.1	52
Living with spouse only	164.4	89	151.8	98	62.0	89	56.1	97	22.9	89	24.3	97
Living with children only	161.8	45	151.3	189	56.2	45	54.8	184	21.5	45	23.9	184
Living with spouse & children	164.7	504	153.7	526	60.7	496	56.6	517	22.4	496	24.0	517
Education												
No schooling	163.6	254	152.8	441	55.6	252	53.2	430	20.8	252	22.8	430
Primary/middle	164.4	257	152.1	283	61.9	253	58.1	279	22.9	253	25.1	279
High school & above	166.3	151	153.7	144	67.6	149	62.1	141	24.4	149	26.2	141
Caste												
SC/ST	162.3	176	151.9	217	55.3	175	52.6	214	21.0	175	22.8	214
OBC	164.6	233	152.7	328	61.6	229	56.7	321	22.8	229	24.3	321
Other	166.5	237	153.6	300	64.2	234	58.8	293	23.1	234	24.9	293
Wealth quintile												
Poorest	162.3	100	152.2	116	52.4	98	50.1	113	20.0	98	21.6	113
Poorer	163.9	102	152.5	137	56.7	102	53.1	135	21.1	102	22.8	135
Middle	164.3	108	152.6	152	59.8	108	55.5	149	22.2	108	23.8	149
Richer	164.3	167	152.3	235	63.1	164	56.9	231	23.4	164	24.5	231
Richest	167.3	184	154.0	228	68.5	181	63.2	222	24.4	181	26.6	222
Consumption quintile												
Poorest	163.2	102	152.6	132	55.1	99	53.2	126	20.8	99	22.8	126
Poorer	162.5	132	151.9	170	58.2	131	53.9	168	22.1	131	23.4	168
Middle	163.9	116	151.9	174	59.5	116	54.8	173	22.1	116	23.8	173
Richer	165.4	145	153.1	191	62.9	143	57.0	189	23.0	143	24.3	189
Richest	166.7	166	154.1	201	65.2	164	60.7	194	23.4	164	25.6	194
Total (pooled)	**165**	**662**	**152.7**	**868**	**60.6**	**653**	**56.1**	**850**	**22.4**	**653**	**24.0**	**850**

Note:
1. Height is measured in centimeters; weight is measured in kilograms
2. BMI= weight (kg)/height(meters)^2

By states, mean height, weight, and BMI values are much higher for both males and females in Punjab than that in other states. Rural-urban differences in mean height are less pronounced. The mean heights of both males and females increased with education, wealth, and consumption expenditure quintile. Variations in mean weight and height of both males and females are more pronounced across states and by background characteristics. The mean weight for males and females in Punjab is notably high with 70 kg and 63kg, respectively, while older persons in Rajasthan have the lowest mean weight. Mean weight was higher by 5 kg for older adults in urban compared with that of rural areas. The mean weights of both the male and

female older populations increased significantly with education, wealth quintiles, and consumption quintiles, indicating strong positive gradient of socioeconomic characteristics on measured weight of both males and females.

Table 6.9 Body mass index (Percent of population with specific level of BMI by state and background characteristics), India, LASI-pilot, 2010

States/background characteristics	Male			Female			Total		
	Under weight /normal	**Over weight /obese**	**N**	**Under weight /normal**	**Over weight /obese**	**N**	**Under weight /normal**	**Over weight /obese**	**N**
State									
Punjab	54.8	45.2	159	39.0	61.0	179	46.4	53.6	338
Rajasthan	92.6	7.4	177	83.4	16.6	200	87.8	12.3	377
Kerala	72.9	27.1	168	55.8	44.2	253	62.7	37.3	421
Karnataka	78.7	21.4	150	68.3	31.7	218	72.5	27.5	368
Age									
<60	78.5	21.5	377	64.8	35.2	589	70.1	29.9	966
60-74	78.5	21.6	218	66.5	33.5	198	72.8	27.2	416
75+	82.8	17.2	59	81.0	19.0	62	81.9	18.2	121
Residence									
Urban	67.2	32.8	163	51.7	48.3	249	57.9	42.2	412
Rural	82.6	17.4	491	72.0	28.0	601	76.8	23.3	1092
Living arrangement									
Living alone	82.6	17.4	24	50.3	49.7	52	60.4	39.7	76
Living with spouse only	65.3	34.7	89	60.0	40.0	97	62.5	37.5	186
Living with children only	79.4	20.7	45	71.6	28.4	184	73.0	27.0	229
Living with spouse & children	80.9	19.1	496	67.0	33.0	517	73.9	26.1	1013
Education									
No schooling	90.6	9.4	252	80.9	19.1	430	84.5	15.5	682
Primary/middle	76.6	23.4	253	53.2	46.8	279	64.3	35.7	532
High school & above	61.3	38.7	149	41.8	58.2	141	52.1	47.9	290
Caste									
SC/ST	86.1	13.9	175	84.0	16.0	214	85.0	15.0	389
OBC	80.0	20.0	229	62.5	37.5	321	69.8	30.3	550
Other	69.7	30.3	234	55.2	44.8	293	61.7	38.3	527
Wealth quintile									
Poorest	95.1	4.9	98	90.7	9.4	113	92.7	7.3	211
Poorer	88.3	11.7	102	80.9	19.1	135	84.0	16.0	237
Middle	83.0	17.0	108	68.6	31.4	149	74.6	25.4	257
Richer	72.9	27.1	164	61.4	38.6	231	66.2	33.9	395
Richest	61.3	38.7	181	37.9	62.1	222	48.5	51.6	403
Consumption quintile									
Poorest	89.2	10.8	99	79.0	21.0	126	83.6	16.4	225
Poorer	81.2	18.8	131	70.3	29.7	168	75.0	25.0	299
Middle	82.3	17.7	116	72.3	27.7	173	76.2	23.9	289
Richer	76.4	23.6	143	62.9	37.1	189	68.7	31.3	332
Richest	69.6	30.4	164	50.6	49.4	194	59.3	40.7	358
Total (pooled)	**78.9**	**21.2**	**654**	**66.3**	**33.7**	**850**	**71.7**	**28.3**	**1504**

Note: Underweight= Minimum to 18.4; Normal=18.5 to 24.9; 25 to 29.9=overweight; 30 to maximum=Obese
In this study we have clubbed Underweight and Normal Into one category and Overweight and Obese into one category.
Classification is according to guidelines of WHO Expert Committee on *Physical Status: the use and interpretation of anthropometry,1995*

Table 6.9 presents percentage distribution of population by classification of BMI level by states and selected background characteristics of the population. The BMI values have been categorized into four categories: underweight, normal, overweight, and obese based on WHO standards of classification. Table 6.9 presents results by merging underweight and normal into one category and overweight and obese into another, because of fewer samples in the individual categories. This is also consistent with our focus on BMI levels above certain limits, which lead to metabolic complications. Results are presented for male, female, and total populations according to BMI classification.

Overall, 28 percent of older people fall into the overweight/obese category, with a much higher level in urban areas (42 percent) than in rural areas (23 percent).By states, the percentage distribution of older adults by BMI levels shows considerable variation, with Rajasthan having the lowest proportion of older persons categorized as overweight/obese (7 percent males; 17 percent females, and 12 percent of total population) while Punjab has the highest percent of overweight/obese individuals in the older population (45 percent males, 61 percent females, and 54 percent of total population). The overweight/obesity prevalence is more than 50 percent higher for females (34 percent) compared with males (21 percent).

Socioeconomic characteristics display strong positive gradients of overweight/obese prevalence. Almost two-thirds of females with high school and above education are overweight/obese. More than a third of males are overweight/obese in the upper socioeconomic stratum. Seventeen percent of older adults living alone are overweight or obese while 50 percent of older females are overweight or obese. Older males living with their spouses only have the highest (35 percent) prevalence of overweight/obese followed by those males living with children only (21 percent) and those males living with spouse and children both (19 percent). The results indicate strong positive socioeconomic gradients for overweight/obesity prevalence for both males and females. However, the socioeconomic gradient is stronger for older females than older males.

6.4.2 Waist Circumference, Hip Circumference, and Waist-Hip Ratio

BMI is a widely used biomarker but it does not take into account the distribution of body fat resulting in an imperfect picture of risks for metabolic complications (Seeman*et al.*, 1997). Sometimes, waist circumference (WC) is preferred to BMI as a predictor for cardiovascular risk (Dagenais*et al.*, 2005) and other adiposity-related conditions. Many studies have shown that waist circumference and waist-hip ratio are better indicators of obesity as they account for regional abdominal adiposity and are better to predict obesity related diseases (Ducimetiere, Richard, Cambien, Avous, & Jacqueson; National Heart, Lung, and Blood Institute, 1998). However, there is no consensus yet, as some studies have shown that both of these can equally predict the risks of obesity related diseases.

Table 6.10: Waist and hip circumference and waist-hip ratio (Mean of measured waist and hip circumference and waist-hip ratio) by states and background characteristics, India, LASI-pilot, 2010.

States/background characteristics	Waist circumference				Hip circumference				Waist-hip ratio			
	Male	**N**	**Female**	**N**	**Male**	**N**	**Female**	**N**	**Male**	**N**	**Female**	**N**
State												
Punjab	91.1	153	90.6	170	95.0	154	97.7	172	0.96	150	0.93	167
Rajasthan	80.0	179	78.5	209	88.0	180	90.1	207	0.91	179	0.87	206
Kerala	87.8	169	89.5	252	90.4	166	94.4	248	0.97	166	0.95	246
Karnataka	83.3	147	81.4	214	88.5	148	93.1	213	0.94	146	0.88	212
Age												
<60	84.1	371	83.3	584	89.8	374	93.5	582	0.94	367	0.89	576
60-74	84.6	218	85.0	199	89.5	217	93.0	196	0.94	217	0.91	193
75+	83.3	59	80.4	61	88.8	57	88.8	61	0.94	57	0.91	61
Residence												
Urban	88.9	157	87.0	245	92.2	160	96.3	246	0.97	156	0.90	240
Rural	82.7	491	82.1	600	88.8	488	91.7	594	0.93	485	0.89	591
Living arrangement												
Living alone	83.4	24	86.1	51	88.6	24	94.6	52	0.94	24	0.91	50
Living with spouse only	88.3	85	84.7	97	90.7	86	92.8	95	0.97	84	0.91	94
Living with children only	80.9	43	82.6	182	87.4	43	92.4	183	0.93	42	0.89	180
Living with spouse & children	83.8	496	83.3	515	89.6	495	93.2	510	0.94	491	0.89	507
Education												
No schooling	79.5	249	79.1	425	86.7	249	90.7	423	0.92	248	0.87	418
Primary/middle	85.6	253	87.4	279	90.2	251	94.9	277	0.95	249	0.92	274
High school & above	90.2	146	90.6	141	93.8	148	97.4	140	0.96	144	0.93	139
Caste												
SC/ST	78.6	173	77.1	210	86.0	175	89.4	208	0.92	173	0.87	206
OBC	85.3	229	84.2	322	90.0	228	93.4	321	0.95	226	0.90	319
Other	87.7	231	88.3	290	92.4	230	95.9	289	0.95	228	0.92	284
Wealth quintile												
Poorest	76.4	100	74.0	116	85.3	100	86.2	115	0.90	100	0.86	115
Poorer	80.0	100	79.3	134	87.5	102	91.5	134	0.91	100	0.87	133
Middle	83.1	106	80.7	149	88.2	104	92.0	146	0.94	104	0.88	146
Richer	86.9	163	87.5	224	90.4	162	94.4	225	0.96	162	0.93	220
Richest	92.1	178	92.6	222	95.1	179	99.2	220	0.97	174	0.94	217
Consumption quintile												
Poorest	78.7	101	78.4	129	86.5	102	89.8	130	0.91	101	0.88	128
Poorer	81.9	127	81.8	167	88.6	129	90.8	167	0.93	127	0.90	166
Middle	82.5	113	81.5	168	88.2	110	92.4	165	0.94	110	0.88	163
Richer	86.6	144	84.9	186	91.6	145	94.6	185	0.94	144	0.90	184
Richest	89.0	162	89.3	195	91.9	161	96.5	193	0.97	158	0.93	190
Total (pooled)	**84.2**	**647**	**83.5**	**845**	**89.6**	**648**	**93.0**	**840**	**0.94**	**640**	**0.90**	**831**

Note: Waist and hip circumference are given in centimeters.

Table 6.10 presents mean waist circumference, hip circumference, and waist-hip ratio by sex and selected background characteristics. Mean waist circumference, hip circumference, and waist-hip ratio indicate variations across the states and by background characteristics. Men have slightly higher mean waist circumferences than do women, but women have much higher mean hip-circumference leading to higher waist-to-hip ratio for men compared to women. Among states, men and women in Punjab have the highest mean waist circumference (91 cm for male and 91 cm for female) followed by men and women in Kerala (88 cm for male and 90 cm for female). Men and women in Rajasthan have the lowest mean waist and hip

circumferences. However, the mean waist-hip ratio is highest for both men (0.97) and women (0.95) in Kerala followed by men (0.96) and women (0.93) in Punjab. Men and women in Rajasthan have the lowest mean waist-hip ratio (0.91 for males and 0.87 for females). Pronounced rural-urban differentials are indicated in mean waist and hip circumferences as the older population in urban areas has much higher mean waist and hip circumferences compared with those of rural areas both for older males and females. Age variations are not pronounced in the mean waist circumference, hip circumference, and waist-hip ratio for either males or females. Co-residence also did not appear to impact waist circumferences, hip circumferences, or waist-hip ratio for either male or female.

Socioeconomic indicators of education, wealth quintiles, and consumption quintiles indicate strong positive gradients for the waist circumference, hip circumference, and waist-hip ratio for males and females. Mean values of waist circumference, hip circumference, and waist-hip ratio for males and females increased remarkably with education, wealth quintile, and consumption quintile.

Table 6.11: Waist circumference: Percent distribution of older population with specific level of waist-circumference by sex, states and background characteristics, India, LASI-pilot, 2010.

States/background characteristics	Male			Female			Total		
	Low risk	**High risk**	**N**	**Low risk**	**High risk**	**N**	**Low risk**	**High risk**	**N**
State									
Punjab	77.8	22.2	153	40.5	59.5	170	58.1	41.9	323
Rajasthan	96.1	3.9	179	77.5	22.6	209	86.0	14.0	388
Kerala	89.5	10.5	169	42.0	58.0	252	61.2	38.8	421
Karnataka	91.8	8.2	147	73.8	26.2	214	81.2	18.9	361
Age									
<60	91.3	8.7	371	63.7	36.4	584	74.4	25.6	955
60-74	89.7	10.3	218	60.6	39.4	199	75.7	24.3	417
75+	93.3	6.8	59	73.6	26.4	61	83.3	16.7	120
Residence									
Urban	85.0	15.0	157	51.8	48.2	245	64.8	35.2	402
Rural	92.8	7.2	491	68.3	31.8	600	79.2	20.8	1,091
Living arrangement									
Living alone	95.0	5.0	24	57.3	42.7	51	69.3	30.7	75
Living with spouse only	80.9	19.1	85	55.8	44.2	97	67.3	32.8	182
Living with children only	95.6	4.4	43	71.9	28.2	182	75.9	24.1	225
Living with spouse & children	92.0	8.0	496	62.7	37.3	515	77.1	22.9	1,011
Education									
No schooling	96.2	3.8	249	77.0	23.0	425	84.0	16.0	674
Primary/middle	90.0	10.0	253	51.5	48.6	279	69.7	30.3	532
High school & above	82.8	17.2	146	42.1	57.9	141	63.4	36.6	287
Caste									
SC/ST	94.8	5.2	173	80.7	19.3	210	87.0	13.0	383
OBC	91.9	8.1	229	64.6	35.4	322	75.9	24.1	551
Other	85.5	14.5	231	47.4	52.6	290	64.4	35.6	521

States/background characteristics	Male			Female			Total		
	Low risk	**High risk**	**N**	**Low risk**	**High risk**	**N**	**Low risk**	**High risk**	**N**
Wealth quintile									
Poorest	100.0	NA	100	90.7	9.3	116	95.0	5.0	216
Poorer	95.8	4.2	100	79.2	20.8	134	86.1	13.9	234
Middle	92.5	7.5	106	74.1	25.9	149	81.8	18.3	255
Richer	89.4	10.6	163	53.1	46.9	224	68.3	31.7	387
Richest	79.7	20.3	178	30.9	69.1	222	52.7	47.3	400
Consumption quintile									
Poorest	97.8	2.2	101	77.6	22.4	129	86.6	13.4	230
Poorer	96.2	3.8	127	69.2	30.8	167	80.8	19.2	294
Middle	93.6	6.4	113	71.0	29.0	168	79.8	20.2	281
Richer	84.3	15.7	144	60.0	40.0	186	70.5	29.5	330
Richest	85.8	14.2	162	44.7	55.3	195	63.4	36.6	357
Total (pooled)	**90.9**	**9.1**	**648**	**63.6**	**36.4**	**845**	**75.4**	**24.6**	**1,493**

Notes: waist circumference limits
For females- min to 87=low risk; 88 to maximum high risk
For males- min to 101=low risk; 102 to maximum high risk
NA- Not available
Classification is according to guidelines of WHO Expert Committee on *Physical Status: the use and interpretation of anthropometry, 1995*

Table 6.11 presents the percent distribution of older population by specific levels of the waist circumference (an indicator of risk for metabolic complication) for males, females, and total populations by states and selected background characteristics. The waist circumference has been categorized into low risk and high risk categories according to the pre-defined limits of waist circumference set by WHO. These limits are different for elderly males and females.

Overall, 25 percent of older people fall into the high risk category of waist circumference. By states, the largest percentages of older males and females in the high risk category of waist circumference are found in Punjab (22 percent male and 60 percent female) followed by Kerala, with the lowest prevalence in Rajasthan. Sex differentials are highly pronounced in high risk waist circumference. The proportion of females in high risk group is four times higher (36 percent) compared with that of males (9 percent). Almost 60 percent of females in Punjab are in the high risk category of waist circumference, not much more than the 58 percent of females in Kerala in that category. The proportion of males and females in the high risk category of waist circumference shows variation by living arrangement. Older adults living with their spouses only have the highest percentage in the high risk waist circumference category and those living with children only have lowest percentage in the high risk category. Almost half (43 percent) of females living alone are in the high risk waist circumference category, and those living with children only have a lower prevalence of high risk categorization for waist circumferences. Socioeconomic indicators of education, wealth quintiles, and consumption quintiles indicate strong positive gradients with the high risk category in waist circumference. The proportion of high risk males and females in waist circumference increased sharply with education, wealth quintile, and consumption quintile. The proportion of high risk females (waist circumference) rose by seven times from the poorest (9 percent) to richest (69 percent) wealth quintiles.

Table6.12: Waist-hip ratio (Percentage distribution of population with specific levels of Waist-hip ratio) By states and background characteristics, India, LASI-pilot, 2010.

States /background characteristics	Male				Female				Total			
	Low risk	**Moderate risk**	**High risk**	**N**	**Low risk**	**Moderate risk**	**High risk**	**N**	**Low risk**	**Moderate risk**	**High risk**	**N**
State												
Punjab	46.0	25.4	28.6	150	7.2	6.6	86.2	167	25.5	15.5	59.0	317
Rajasthan	73.7	14.0	12.3	179	19.4	19.9	60.7	206	44.6	17.2	38.2	385
Kerala	38.7	33.8	27.5	166	2.3	5.9	91.8	246	17.1	17.2	65.8	412
Karnataka	63.7	11.6	24.7	146	25.0	23.6	51.4	212	40.8	18.7	40.5	358
Age												
<60	61.3	18.8	20.0	367	16.6	18.5	64.9	576	34.0	18.6	47.4	943
60-74	57.7	18.2	24.2	217	13.9	11.0	75.1	193	36.9	14.8	48.3	410
75+	55.5	22.6	21.9	57	15.4	13.0	71.6	61	34.8	17.7	47.6	118
Residence												
Urban	48.8	19.7	31.5	156	11.2	18.0	70.8	240	26.1	18.7	55.3	396
Rural	63.0	18.6	18.4	485	17.8	15.8	66.4	591	38.0	17.1	45.0	1,076
Living arrangement												
Living alone	44.8	32.8	22.4	24	7.0	11.0	82.0	50	19.2	18.1	62.7	74
Living with spouse only	49.6	19.2	31.2	84	13.5	11.8	74.8	94	30.2	15.2	54.7	178
Living with children only	70.0	16.0	14.1	42	22.2	13.1	64.7	180	30.2	13.6	56.2	222
Living with spouse & children	61.1	18.4	20.5	491	15.0	19.0	66.0	507	37.8	18.7	43.5	998
Education												
No schooling	68.3	15.3	16.4	248	23.3	19.3	57.4	418	39.9	17.8	42.3	666
Primary /middle	55.6	19.9	24.5	249	8.9	13.5	77.6	274	31.1	16.6	52.4	523
High school& above	50.3	23.7	26.0	144	4.9	12.3	82.8	139	28.7	18.3	53.0	283
Caste												
SC/ST	67.0	18.8	14.3	173	29.7	16.0	54.3	206	46.5	17.3	36.3	379
OBC	59.1	15.3	25.6	226	14.1	20.5	65.4	319	32.7	18.3	49.0	545
Other	53.9	24.1	22.0	228	7.0	10.4	82.6	284	28.0	16.5	55.4	512
Wealth quintile												
Poorest	75.4	12.0	12.5	100	24.9	22.2	52.9	115	48.4	17.5	34.1	215
Poorer	75.5	14.9	9.6	100	25.3	21.6	53.1	133	46.3	18.8	35.0	233
Middle	62.1	15.8	22.2	104	23.0	18.1	58.9	146	39.2	17.1	43.7	250
Richer	49.6	21.6	28.8	162	6.6	13.4	80.0	220	24.7	16.9	58.5	382
Richest	41.4	27.7	30.9	174	4.7	9.0	86.3	217	21.2	17.4	61.4	391
Consumption quintile												
Poorest	73.8	15.8	10.4	101	18.2	22.5	59.3	128	43.0	19.5	37.5	229
Poorer	64.6	19.8	15.6	127	16.6	12.6	70.8	166	37.4	15.7	47.0	293
Middle	56.4	16.5	27.1	110	17.2	26.6	56.2	163	32.6	22.6	44.8	273
Richer	57.6	19.0	23.4	144	20.6	11.8	67.6	184	36.7	15.0	48.3	328
Richest	48.6	22.2	29.2	158	7.7	10.4	81.9	190	26.3	15.7	57.9	348
Total (pooled)	**59.6**	**18.9**	**21.5**	**641**	**16.0**	**16.4**	**67.6**	**831**	**34.9**	**17.5**	**47.7**	**1472**

Note: Limits of waist-hip ratio
For males: lowest to 0.95= low risk; 0.96 to 1.0=moderate; 1.01 to maximum=high risk
For females: lowest to 0.8= low risk; 0.81 to 0.85=moderate; 0.86 to maximum=high risk

Classification is according to guidelines of WHO Expert Committee on *Physical Status: the use and interpretation of anthropometry, 1995*

Table 6.12 presents the percentage distribution of the population at specific levels of waist-hip ratio by states and selected background characteristics for males, females, and total population separately. The waist-hip ratio has been categorized into three categories: low risk, moderate risk, and high risk (risk for metabolic complications) according to the WHO criteria of classification.

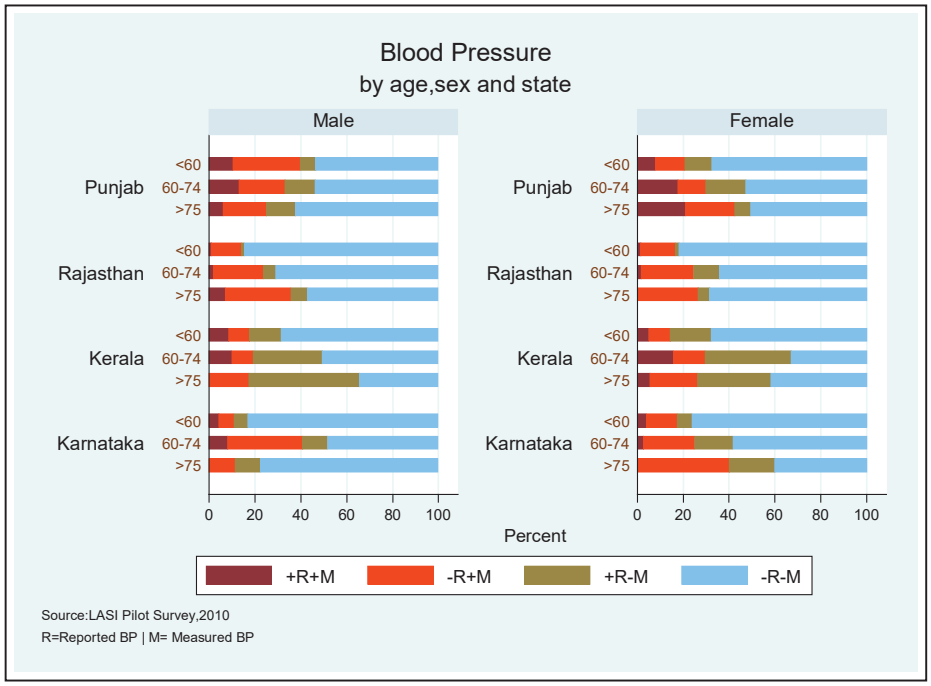
Overall, 48 percent of older people fall into the high risk waist-hip ratio category. Among the states, Punjab has the largest proportion of males in the high risk waist-hip ratio category, and Kerala has the largest proportion of females in the high risk waist-hip ratio category, followed by Kerala for males and Punjab for females. Overall, almost one in five males are in the high risk waist hip ratio category, while more than two thirds of females are in the high risk waist-hip ratio category. Virtually, five in six of older females with higher education and in the upper wealth and consumption quintiles are in the high risk category of waist-hip ratio.

6.5 Reported Versus Diagnosed Blood Pressure

One of the objectives of the health module was to compare reported and measured health of older Indians. In this section, we compared measured positive and negative status of hypertension vis-a–vis reported diagnosed positive and negative status.

6.5.1 Reported Versus Diagnosed Hypertension

Figure 6.1 Blood Pressures by Age, Sex, and States



6.5.2 Measured BMI and Waist Hip Ratio as Predictors of Diagnosed Chronic Diseases

In this section, we examined the prevalence of cardiovascular diseases by health risk factors, body mass index, and waist-hip ratio. The prevalence of cardiovascular diseases (almost 50 percent) increased more than twice for both older males and females for overweight/obese persons compared with underweight/normal older persons (less than 20 percent). The prevalence of diabetes increases to 20 to 25 percent for overweight/obese persons compared with persons with normal BMI ranges. The prevalence of cardiovascular diseases similarly more than doubled for persons with high risk waist-hip ratio compared with those with low risk waist-hip ratio.

Figure 6.2: Cardiovascular Diseases by Age, Sex, and Measured BMI

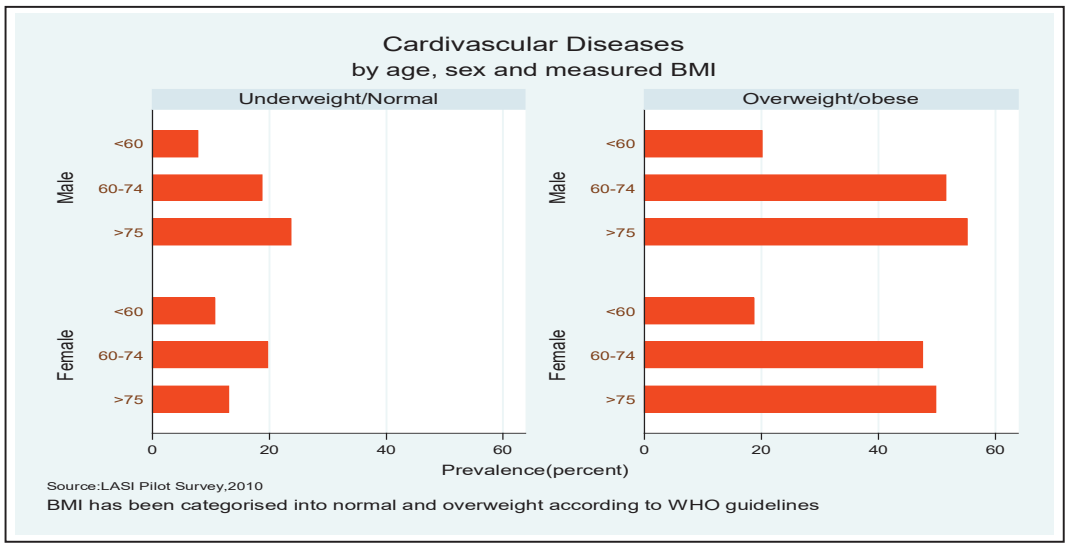


Figure 6.3: Cardiovascular Diseases by Age, Sex, and Measured Waist-Hip Ratio

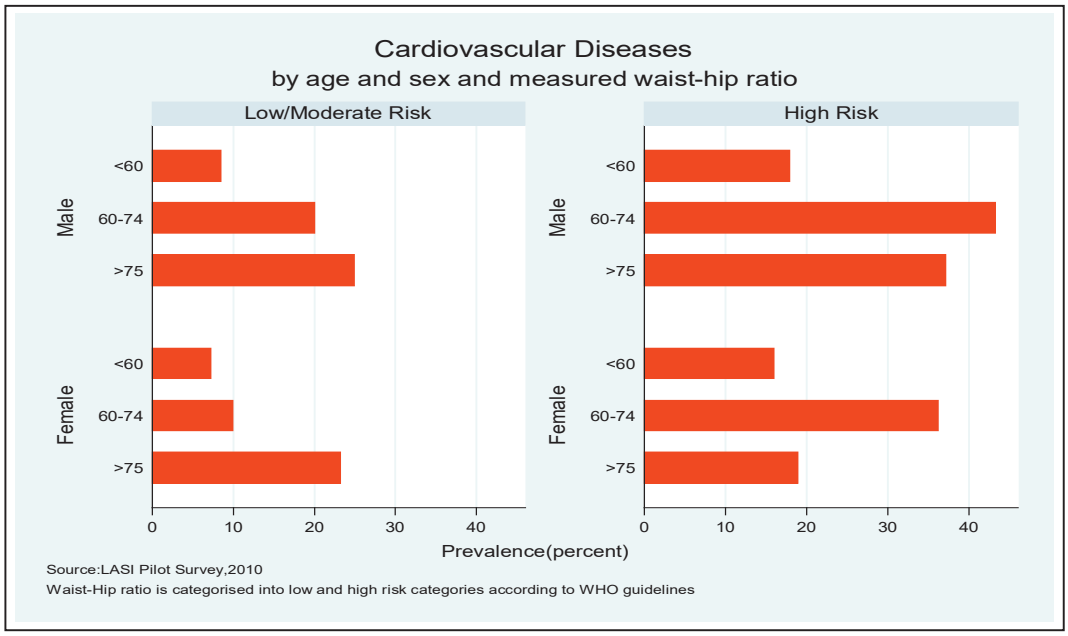


Figure 6.4: Diabetes Prevalence by Measured BMI, Age and Sex

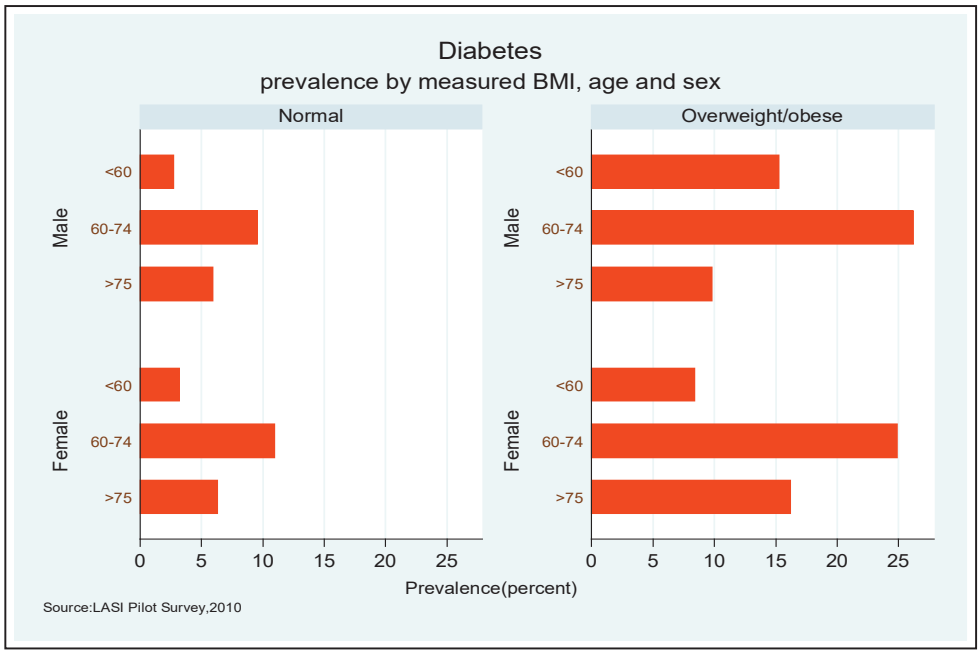
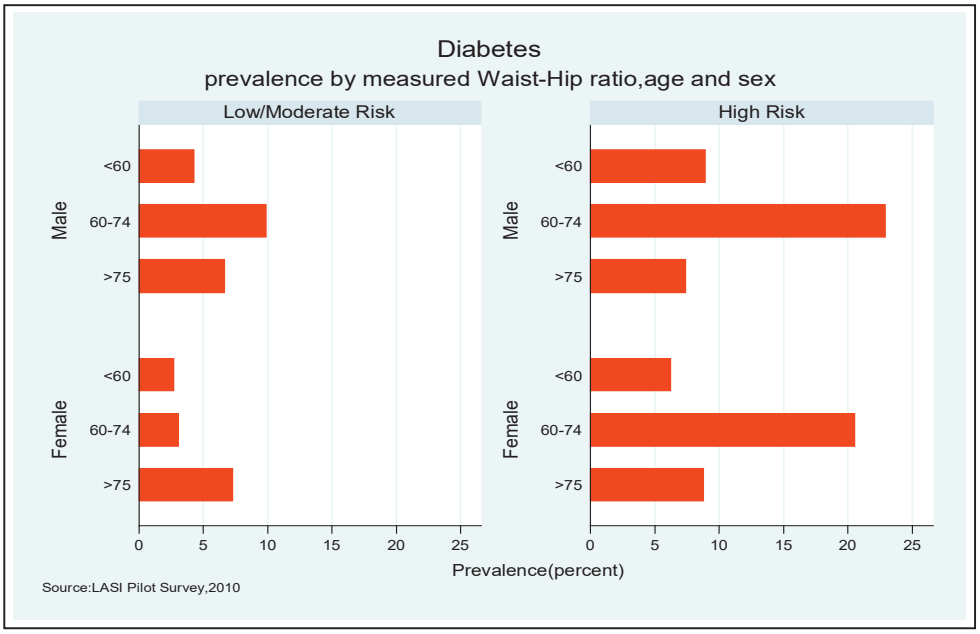


Figure 6.5: Diabetes Prevalence by Measured Waist-Hip Ratio, Age and Sex



LESSONS LEARNED FROM THE PILOT AND RECOMMENDATIONS FOR THE MAIN WAVE

7

This chapter provides (a) an overall assessment of the LASI pilot experiences and (b) an item-wise assessment of LASI pilot data and recommendations for the LASI main wave.

7.1 LASI Pilot Experience Assessment

The LASI pilot survey has brought out several useful lessons on survey administration, survey instrument, CAPI limitation, quality control, and checks and balances. These experiences will form the lessons for the main wave implementation. The following is a brief summary assessment of LASI pilot experience.

Survey administration

The IIPS team provided all survey administration. These include materials, trainings, translations, manuals, protocols, management, monitoring and supervision, data transfers, field logistics, team coordination, and meticulous and rigorous survey administration. Data error assessment indicates significant mistakes of investigators' errors common in the survey owing to varying levels of commitment among investigators and constraints of supervision and variable engagement of state organizations. For the main wave, all training and in-field supervision deficiencies will be effectively addressed based on the lessons learned from the pilot survey.

CAPI program

Between the pretest (July to August, 2010) and TOT completion (when CAPI was frozen), a great deal of program errors were corrected and addressed, but CAPI was not tested after this. During the state level training of investigators and through the launch and administration of survey, CAPI issues were frequently time-consuming for supervisors (state and IIPS) and programmers.

The recommendation for the main wave would be to have the pretest twice; the first time before TOT and the second time before the launch of the survey in phase-I states to ensure CAPI related errors are minimum. A well experienced programmer from RAND will be requested to be stationed at IIPS during the progress of survey implementation. In accordance with the experience in the pilot, the recommendation would be to undertake a full-fledged second pretest before the survey launch and then freeze the instrument.

Quality control

In the paper and pencil version of the survey implementation, there were several stages and layers of quality control check:

Spot and back check of filled in questionnaires by team supervisor/editor, IIPS supervisor, and state coordinators.
Question by question check of answers of each questionnaire by field editor.
Question by question check by office editors.

The above mentioned monitoring and quality control protocols in paper and pencil version will effectively reduce errors in completing the interview. However, in CAPI, not all of these quality control protocols are possible. To manage this challenge, for the main wave, we will implement three-stage quality control. These will include (a) multilevel supervision; (b) supervisor verification for 10 percent of surveys; and (c) weekly quality control assessment feedback for field teams.

Survey instrument

In the LASI pilot, the survey instrument sections on assets and debts, demographics, family and social networks, health, health care, and expectations went through successfully without much constraint. These sections will not require major revisions for the main wave, except minor adjustments.

In the consumption section, the problems were limited to the assessment of homegrown produce and standardization of durations. This section needs to be carefully modified before the main wave pretest.

The LASI pilot clearly suggests that the income, work and employment, and pension sections require major review and need to be revamped with short and clearly focused modules. These modules, after revision, will require pretesting and final modifications.

The biomarker section requires streamlining and pruning of unnecessary questions (which contributed to investigators' errors) for effective implementation and maximization of response rates.

Overall, the length of the questionnaire could be substantially reduced (through eliminating questions) without compromising the amount of information collected. This will provide space for new topics and issues to be included for the main wave.

Caution for generalizing LASI pilot results

The goal of the LASI pilot was to test the feasibility of LASI instruments, survey protocols, and filed management and quality control techniques. The results presented in the

LASI pilot report are based on limited sample coverage and therefore users are cautioned not to generalize findings from the pilot data.

7.2 Item-wise Assessment on LASI Pilot Data and Recommendations for Main Wave

The following provides a transparent item-wise assessment of the LASI pilot and the recommendations for the main wave.

Pretest

As expected, pilot survey experience suggests that using a tabular format for repeat questions is easy to implement, time saving, and a more efficient way of survey administration.

A substantial proportion of interviews were completed with two or more sittings. The LASI pilot administration time needs more detailed analysis and to draw lessons for the main wave.

Translation

The survey instrument was fully translated and verified in four regional languages. The translated instrument was reviewed by language and survey experts in each state before finalization. Key terms were back translated for verification.

For the LASI main wave, the recommendation is to follow the pilot protocol. Translated versions will be reviewed by experts and key terms will be back translated.

Sample management

Only completed house-listing information was entered for the sample selection for each primary sampling unit (PSU) for drawing the PSU-wise sample. However, the CAPI selection did not always conform to the circular systematic sampling procedure. The CAPI sampling protocol will be put through sufficient pretest checks prior to main wave implementation.

Team composition

In the pilot, each field team consisted of four interviewers and one supervisor. For the main wave, the team will consist of four investigators (two male and two female) and two team supervisors. One of the two female supervisors will be added to monitor CAPI, survey, and biomarker supervision. Another team supervisor will lead the team, manage logistics, and allocate work to the team members.

Training of Training Workshops

The training of trainers (TOT) workshop was conducted from August 31–September 9, 2010. The objective of the TOT workshop was to provide training to the survey team from regional agencies about the questionnaire. Apart from the IIPS team, three persons from each regional

agency attended the workshop. Also, the teams from Harvard University, University of Michigan, and RAND were represented in the workshop. The workshop started with a brief introduction about LASI design, goals, and sampling, and the CAPI. After the introduction, section-wise details about the questionnaire were explained to the workshop attendees. During the last day of the workshop, attendees were taken to a nearby locality for field practice. TOT also included training on biomarkers and CAPI. LASI health coordinators and IT experts imparted training to regional agencies.

Field work

The field monitoring was carried out rigorously based on established protocols manually. Field supervisors sent updates to IIPS administration on a daily/weekly basis. IIPS updated Harvard and RAND regularly on field work progress.

One research officer, appointed and trained by IIPS, was stationed in each state throughout the survey period to closely supervise the survey activities of each team. Additionally, one programmer, one health coordinator, and one designated IIPS principal investigator regularly visited the states for monitoring and supervision. A problem faced during field work monitoring was CAPI quality control (discussed above).

During the pilot survey, many times field teams were working in the far flung villages without internet access. The more ideal protocol would be to upload data at the completion of the survey in each PSU. Therefore, the quality control protocol report and feedback for field team is required to be sent on a weekly basis.

The main wave data will be uploaded onto the IIPS server with access granted to Harvard and RAND Corporation.

Response rates

The response rates computed and presented in this report are based on well-established sampling protocol followed in all of the large-scale national surveys such as NFHS, DLHS, and WHS/SAGE, etc. The response rates computed for household, individual, and biomarkers sections were 93, 96, and 91 percent respectively. These response rates are excellent.

Survey administration time

The mean survey administration time of the LASI pilot (CAPI) was 37 minutes for the household questionnaire, 60 minutes for the individual questionnaire, and 30 minutes for the biomarker module. These timings were computed after dropping extreme values in survey administration time.

In many cases, interviews were done in two or more sittings spread over two to three days. In addition, before punching the key, the investigator had to spend considerable time in self-

introduction, explaining the objective of the survey, and convincing the respondent of the survey's utility. These timings are not captured in CAPI.

Quality control

The back-check questions designed for supervisors' verification for CAPI quality control during the field interviews did not appear properly for some laptops, and if these questions did appear, the navigation of the screen to the next question got stuck in many cases. These will be addressed and strengthened in the main wave.

Household income module

CAPI requires modifications not only to accept only reasonable values but also to incorporate consistency checks to avoid unusual and extreme entries that are abundant in the data set, particularly in the income module. For example, in the agricultural income section, if somebody has rented out his entire land, he or she may be still reporting having incurred expenditure on irrigation, which is illogical. Despite all efforts, the income data appears to be grossly underreported. The recommendation would be to streamline and shorten the income module for the main wave.

The recommendation for the assets module is to add the valuation of assets in the instrument for the main wave to obtain estimates of the wealth of the household. Errors may be minimized by tailoring the CAPI program to some upper limit. About 0.5–1 percent extreme values may have to be adjusted.

Household consumption module

The consumption expenditure appears to be grossly overestimated in the LASI pilot survey. There were responses that pertain to monthly but appear to be yearly. The problem of missing values for homegrown produce in the household consumption module is also to be resolved. Attention is required to the value of homegrown or in-kind transfers during the last 30 days, which respondents were asked about. Usually households do not consume all of their homegrown produce or in-kind transfers. Therefore, in this module rather than asking about the value of homegrown produce, the instruments should ask for the value of consumed homegrown produce.

Also, the value of homegrown agricultural produce is asked in the agricultural income section (Q. No. Ag023), which is a repetition. This needs to be addressed in the main wave.

Seasonal fluctuations also hamper the consumption estimates but this will be taken care as the main wave will be spread over a longer period (6-8 months).

Demographics

For the questions on age or year of birth, in some cases, the investigators mixed up values of year/age. Ideally, CAPI has to be revised to have checks so that wrong entries are not allowed.

Family and social networks

Some degree of self-reporting bias can occur in responding to questions like closeness with spouse and with children. The refusal rate for the questions related to relationship with spouse is around 6 percent and about the relationship with children is around 2 percent. The recommendation is to modify the questions.

Health

The health section went through without many problems. In this section, for the question on time of diagnosis, respondents could choose to respond either as the time elapsed since first diagnosis or the year of the first diagnosis. For these questions, the investigators entered mixed up values of year/duration since first diagnosis. CAPI will have to be revised with checks for such errors. This will also be addressed during training.

Biomarker module

Incorrect measurement of hypertension may be one of the error factors, and therefore it is recommended that calibration of measuring devices is required and that more rigorous training of the interviewers is implemented.

We need to eliminate many unnecessary questions in the biomarker module for more efficient administration. In the biomarkers module, there were recording errors. For example, asking 10 questions before collecting DBS sample is unnecessary and time-consuming for respondents. The recommendations for the main wave are to have a set of two to three questions.

Thirty four DBS samples in NARI do not match with the biomarker data file mainly owing to untraceable DBS barcodes in the transmittal sheets at NARI.

The use of a numeric barcode instead of using an alpha-numeric barcode is suggested to avoid human errors in recording barcodes. We recommend including the name, age, and sex of the respondent (with the approval of IRB) to ensure identification.

Work and employment and pension

The work and employment section of pilot data had problems in terms of the CAPI structure (loops and skips). The work and employment section requires a thorough revamp.

The pension module needs a thorough revamp to be shortened and simplified.

Unfolding brackets

As indicated in the report, in the LASI pilot only 3 percent of those who did not report exact amounts have used unfolding brackets. Most of the respondents gave direct monetary values when requested. The use of unfolding brackets made the interview more complicated, cumbersome, and time-consuming. This also increased the total administration time of the interview. The unfolding bracket did not significantly add value to the data collection process. The computation of income was also cumbersome because of unfolding brackets, which should be modified for the main wave.

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Appendix-I

Non-sampling Errors and Data Cleaning

Sampling errors occur solely because data are collected for only a part of the population as opposed to the whole population, as happens in a census. Thus, the results will likely be different than if a complete census had been taken under the same general survey conditions. Sampling error is encountered because the selected sample is not a perfect representation of the test population. Sampling errors depend on factors such as sample size, population variability, sample design, and estimation method. For example, for a given sample size, the sampling error depends on the choice of sampling units, the stratification method, the allocation of the sample, and the selection method. Sampling errors can be estimated and could be reduced by carefully selecting the sample population and increasing the sample size.

To reduce random sampling errors in the LASI pilot survey, the population's variability or heterogeneity with respect to the age, composition, urbanization level, and state variations was taken into consideration while preparing the sampling design. For a better representative sample, a multistage, stratified sampling procedure was adopted, and the sample size was relatively small to give highly precise estimates at the state level compared to that of other household surveys. We attempted to reduce the sampling errors by weighting the sampled data—which means maximizing the sample's representativeness in terms of the population's size, characteristics, and distribution. The sampling weights take care of an unequal probability of selection of sampling units. If a sample is selected from a robust sampling frame and is well implemented with almost zero non-response, then the sample weight is equal to the design weight (inverse of inclusion probability of a unit). But in practice, the situation is more complicated because of shortcomings in sample selection and implementation (data processing), which lead to non-sampling errors.

Non-sampling errors are caused by phenomena such as subject non-response and misreporting of answers. These are not associated with the sampling process. Non-sampling errors arise from reporting errors, data recording, faulty responses, and non-responses. Non-sampling errors include respondent-based events—such as some respondents interpreting questions differently from other respondents; respondents making estimates rather than giving actual data; and respondents being unable or unwilling to provide complete, correct information. Errors can also arise during the processing of responses, such as during recording. Non-sampling errors arise from different sources. Some important non-sampling errors in LASI are given below:

Coverage Error: This error stems from an incomplete sampling frame that results in inadequate coverage of the target population. In the pilot survey, we used the 2001 primary census abstract (PCA) as the sampling frame for primary sampling units (PSUs). The sampling frame for households was prepared through a well-organized mapping-listing endeavor before

the survey in each of the selected PSUs. The possibility of coverage error in the LASI pilot data does not exist or is minimal.

Errors in the Survey instrument: This type of error occurs because of possible constraints in the survey instrument (questionnaire). It may be related to the skips, inconsistency in the questions or issues related to conceptualization of the question, cultural appropriateness, etc. In the pilot survey, we used mini laptops in which the survey instrument was programmed for CAPI. The errors inherent in the CAPI programming of the instrument resulted in program related errors (like skipped problems and out-of-range values) in the dataset.

Response Error: This type of error arises because of questionnaire design, characteristics of the question, or the respondent's inability or unwillingness to provide correct information. It may also stem from misinterpret ting the questions because of definitional difficulties and the tendency of interviewers to explain questions or interpret responses differently, and respondents making irrational estimates about the quantities being asked. In the pilot data, this types of error is particularly seen in the consumption, income, and agricultural income sections.

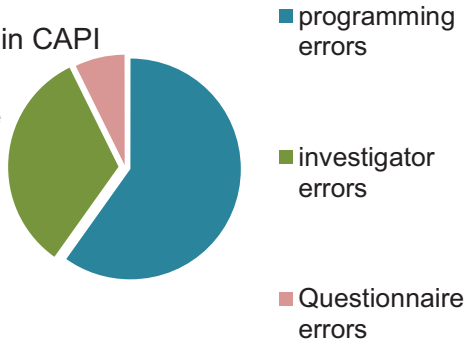
Non-response: Some respondents may refuse to answer specific questions; some are unable to respond; and others may be too late in responding, causing missing values in the data set. This type of error can be taken care of by imputing the missing values or accounting in sampling weights. In the LASI pilot data we adjusted the sampling weights for non-response to reduce errors owing to non-response.

Processing Error: This error may occur at the various stages of data processing such as coding, data entry, editing, etc. Because we used CAPI in the pilot survey, the processing errors in the data set are an inherent part of CAPI program errors.

Non-sampling errors can be identified through consistency checks, summary statistics and outlier checks, sample verification, post survey checks, and study of recall errors. It is very difficult to estimate the amount of non-sampling errors and rectify them in any survey data, but these can be reduced to some extent through data editing, cleaning, statistical adjustments for non-response, and most important, close monitoring and periodic retraining of the interviewers.

The LASI pilot data is also not free from non-sampling errors. Therefore, we undertook an error identification and the cleaning process. The first step was to identify the errors present in the dataset. This process mainly involved the checking for consistency, variable summary, frequency, outliers and range, wrong skipping pattern, unusual entry, and coding errors for all variables in each dataset section. To assess errors, we recognized that these errors can be broadly classified into three categories:

Program Related Error: Error owing to programming in CAPI
Investigator Error: Error owing to investigator
Questionnaire Error: Errors inherent in questionnaire



Overall, programming related errors were the most prevalent and questionnaire related errors were the least. The following are some illustrations of each of these errors by type.

Program Related Errors: The CAPI was designed to minimize the errors in data collection. However, owing to the survey instrument's complexity, CAPI contained substantial unresolved errors. Some examples of errors in skipping pattern are given here. For instance, question he007 is:, "Is water piped into your dwelling?". If the variable he007 is coded as '2' (i.e., not piped into dwelling), then the next question should skip to he006 (what is the main source of drinking water?). But, in the data set, the variables such as he007a, he007b, etc. (questions on the details about pipe water) were also coded.

In all the sections, there were several problems owing to information entered in CAPI by the interviewer mostly because the programming range was not defined correctly. Ideally, CAPI should not allow the entry of values beyond the range and should not proceed to any further questions. The back-check questions designed for supervisors' laptops for quality checks during the field interviews did not appear properly for some laptops, and if these questions appeared, the navigation of the screen to the next question got stuck in many cases. Therefore, the first level of quality control could not be implemented because of a CAPI error.

Investigator errors: There were many situations that may be attributed to investigator error. In the household consumption section, there were unexpected entries that were not possible. For instance, a household with five members reported that it was purchasing staple foods of 10,000 rupees per month; they have also reported home grown/received in-kind staple foods of 50,000 rupees in the last month. For a household with five members it is impossible to consume staple food of this amount. Certainly, they have reported on a yearly basis.

In the biomarker section, barcode mistakes are numerous. Sometimes investigators coded the bar code in five digits or four digits and also duplicate bar codes are present on transmittal sheets. Global Positioning System (GPS) information about latitude and longitude were not captured properly in the data because of investigator difficulties and technical problems. For example, India's Latitude is 8°4' to 37°6', so the district latitude and longitude should not be beyond these values. However, the data is showing 0o for some places and 111o in some other places. Similar problems exist in minute and second coordinates. Many records show duplicate values.

Questionnaire error: The questionnaire related errors are mainly related to the structuring of skips and filters in the questionnaire. For instance, in the demography section, the

question dm004 (How old were you at the time of your first marriage?) is asked to only those who have reported ever being married—that is, if the value of dm003 (what is your current marital status?) is more than 1. However, in the questionnaire, it is specified that dm004 should be asked only if dm002 (please note the sex of the respondent) >1. This should have been given as dm003>1. Similar types of errors were present in many questions.

Cleaning of Data

After identifying and classifying the errors, data cleaning was done (a) manually and (b) using programming. The following are some illustrations of data cleaning process.

Manual data cleaning

In the "Household Real Estates" section, the question ad004 (Which household member is the owner of current residence?) is asked to only those who have reported options 1 to 3 (employer/child/parent) for question ad003 (Who owns your current residence?). If variable ad003 is coded as 4 to 7 (i.e., owner is not a household member), ad004 should not have any entries. But in the data set, there were two such cases, and they were edited manually.

For variable dm023 (What is your mother tongue?) in "the Demographics" section, there were only 29 cases that were reported as "'others." The variable dm023_others (If the answer of dm023 is others, then show the list of other languages) should include only those 29 cases. But, the data shows 37 cases for variable dm023_others. These extra eight cases were manually corrected in the data set.

Data cleaning using state codes

In the "Household Debts" section, question ad203a is on "the amount of money you/household member currently owe?" and ad203a_a is on "total amount of money you/household member borrowed from the lender?". The amount reported ad203a should be less than that of question ad203a_a. These types of errors were presented for the variables ad203b, ad203b_a, ad203b_b, and ad203b_c, which were also edited using the program as given below.

```
brprim_key ad203a ad203a_a ad203a_b ad203a_c
replace ad203a=ad203a_a if ad203a>ad203a_a
replace ad203a_a=ad203a if ad203a_a == .

brprim_key ad203b ad203b_a ad203b_b ad203b_c
replace ad203b=ad203b_a if ad203b>ad203b_a
replace ad203b_a=ad203b if ad203b_a == .
```

In the "Family and Social Network" section, the question fs405 (To whom did you give financial help?) is asked to those who reported "yes" for variable fs404 (Did you give any

financial help to your family?). However, in the data set, there were some cases where fs405 is entered although the variable fs404 is coded as “2” (No). These types of errors were edited using the following program:

```
replace fs405s1=. if fs404==2
replace fs405s2=. if fs404==2
replace fs405s3=. if fs404==2
replace fs405s4=. if fs404==2
replace fs405s5=. if fs404==2
replace fs405s6=. if fs404==2
replace fs405s7=. if fs404==2
replace fs405s8=. if fs404==2
replace fs405s9=. if fs404==2
replace fs405s10=. if fs404==2
replace fs405s11=. if fs404==2
replace fs405s12=. if fs404==2
```

Mean, standard deviation, and factor score of variables used in computation of wealth index in India LASI-pilot, 2010

Sr No	Name of variable	Mean	Standard Deviation	Factor Score
1	Two person per room	0.5567	0.497	0.1688
2	2-3 person per room	0.1878	0.3908	-0.0394
3	Four or more person per room	0.2554	0.4363	-0.157
4	Kitchen	0.6905	0.4625	0.195
5	Does not own any house	0.001	0.0323	-0.0174
6	Valuation of house up to 1 lakh	0.5068	0.5002	-0.156
7	Valuation of house 1-5 lakh	0.308	0.4619	0.0319
8	Valuation of house of more than5 lakh	0.1842	0.3878	0.1646
9	Flush toilet	0.342	0.4746	0.219
10	Pit toilet	0.237	0.4254	0.0291
11	No toilet	0.3967	0.4895	-0.2298
12	Piped water into the residence	0.3445	0.4754	0.1022
13	Using public tap	0.1032	0.3043	-0.0384
14	Tube well	0.0622	0.2417	-0.0016
15	Dug well	0.2598	0.4388	0.0618
16	Rain water/pond	0.1706	0.3764	-0.1348
17	Water from tanker	0.0592	0.2361	-0.0548
18	Electricity	0.8386	0.3681	0.1702
19	Land line phone	0.2002	0.4004	0.1757
20	Mobile line (he012)	0.7697	0.4212	0.1598
21	Internet	0.0414	0.1994	0.1023
22	Cooking Gas	0.3349	0.4722	0.2166
23	Car	0.0601	0.2378	0.1388
24	Truck	0.0129	0.1131	0.0328
25	Automobile	0.0196	0.1385	0.0464
26	Bicycle	0.219	0.4138	0.0435
27	Motorcycle/moped/scoter	0.2584	0.438	0.1913
28	Refrigerator	0.236	0.4249	0.2295
29	Washing machine	0.1001	0.3003	0.1777
30	Sewing machine	0.17	0.3758	0.1582
31	Black and white television	0.044	0.2053	0.0122
32	Colour television	0.5428	0.4984	0.2422
33	Radio	0.1191	0.324	0.1281
34	Computer	0.066	0.2485	0.1494
35	Stereo	0.0368	0.1883	0.1137
36	Camera	0.0524	0.223	0.1244
37	Air conditioner	0.0146	0.1199	0.082
38	Mobile phone (ad106_setk)	0.6831	0.4655	0.204
39	Mixer	0.3479	0.4765	0.2263
40	Clock	0.6347	0.4818	0.1973
41	Cooker	0.3736	0.484	0.2413
42	Fan	0.5719	0.4951	0.2357
43	Bank Account	0.3241	0.4683	0.1561
44	Any bond/stock	0.0167	0.1283	0.0182

Field Work Implementation Snapshots:

Snapshots of LASI- Pilot Training Workshop

LASI training and pre-pilot activities
Summer 2010

Mapping and listing activities, IIPS

Training of the trainers, IIPS

Snapshots of LASI-pilot Manuals for survey Implementation

- *Mapping & listing Manuals*
- *Instrument Interviewer manual*
- *Bio-marker manual*
- *CAPI- Interviewer manual*
- *CAPI-Supervisor manual*
- *Field management manual*

I_BM. LASI Biomarker (BM) Manual

LASI-Biomarkers: Protocol and Guide to Taking Health Measurements and Tests

The inclusion of bio-markers is particularly important for India, where access to health care tends to be limited. India's aging population is at risk for undiagnosed diseases. With low literacy level in this age group a significant level of self reporting bias exists."

The following is the revised and final list of biomarkers based on the comments of ICMR medical experts. The health measurements and examinations are to be implemented as part of field survey. The consenting respondents will be examined by trained investigators team.

This part covers instructions on taking the following heath measurements and tests.

Biomarker measurement for LASI	See Page
Error! Reference source not found.	2-3
Error! Reference source not found.	4-6
Timed walks	6-7
Error! Reference source not found.	8-9
Error! Reference source not found.	9-10
Balance Tests	10-12

MANUAL LASI SMS SUPERVISORS MODE

Introduction: The role of Supervisors is the one of the most important role in LASI to supervise the interviewers, collect the data from eee PCs of interviewers and se data back to IIPS on daily basis.

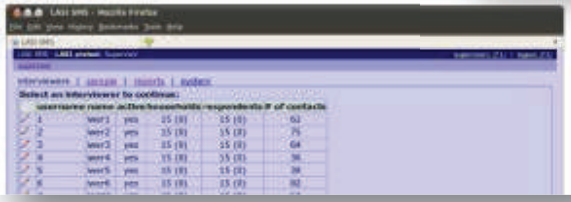
They have to allot (or assign) households to each and every interviewers. And manage the households that is already allotted/assigned to interviewers. Their role i (changing) of Households from one interviewer to another interviewer (if necessary)

Interviewer tab:
Supervisor should use 'SMS login screen' to login to the eee PC by using the usern provided by IIPS. After entering the username and password the given below screen

The main screen shows a table with interviewers that are assigned to the particular table contains the following columns:

1. username: This column contains the username of the interviewer that they u eee PC.
2. name: The name of the interviewer assign by his/her supervisor.
3. active: Indicates that the user is a active user or not. If the interviewer is active it this main page.
4. households: The number of household assign to each interviewer.
5. respondents: This column shows the number of respondents interviewe interviewer.
6. # of contacts: This column indicates the number of contacts by the interview date.

You can also search for a interviewer by typing text in the box below the list w pressing <search>. The list will then be filtered based on your search term. (see illu



MANUAL LASI SMS INTERVIEWER MODE

Introduction

The LASI system is divided into two components: the CAPI instrument and the Sample Management System (SMS). The CAPI instrument in its turn consist of two questionnaires, the (short) cover screen that creates an inventory of the people in a household and the (longer) main LASI instrument that is conducted only when a respondent is eligible for this interview.

The Sample Management System issues contacts and determines what to do with each sample record. A sample record is made up of many variables such as name, address and telephone number. A number of rules determine the selection of a record and its disposition once the interview has been completed.

Snapshots of LASI-pilot Field Control Forms

- *Field measurement forms*
- *Individual consent form*
- *Household consent form*
- *Biomarker consent form*
- *Checklist for field monitoring and supervision*
- *Checklist for Mapping and House listing*
- *Checklist for Material provided to PRCs*
- *Guideline presentations for different test*

International Institute for population sciences
Deonar, Mumbai-400088.

LASI India Project
(Pilot Study2010)

LASI MEASURED TEST RESULTS

Respondent Name: _____ Age: ____yrs. Sex: ____

Household ID: [ ][ ][ ][ ][ ] Date: ____/____ / 2010.

Respondent Number: [ ][ ]

Measurements	Measured Results
Blood Pressure	____ / ____ mmHg
Pulse	_____beats per minute

Longitudinal Aging Study in India (LASI)

Checklist for Field Monitoring and Supervision

ITEM	YES	NO
1. Composition of Field Teams		
Each field team is comprised of:		
4 Interviewers		
1 Supervisor		
2. Common documents held by each team member		
Photo Identity Card		
Letter of Introduction		
3. Supervisor has the following documents:		
Location map which shows the location of PSU w.r.t. highway/rail road, etc		
Layout map which shows all the structures and other landmarks, temple, school, river etc. Also look for LASI structure number (LASI001, LASI002,…) on the front of each listed household		
Household Listing Form (Form 3) with listing of all the structures and households		
Supervisor's Assignment Sheet for each PSU		

LASI-PILOT

List of TOT materials given to Research

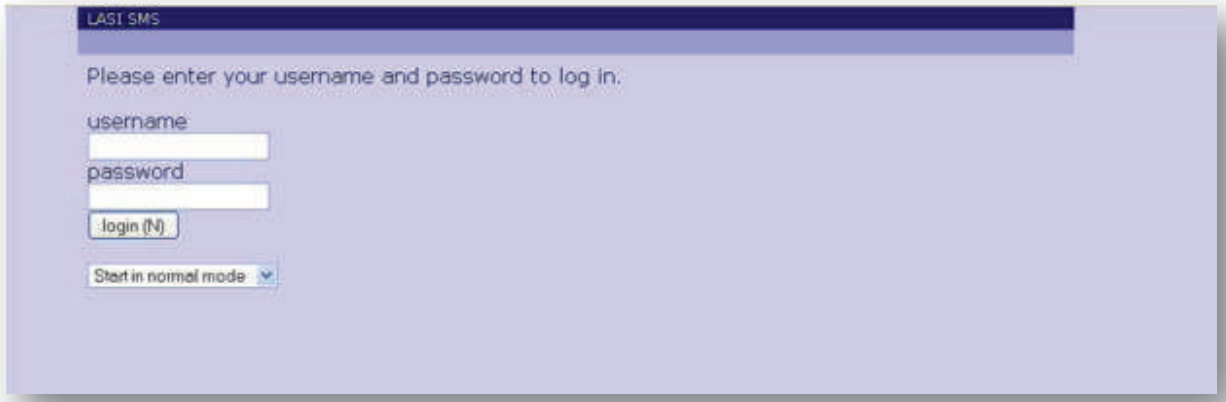
SR. NO.	ITEM
I	QUESTIONNAIRES
1	Paper-pencil version - Household/Individual/Biomarker quest
2	HTML version of capi - Household/Individual/Biomarker quest
3	List of pending capi changes
II	MANUALS
1	Mapping and Houselisting manual
2	Interviewer's manual (Q by Q)
3	Biomarker manual
4	CAPI interviewer's manual - household, individual and biomar
5	CAPI supervisor's manual
6	Quality control manual
7	Hardcopy control forms
III	PRESENTATIONS
1	LASI - Overview
2	Health module
3	Experimental module
4	Work
5	Income
6	Assets and debts
7	Housing - water and toilet facilities
8	Health care utilization
9	Interviewer's technique
10	Supervisor's role
11	Training guidelines
IV	OTHER MATERIALS REQUIRED FOR
a.	Interview Related
1	IIPS contact information - visiting card
2	Identity card from RO - give format
3	Letter of introduction from RO to interviewer - format
4	Card showing alcohol measures
5	Card showing ladder with numbers
b.	Mapping and Houselisting R
1	Letter to RGI for census forms
2	Hard copy of sample PSUs
c.	Biomarker Related
1	Biomarker result card
2	Biomarker brochure
3	Letter to health secretary
4	Reference letter to health facility
5	Letter for biomarker disposals
6	Biomarker related showcards
7	Fieldwork related showcard
8	List of biomarker supplies
d.	Devices and tools
1	Mini laptops and related supplies
2	Biomarker materials
3	Bowls/marbles
e.	Other
1	Timeline for Research Organizations
2	Contact persons list - Research Organization and IIPS
3	Copy of IRB certificate - ICMR, IIPS
4	Copy of letter from health secretary about LASI

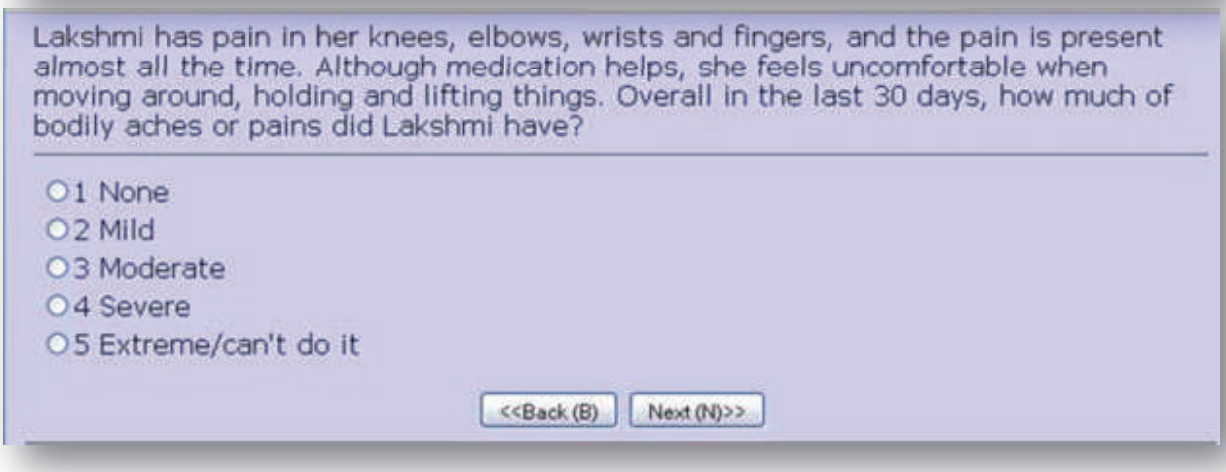
Longitudinal Aging Study in India (LASI)

Checklist for Mapping and Houselisting

1. Check the household listing form. Research Organization must use the standard form as provided by IIPS. Field teams must be provided with maps showing boundary descriptions and household listings for sample PSUs.
2. Check the obtained census ward information collected by Research Organization used for selecting the CEBs.
3. Check the selection procedure for selected CEBs.
4. Check the name and number of listed PSUs with the list provided by IIPS.
5. Check the identified boundaries for the listed Rural PSUs with the census map, wherever census maps of PSUs are available.
6. Check the identified boundaries for the selected CEBs with the census map
7. Make sure that the team is doing fieldwork in the correct location and the household listing covers the correct geographical area.
8. Check whether the location map and the detailed layout sketch map is drawn properly.
9. Check whether household listing operation for the listed households is done in a systematic manner.
10. Compare the state, district, tehsil and PSU codes (census) with the list provided by IIPS.
11. Obtain the required limit fixed by the Research Organization for the segmentation and check segmenting procedure.
12. Check whether the village is segmented on the basis of natural boundaries or artificial boundaries. If village is segmented then check whether all segments are roughly of equal sizes.
13. Check whether two segments are selected and also check whether all the households are listed in the selected two segments.
14. Check whether structure number is marked on the walls/doors of the structure within PSU (for example; NF-0001).

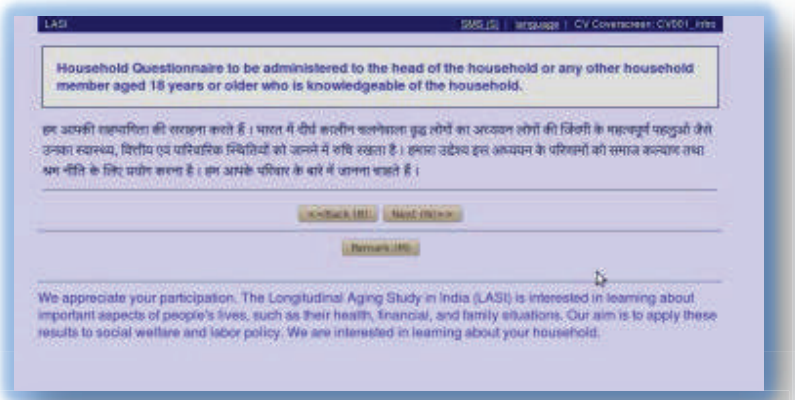
CAPI-Program Snapshots



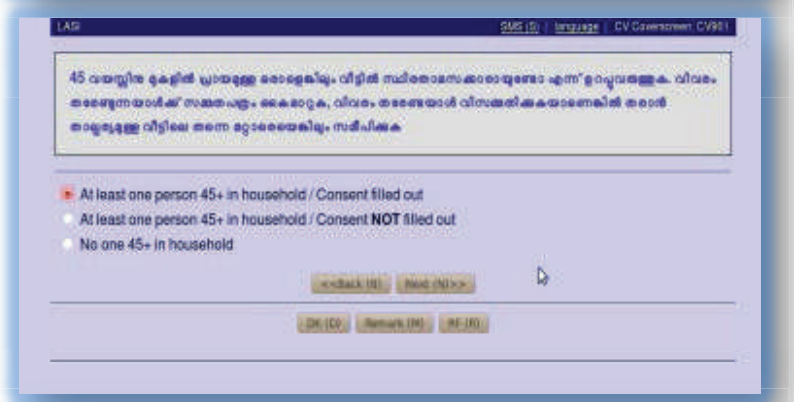


Translation Snapshots

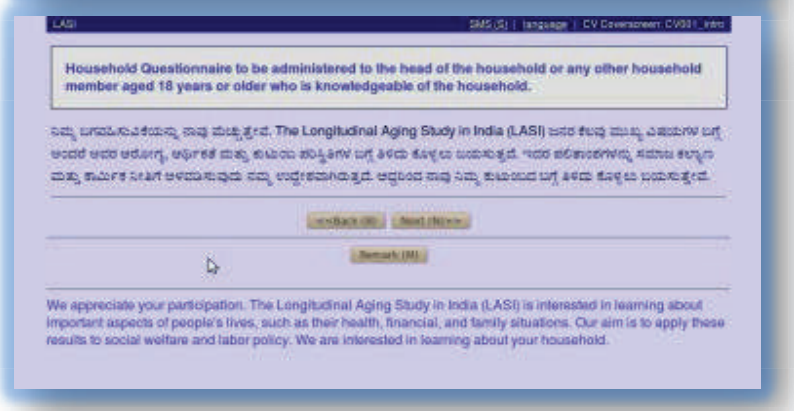
Hindi translation



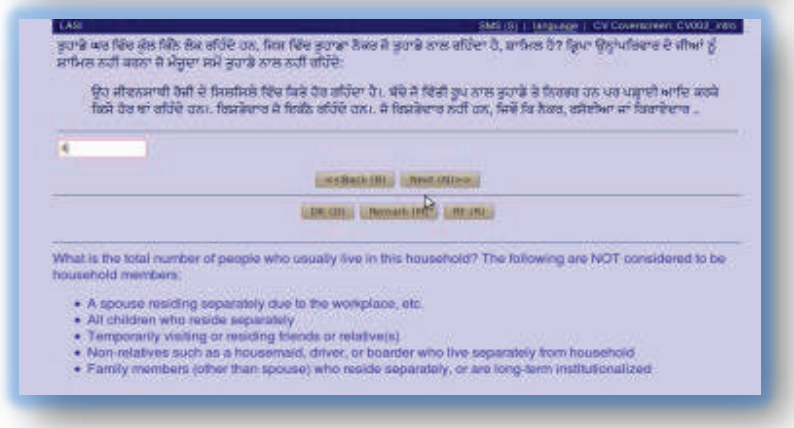
Malayalam translation



Kannada translation



Punjabi translation



Snapshots of LASI-Pilot Field Work Activities

Appendix-IV

State-Level Organizations Involved in LASI-Pilot Fieldwork

Research Organization	State(s)
Population Research Centre, Himachal Pradesh University Summer Hill, Shimla – 171 005.	Punjab
Population Research Centre, Institute for Social and Economic change, Dr. V.K.R.V. Rao Road , Nagarabhavi Bangalore – 560 072.	Karnataka
Population Research Center, Department of Economics, University of Lucknow – 226 007.	Rajasthan
Population Research Center, University of Kerala, Kariavattom, Thiruvananthapuram – 695 581.	Kerala

Appendix-V

Collaborating Institutions

International Institute for Population Sciences (IIPS)
Harvard School of Public Health (HSPH)
RAND Corporation
National AIDS Research Institute (NARI)
Indian Academy of Geriatrics (IAG)
University of California - Los Angeles (UCLA) School of Medicine

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Director-General, Indian Council of Medical Research and Secretary, Department of Health Research, Ministry of Health and Family Welfare (MOHFW), Government of India (GOI) *(ex officio)*
Director-General of Health Services, MOHFW, GOI *(ex officio)*
Additional Director-General, Statistics, MOHFW, GOI *(ex officio)*
Chief Director, Statistics, MOHFW, GOI *(ex officio)*

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Suman Bery, National Council for Applied Economic Research
Shalini Bharat, Tata Institute of Social Sciences
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I.S. Gambhir, Banares Hindu University
S. Irudaya Rajan, Center for Development Studies
S. Siva Raju, Tata Institute of Social Sciences
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Mr. Goli Srinivas
Mr. Koushalendra Kumar

Longitudinal Ageing Study in India

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Capacity Building for a Better Future

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