

Centenarians and Near-Centenarians in India For All We Know?

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"... modest annual increments in life expectancy will never lead to immortality. It is striking, however, that centenarians may become commonplace within the lifetimes of people alive today."

- Jim Oeppen & James W. Vaupel¹

Introduction

The science of aging is preoccupied with two broad area of enquiries: a) What is the limit to life expectancy? And, b) What is the secret of longevity? The seminal yet contrasting views of S. Jay Olshansky and James W. Vaupel are a staple on the first set of questions. While, Olshansky et al² argue that only modest gains in life expectancy is possible, Oeppen & Vaupel show that, in the last 160 years, life-expectancy in best-performing countries have continuously increased by a quarter of a year per year.

exchange This stimulating has triggered widespread interest in longevity research including efforts to list the oldest living person on earth. Several reviews of supercentenarian³ statistics are now available including the conclusion of Dong et al⁴ that maximum lifespan of humans is fixed and that Jeanne Calment (age at death, 122 years) was the oldest person who ever lived. These longevity estimates essentially draw upon dedicated international databases such as the Human Mortality Database (HMD) and the International Database on Longevity (IDL) that provide data for 41 countries and 13 countries, respectively. Despite limited global representation, the guality and rigor of data collection is the hallmark of these datasets⁵ . The evidence has been of immense relevance for advancing scientific understanding on aging and policymaking on social security.

In contrast, longevity research in Low-and Middle-Income Countries (LMICs) is in its infancy and India is no exception. Although India is quickly emerging as a global economic powerhouse, it is critical that the country adopts a long-term perspective on longevity and well-being. For instance, despite improvements in longevity, there remains a lot inequality before death that is overlooked by economists⁶. Similarly, with rapid integration of technology in production, it is critical that pessimistic attitudes toward retirement are reconciled by acknowledging that labour and human capital are now more inextricably linked than ever. With healthy aging, the expanding life expectancies at older ages can also enhance labour availability. A lackadaisical approach, however, can devalue the longevity dividends and impose huge burden on the public exchequer. Longevity research is necessary to unravel the economic and labour market implications⁷ of expanding population base of elderly.

The cultural ethos⁸ and diversity in India also warrant an assessment of longevity both for personal well-being⁹ and for decision-making¹⁰ that influences the near and dear ones. The traditional knowledge systems¹¹ in India have abundant insights on secret of longevity. But, time and again, dearth of research and statistics¹² emerge as decisive epistemic barriers in decoding such ancient wisdom.

India has, nevertheless, traversed a long way since the colonial rule. With decades of public health investments, India has now arrived at a point of inflection where research and policymaking on longevity can be prioritized. Although, India is not a contributor to the HMD and IDL databases but with improvements in data infrastructure there is ample scope to launch an investigation into the magnitude and varied dimensions of longevity in India. With this motivation, we specifically seek to investigate two inter-related questions on longevity in India: a) Is India moving up the ladder? b) If yes, who are the champions?

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Longevity in India, 1975 to 2020

India's life expectancy at birth increased from 50 years in 1975 to 70 years in 2020. In Figure 1, the slope of the linear regression trendline reveals that India's life expectancy increased by 4.5 years in each decade since the 1970s. The trendlines for India and best performing countries (as per the HMD) are converging at a very slow pace. In 1975, India's life expectancy was 25 years lower than Sweden whereas in 2020, India remains 14 years below Japan. Between 1975 and 2020, the global best performing life expectancy has continuously increased at a rate of two year per decade which is slightly lower than Oeppen & Vaupel's estimate based on a longer time horizon (1840-2000).

India may still need about four decades to catch up with the best performing countries. The chase can be cut short if there are explicit efforts to boost population longevity. With subsiding burden of infectious diseases and deaths, all the Indian states¹³ can now aim at achieving longevity targets set by the National Health Policy 2017. With reduction in childhood mortality, much of the survival gains will now have to come from lifesaving interventions for older adults and elderly. While this may be plausible through universal health coverage, but greater focus on preventive and cost-effective strategies such as modification in nutrition and lifestyle is preferable.





Source: Authors based on Sample Registration System (SRS), India; Human Mortality Database (HMD) Note: The trend coefficient (standard error; R-square) of the linear regression equations for the period 1975-2020 are as follows: India 0.447 (0.013; 0.994); Global highest life expectancy countries 0.209 (0.0.005; 0.995), India's lowest life expectancy states 0.504 (0.017; 0.991) and, India's highest life expectancy states 0.273 (0.036; 0.879). All the coefficients are significant at one percent level.

^{13.} Kerala has consistently remained the highest life expectancy major state in India. In 1975, Kerala's life expectancy was 62 years and it increased to 75 years in 2020. Uttar Pradesh had lowest life expectancy in 1975 (43 years) and in 2020 (66 years). However, between 1985 to 2000, Madhya Pradesh and between 2000 to 2010 Assam had the lowest life expectancy in India. The life expectancy of the lowest performer states increased at an average of 5 years per decade. The gap between worst and best performing state was 19 years in 1975 and has shrunk to 9 years in 2020. From a global standpoint, Kerala, and Uttar Pradesh, respectively, are 9 years and 18 years behind Japan.

The foregoing policy prescriptions on longevity are often an extrapolation of scientific understanding on certain well-established conclusions. For instance, unhealthy diets¹⁴, physical inactivity¹⁵ ,smoking¹⁶, and substance abuse¹⁷ are widely acknowledged risk factors of premature mortality. Those who comply can also take a shot at the coveted club of centenarians. The selection bias, however, cannot be ruled out as there may be others who also have similar lifestyles and yet have succumbed due to one or the other reason. This in a way may reinforce that there is no secret of longevity18 . There is indeed much to learn about such natural selection as this can be highly conditional for the young but increasingly random for the old.

Issues and Insights from Centenarian Research

Centenarians are one of the fastest-growing population subgroups. The United Nations Population Division¹⁹ estimates show that the global population of centenarians increased from 162,000 in the year 2000 to 480,000 in 2020. By 2050, the centenarian population is projected to reach 2.5 million i.e., a five-fold increase since 2020. Centenarians in India have increased from 9,000 in the year 2000 to 30,000 in 2020. The number will double itself to 63,000 by 2030 and reach 214,000 by 2050. India's share in global population of centenarian is projected to rise from 5.6% in 2000 to 8.3% in 2050. Such aggregate statistics, while necessary, have limited utility for centenarian research. The projections are

scrutinized for the approach²⁰ and underlying information base. The validity of centenarian headcount based on self-reported age statistics is also questioned²¹. Age heaping²² and digit preference in reported are major concerns in LMICs and affects the confidence in the reported information. Centenarian research, therefore, relies on carefully reviewed and validated administrative records. Supercentenarian information from the IDL database passes through several validation checks before they are confirmed to be authentic. Studies²³ often cross-validate the age information across various sources such as birth certificate, baptismal certificate, marriage certificate, travel passport, and census records.

Studies on centenarians and supercentenarians identify good health as a key marker of longevity. Vaupel observes that supercentenarian characteristics are not much different from the young. The key distinction is that most of them are women who were unmarried or had fewer children. Importantly, they had relatively good health throughout their life and were not heavy smokers. The centenarians are physically active and have better health status such as low disease prevalence and delayed onset of chronic conditions²⁴.

Hittetal²⁵ find remarkable compression of functional decline and disability among centenarians that further allow them to enter the supercentenarian club. Centenarians wear a positive attitude and display higher social capital and contentment towards life²⁶. While genetic factors are intrinsic to health conditions and extreme longevity, their interaction with non-genetic, environmental, and lifestyle factors account for successful aging²⁷.

^{14.} Trichopoulou, A., & Vasilopoulou, E. (2000). Mediterranean diet and longevity. British Journal of Nutrition, 84(S2), S205-S209.

^{15.} Gremeaux, V., Gayda, M., Lepers, R., Sosner, P., Juneau, M., & Nigam, A. (2012). Exercise and longevity. Maturitas, 73(4), 312-317.

^{16.} Taylor Jr, D. H., Hasselblad, V., Henley, S. J., Thun, M. J., & Sloan, F. A. (2002). Benefits of smoking cessation for longevity. American journal of public health, 92(6), 990-996.

^{17.} Palmore, E. B. (1982). Predictors of the longevity difference: a 25-year follow-up. The Gerontologist, 22(6), 513-518.

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^{21.} Poulain, M. (2010). On the age validation of supercentenarians, in Maier, H., Gampe, J., Jeune, B., Vaupel, J. W., & Robine, J. M. (Eds.). Supercentenarians. Springer Science & Business Media.

^{22.} Singh, M., Kashyap, G. C., & Bango, M. (2022). Age heaping among individuals in selected South Asian countries: evidence from Demographic and Health Surveys. Journal of Biosocial Science, 54(4), 725-734.

^{23.} Schoenhofen, E. A., Wyszynski, D. F., Andersen, S., Pennington, J., Young, R., Terry, D. F., & Perls, T. T. (2006). Characteristics of 32 supercentenarians. Journal of the American Geriatrics Society, 54(8), 1237-1240.

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^{25.} Hitt, R., Young-Xu, Y., Silver, M., & Perls, T. (1999). Centenarians: the older you get, the healthier you have been. The Lancet, 354(9179), 652

^{26.} Jopp, D., & Rott, C. (2006). Adaptation in very old age: exploring the role of resources, beliefs, and attitudes for centenarians' happiness. Psychology and aging, 21(2), 266.

^{27.} Passarino, G., De Rango, F., & Montesanto, A. (2016). Human longevity: Genetics or Lifestyle? It takes two to tango. Immunity & Ageing, 13, 1-6.

2050, India will be among the three By countries with highest numbers of oldest-old and centenarians. The UNPD estimates put the centenarian headcount between 9,000 in the vear 2000 to 30,000 in 2020. On the other hand, the Census of India 2011 enumerates 605,778 as centenarians²⁸. There is little scope to reconcile these as birth and death registration are also incomplete. The gross mismatch in age reporting requires institutional as well as methodological improvements for age validation. While, aging research in India may not have effectively engaged with the centenarians but there is a vast body of literature²⁹ on elderly³⁰ health and wellbeing³¹. Bulk of the focus is on clinical, biological, social, psychological, institutional, and behavioral investigations.

Completing 100 years of life is no mean feat and should be celebrated both as a personal as well as a societal achievement. Empirical research on centenarians (or near-centenarians), however, is entirely overlooked even though there are a few sporadic attempts³² to engage with the topic³³. But there is hardly any evidence on the demographic profile or the socioe conomic patterning of the Indian centenarians. The profiling is a first step to set the ball rolling on independent search and research on centenarians. Lack of insights on their living circumstances and requirements have constrained policymaking on their health and well-being. Such research may also traverse its relevance on other important areas of policymaking³⁴ such as labour market, social security arrangements, nutrition, and neighborhood environment.

Understanding centenarians and their secret of longevity requires a longitudinal or case-study approach. Given the rarity of the phenomenon, the profile research on centenarians is often based on limited sample observations³⁵. Cross-sectional databases are not designed to indulge with such atypical enquiries. A common practice of data cleaning may also exclude such outliers assuming those to be more of a typo (and an anomaly). This has created a void in the literature on centenarians in India and has prevented even a basic profiling of their socioeconomic characteristics.

We explored the age distribution of elderly (60+ years) sample in the most recent rounds of nationally representative household surveys in India viz. National Sample Survey (NSS) Consumer Expenditure Survey (2022-23), NSS Survey on AYUSH (2022-23), National Family Health Survey (NFHS 2019-21) and Longitudinal Aging Study of India (LASI 2017-19).

Figure 2 shows that age heaping is quite common in the elderly population with a digit preference for 0 and 5. The NSS surveys have provided age distribution extending above 100 years. The maximum age in the NSS CES 2022-23 data is 120 years. However, NFHS 2019-21 has truncated the distribution at 95 years. The figure also shows a small peak at this age indicating either digit preference or presence of household members above this age group. LASI (2017-19) also covers members with age above 100 years. Given the datasets, we focus on LASI for this analysis as it provides comprehensive information on the demographic, socioeconomic, health and subjective well-being status of the elderly. Other datasets such as NSS CES provides household level information whereas NFHS does not provide health and well-being information of the elderly population. This study, therefore, uses LASI data to provide a first set of insights into the prominent socioeconomic characteristics, health status markers and subjective well-being indicators of centenarians (100+ years) and nearcentenarians (90-99 years) in India. The contextual characterization of centenarians is expected to prompt research on centenarians in India.

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^{29.} Rajan, S. I. (2022). Handbook of Aging, Health and Public Policy: Perspectives from Asia (ed). Singapore: Springer Nature Singapore.

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^{31.} Shankardass, M. K. (2021). Ageing Issues in India—Practices, Perspectives and Policies: Introductory Comments. Ageing Issues in India: Practices, Perspectives and Policies, 1-9.

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LASI, 2017-19

Sample design

LASI³⁶ is a nationally representative household survey that was conducted during 2017-19 across all the States/UTs of India. The survey adopted a multistage stratified sampling method with a three-stage sampling design in rural areas and a four-stage sampling design in urban areas. Subdistricts (Tehsils/Talukas) formed the Primary Sampling Units (PSUs), villages in rural areas, and wards in urban areas formed the Secondary Sampling Units (SSUs). Households from selected villages comprised the third stage in rural areas. For urban areas, census enumeration blocks (CEBs) formed the third stage and finally, households were selected from these CEBs in the fourth stage.

LASI provides information on four core domains of health and well-being among older adults and elderly in India: a) disease burden and risk factors, b) healthcare utilization and financing, c) social and family networks, and d) income, wealth, and expenditure. Some other related dimensions covered in the survey were functional health, subjective well-being, and four experimental modules on expectations, social connectedness, time use, and vignettes.

The first wave of LASI was aimed to capture the target population of men and women aged 45 years and above and their spouses residing in the same household (irrespective of age). The survey was conducted during the period 2017-19 with a sample of 72,250 older adults aged 45 years or above (and 31,464 aged 60 years or above) across all Indian states and union territories. For the final analytical sample of centenarian and near-centenarian populations, individuals below 90 years of age were excluded, reducing the sample size from 72,750 to 573 individuals (58 centenarians and 515 near-centenarians).

Outcomes and Characteristics

We analyzed two binary age-based outcomes, for individuals who were 100 years or above

(centenarians) and between 90 and 99 years (near-centenarians). The selection of variables for characteristics of interest was taken from literature on elderly populations, particularly centenarians. Demographic and socioeconomic indicators such as sex, place of residence, social group, education, monthly per capita expenditure (MPCE) quintiles, and marital status were incorporated. Four categories of social groups were considered, scheduled tribes (ST), scheduled caste (SC), and other backward classes (OBC), and others. Education was classified into two groups for comparison, individuals with one to five years of education and above 12 years of education. Marital status was categorized as married, widowed, divorced, and others.

Health and subjective well-being indicators were included. Diagnosed chronic ailments like hypertension, diabetes, cancer, lung disease, heart disease, stroke, bone disease, psychiatric/ neurological disorders, and high cholesterol were incorporated as binary indicators (yes/ no). Additional dichotomous indicators identified whether diagnosed individuals were receiving medication for these conditions.

Biomarkers such as body mass index (BMI), blood pressure (BP), and waist circumference were created based on WHO cut-offs. BMI categories were underweight (below 18.5), normal (18.5–24.9), overweight (25-29.9), and obese (30 or above). Categories for blood pressure were normal (Systolic: <120 mmHg, Diastolic: <80 mmHg), prehypertension (Systolic: 120-139 mmHg, Diastolic: 80-89 mmHg), and hypertension (Systolic: ≥140 mmHg, Diastolic: ≥90 mmHg). For waist circumference, binary indicators for high-risk status were created based on gender-specific cutoffs as high risk for males (>102 cm) and females (>88 cm).

To assess functional health, all 13 indicators provided in the LASI on the activities of daily living

^{36.} International Institute for Population Sciences (IIPS), National Programme for Health Care of Elderly (NPHCE), MoHFW, Harvard T. H. Chan School of Public Health (HSPH) and the University of Southern California (USC). (2020). Longitudinal Ageing Study in India (LASI) Wave 1, 2017-18, India Report, International Institute for Population Sciences, Mumbai.

(ADL) were included. These were measured using binary responses (yes/no) on whether individuals faced difficulty in performing selected ADLs viz. dressing, walking, bathing, eating, getting in or out of bed, using the toilet, cooking, and serving, shopping making calls, taking medication, housework, managing money, finding address.

Analysis

Descriptive analyses are presented using crosstabulations and graphs to illustrate the distribution of sample centenarians and near-centenarians across demographic, socioeconomic, health, and subjective well-being indicators. All the analysis is unweighted as the motivation is to present a plain statistical description of the sample that is reportedly above 90 years of age.

Profile of Centenarians and Near Centenarians

Socioeconomic characteristics

The centenarian sample predominantly comprised of females (63.8% females and 36.2% males) (Table 1). One third of the male centenarians were currently married and living with their spouse whereas all the female centenarians were either widowed or divorced / separated. Centenarians from the ST community accounted for one-fifth of the total sample. For both male and female centenarians, there was slightly higher representation (about 20.0%) of the scheduled tribe community compared to their share in the national population (8.6%).

Background Characteristics	Centenarian (N/58)							Near Centenarian (N/515)						
	Male		Female		Both		Male		Female		Both			
	%	Ν	%	Ν	%	Ν	%	Ν	%	Ν	%	Ν		
Overall	36.2	21	63.8	37	100.0	58	41.6	214	58.4	301	100.0	515		
Marital Status*														
Currently Married	33.3	7	-	-	12.1	7	45.8	98	5.7	17	22.3	115		
Widowed	66.7	14	97.3	36	86.2	50	51.4	109	94.0	283	76.1	392		
Divorced / Separated	-	-	2.7	1	1.7	1	0.5	1	-	-	0.2	1		
Other	-	-	-	-	-	-	2.8	6	0.3	1	1.4	7		
Social Group														
Scheduled Caste	20.0	4	16.7	6	17.9	10	10.0	21	14.1	41	12.4	62		
Scheduled Tribe	20.0	4	19.4	7	19.6	11	18.1	38	20.3	59	19.4	97		
Other Backward Class	35.0	7	41.7	15	39.3	22	47.6	100	35.1	102	40.3	202		
Other	25.0	5	22.2	8	23.2	13	24.3	51	30.6	89	27.9	140		
Education#														
Up to Primary	14.3	3	2.7	1	6.9	4	14.5	31	5.6	17	9.3	48		
Secondary	4.8	1	5.4	2	5.2	3	17.7	38	5.3	16	10.5	54		
Higher	80.9	17	91.9	34	87.9	51	67.8	145	89.1	268	80.2	413		
MPCE Quintile\$														
Poorest	14.3	3	27.0	10	22.4	13	22.0	47	18.3	55	19.8	102		
Poor	23.8	5	24.3	9	24.1	14	21.5	46	14.6	44	17.5	90		
Middle	23.8	5	24.3	9	24.1	14	20.6	44	26.6	80	24.1	124		
Rich	19.1	4	10.8	4	13.8	8	17.8	38	22.9	69	20.8	107		
Richest	19.1	4	13.5	5	15.5	9	18.2	39	17.6	53	17.9	92		
Place of Residence														
Rural	85.7	18	67.6	25	74.1	43	75.2	161	75.1	226	75.2	387		
Urban	14.3	3	32.4	12	25.9	15	24.8	53	24.9	75	24.9	128		

Table 1: Distribution of centenarian and near centenarian by background characteristics, India (LASI, 2017-19)

Note: Centenarian (100+ years), Near Centenarian (90-99 years); * 'Others' includes 'deserted', 'never married', and 'live-in'; # 'Up to Primary' (1-5 years), 'Above 12th Grade' (13+ years); Sample observations = 481 for Near Centenarian and Sample observations = 57 for Centenarian; \$ MPCE - Monthly Per Capita Expenditure. N – Numerator.

The remarkable higher educational achievement of the centenarians is an important insight emerging from the socioeconomic overview of the available sample. Almost, nine out of every 10 centenarians have completed higher education. The educational status is found to be similar among both male and female centenarians. The distribution of female centenarian was slightly skewed toward lower and middle MPCE quintile households whereas among male centenarian the clustering were more in the middle MPCE quintile. The male centenarian (85.7%) was mostly from rural areas whereas in case of females, about onethird were also residing in urban areas.

Females also had a relatively higher representation in the near-centenarian sample. About 45.8% of the near-centenarian males were currently married but over 94.0% of the near-centenarian females were widowed. The ST males and females again show an advantage with greater representation in the overall sample compared to their population share in the total population. Among near-centenarians as well, 89.1% of the females had higher education but only two-third of the males have higher education. As regards, economic status, the near-centenarian again were concentrated in the middle MPCE quintile households. The relative advantage of income is not apparent from the sample distribution. Three out of every four near-centenarian reside in rural areas.

Health status

The anthropometric biomarker of the sample centenarians and near-centenarians is presented in Table 2. Based on the BMI metric, over 40% of the male and female centenarians were found to be underweight. However, one of the male centenarians was obese. Similarly, only one of the male centenarians had higher blood pressure level whereas rest had normal blood pressure. In contrast, 60% of the female centenarians had hypertension or were pre-hypertensive. Except for the one sample of the male centenarian, the waist circumference of rest of the sample (both male and female) was normal.

Among the near-centenarians, while over 40% were underweight (low BMI) but overweight and obesity was also prevalent in both male and female sample. 6.1% and 7.8% of the male near-centenarians were overweight and obese, respectively. Similarly, 7.4% and 8.7% of the female near-centenarians were also overweight and obese, respectively. Over 60% of the male near-centenarians had normal blood pressure readings whereas remaining had hypertension (17.2%) or were in the pre-hypertensive (21.8%)

Background Characteristics	Centenarian (N/58)							Near Centenarian (N/515)					
	Male		Female		Both		Male		Female		Both		
Body Mass Index*		N/16		N/20		N/36		N/180		N/230		N/410	
Underweight	43.8	7	40.0	8	41.7	15	40	72	45.7	105	43.2	177	
Normal	50.0	8	60.0	12	55.5	20	46.1	83	38.3	88	41.7	171	
Overweight	-	-	0	0	0	0	6.1	11	7.4	17	6.8	28	
Obese	6.3	1	0	0	2.8	1	7.8	14	8.7	20	8.3	34	
Blood Pressure#		N/6		N/5		N/11		N/87		N/109		N/196	
Normal	83.3	5	40.0	2	63.6	7	60.9	53	49.5	54	54.6	107	
Pre - Hypertension	16.7	1	40.0	2	27.3	3	21.8	19	17.4	19	19.4	38	
Hypertension	-	-	20.0	1	9.1	1	17.2	15	33.0	36	26.0	51	
Waist Circumference\$		N/16						N/180		N/230		N/410	
Normal	93.8	15	100	20	97.2	35	90	162	73.9	170	81	332	
High Risk	6.3	1	-	-	2.8	1	10	18	26.1	60	19	78	

Table 2: Distribution of centenarian and near centenarian individuals across biomarkers, India (LASI, 2017-19)

Note: Centenarian (100+ years), Near Centenarian (90-99 years); * BMI, Underweight (<18.5), Normal (18.5-24.9), Overweight (25-29.9), Obese (>=30). # Normal (Systolic: <120 mmHg, Diastolic: 80 <80 mmHg), Pre-Hypertension (Systolic: 120-139 mmHg, Diastolic: 80-89 mmHg), Hypertension (Systolic: >=140 mmHg, Diastolic: 90 mmHg). \$ High Risk - Male (>102 cm) and High Risk - Female (>88 cm). N – Numerator. Cut-offs taken as per LASI report (in accordance with WHO).

^{37.} Mossey, J. M., & Shapiro, E. (1982). Self-rated health: a predictor of mortality among the elderly. American journal of public health, 72(8), 800-808.





Note: Centenarian (100+ years), Near Centenarian (90-99 years); 'Bone disease' include Arthritis, Rheumatism, Osteoporosis, or others; 'Neurological Conditions' include Depression, Alzheimer's disease, Dementia, and psychiatric problems such as unipolar/ bipolar disorder, schizophrenia etc and neurological problems such as neuropathy, convulsions, migraine, Parkinson's et

condition. Prevalence of hypertension was higher among females and about one-third of them were hypertensive. One in every ten male nearcentenarians had a high waist circumference whereas the problem was found in three out of every ten females.

The diagnosis status of various chronic diseases and conditions among the centenarians and the near-centenarian sample is also reviewed (Figure 3). Except for hypertension, lung disease and bone disease, no other major ailments have been diagnosed among the centenarian sample. Importantly, none of the sample centenarians were reported to have high cholesterol, heart disease, or stroke. Lung diseases were found to be relatively less among female centenarian than males. In the near-centenarian sample as well, prevalence of hypertension was higher and lung diseases were also high among males. However, in general, all the centenarians and near-centenarians had low prevalence of multiple morbidities.

Figure 4 presents information on difficulty in performing activities of daily living (ADL) among centenarians and near-centenarians. Only about a third of sample centenarians were reported to have difficulty in walking, eating, bathing, and dressing. However, a larger proportion of sample centenarians were reported to have difficulty in housework, managing money, making calls, shopping, and finding addresses. These patterns were similar for near-centenarians as well with an overall lower magnitude. In the case of

 Table 3: Distribution of centenarian and near centenarian individuals across subjective wellbeing indicators, India

 (LASI, 2017-19)

Background Characteristics	Centenarian (N/58)							Near Centenarian (N/515)					
	Male		Female		Both		Male		Female		Both		
Self-Rated Health*		N/16		N/24		N/40		N/192		N/260		N/452	
Good	18.8	3	20.8	5	20.0	8	9.9	19	8.9	23	9.3	42	
Fair	62.5	10	50.0	12	55.0	22	62.0	119	64.6	168	63.5	287	
Poor	18.8	3	29.2	7	25.0	10	28.1	54	26.5	69	27.2	123	
Life Satisfaction#		N/17		N/24		N/41		N/192		N/260		N/452	
High	47.1	8	54.2	13	51.2	21	44.8	86	40.8	106	42.5	192	
Moderate	47.1	8	29.2	7	36.6	15	41.7	80	41.2	107	41.4	187	
Low	5.9	1	16.7	4	12.2	5	13.5	26	18.1	47	16.1	73	
Happiness\$		N/16		N/23		N/39		N/189		N/256		N/445	
High	18.8	3	60.9	14	43.6	17	49.7	94	42.6	109	45.6	203	
Moderate	62.5	10	30.4	7	43.6	17	34.4	65	35.9	92	35.3	157	
Low	18.8	3	8.7	2	12.8	5	15.9	30	21.5	55	19.1	85	

Note: Centenarian (100+ years), Near Centenarian (90-99 years); * 'Excellent' and 'Very Good' coded as 'Good; 'Good' and 'Fair' coded as 'Fair'; 'Poor' coded as 'Poor'. # 'Completely satisfied' and 'Very satisfied' coded as 'High'; 'Somewhat satisfied' coded as 'Moderate'; 'Not very satisfied' and 'Not at all satisfied' coded as 'Low.' \$ 'Most or all of the time' and 'Often' coded as 'High'; 'Sometimes' coded as 'Moderate' and 'Rarely or Never' coded as 'Low.'

grip strength, almost all the centenarians and near-centenarians have difficulty. Among nearcentenarians, the relative difficulties in ADL is low for males than females.

Subjective wellbeing

Self-rated health is an important marker³⁷ of health and longevity. Almost, 20% of the male and female centenarian reported good self-rated health (Table 3). While 18.8% male centenarian reported health to be poor but in contrast the number was relatively more among female centenarians (29.2%). Among near-centenarian, less than 10% of the males and females reported good self-rated health. Almost, one in every four nearcentenarian had poor self-rated health. A notable proportion of both groups expressed moderate to high levels of overall satisfaction with life. For example, 51.2% of centenarians and 42.5% of near centenarians expressed high satisfaction levels. A similar pattern was observed for happiness where 43.6% of centenarians and 45.6% of near centenarians reported high levels of happiness. It is worth noting that much higher proportion of female centenarians (60.9%) reported high happiness than males (18.8%). More interestingly, when comparing both groups, centenarians demonstrated higher levels of self-rated health, life satisfaction as well as happiness than near centenarians.

Discussion

This is one of the first attempts to outline the socioeconomic, health and subjective wellbeing characteristics of centenarians and nearcentenarians in India. Following were the main observations from the descriptive estimates. In terms of demographic characteristics, most of the sample centenarians (and near-centenarians) in India were observed to be widowed. However, the widowhood was relatively low among males.

near-centenarians The centenarians and predominantly reside in rural areas though female centenarians also show good presence in urban areas. The ST individuals had a greater representation in the analytical sample when compared to their share in the national population. The socioeconomic characteristics were also striking. For instance, majority of the centenarians and near-centenarians had higher level of education. Also, there was apparent income-related advantage in the distribution of centenarian and near-centenarian sample. Rather, most of the sample demonstrated a concentration in the middle-income households in terms of the monthly per capita expenditure guintiles.

As regards health, the centenarians generally were in a good condition as characterized by better biomarkers, and a low prevalence of chronic

Figure 4: ADL status and grip strength among centenarian and near centenarian individuals, India (LASI, 2017-19)

(A) Centenarian







(B) Near Centenarian



Note: Centenarian (100+ years), Near Centenarian (90-99 years); as per LASI 2017-19.

ailments. While ADLs like walking, bathing, dressing, and eating were not difficult for most of the sample centenarians, more complex tasks – warranting physical as well as mental involvement – were reported to be tough for a large proportion (housework, making calls, managing money, and finding address). Subjective health assessment is a direct measure of wellbeing. Majority of the sample reported good or moderate health status. Overall life satisfaction was similar among both males and females but the latter reported much higher levels of happiness.

We acknowledge the following limitations. First, the sample size is limited to represent the centenarian and near-centenarian cohort at the national level. However, it may be noted that the sample selection in LASI was not designed to explicitly capture the 90+ population. The sample size is too low to draw definitive generalizable statements at the population level. Additionally, this is the first set of information on the centenarians in India, especially in the absence of any reliable estimates of their headcount. The data on age is self-reported and can suffer from reporting errors and bias. However, most of the sample centenarians were educated up to senior secondary, and the assumption of correct age reporting may hold. The chronic ailments reporting is subject to self-reporting bias and limitations of such assessments.

The insights from the demographic and socioeconomic patterning quite consistently matches with the global evidence on secret of longevity. In particular, the findings resonate well with Hitt et al who unravel the role of morbidity compression that allow individuals to transcend to higher and higher age group such as the supercentenarian club. The centenarians in the sample not only showed morbidity compression but also were able to demonstrate compression of functional decline in terms of the ADL. The latter is an important aspect as physical independence is found to be a key motivation for surviving to extreme old ages³⁸. Psychosocial wellbeing was also critical in terms of the moderate to high reporting of life satisfaction and happiness.

It will be no surprise if these centenarians were

also among the superagers. A good educational background of the study sample lends some credence to this claim as cognitive ability is found to be associated with longevity³⁹. Also, it is interesting that these highly educated individuals predominantly reside in rural areas. The rural residency offers two immediate benefits in terms of better environmental quality⁴⁰ as well as more vibrant community engagements. In general, the presence of joint and extended family⁴¹ systems also offer much needed support and care for the elderly. Like all complex things, longevity is also a multidimensional phenomenon and several things must fall in place for an individual to enjoy an extraordinary healthy and lengthy life. This involves a gamut of factors ranging from genetics ⁴², diets⁴³, geography, resources (public and private), behaviors and subjective experiences.

Further, issues related to informal caregivingrelated challenges need to be addressed, particularly in the Indian context. For example, conflicts between centenarians and their caregivers (family members) are common, especially when the elderly cohort becomes more and more challenging with increasing age in terms of complaints, and day-to-day adjustments. Such conflicts are difficult to deal with, by both sides and can take a toll not only on the health of centenarians (elderly abuse) but their caregivers⁴⁴ as well. Additionally, loss of social role, recognition, and dependability to perform activities of daily living negatively impact their mental status thereby worsening social interactions. Hence, it is important to explore feasible solutions pertaining to the informal care of the oldest old and centenarians, like building formal caregiving facilities with trained staff in gerontology.

A priority should be towards building a national data repository on centenarians, and their distribution across geographic regions, demographics, and socioeconomic groups. This is critical to target, plan, and navigate the resources to support the increased economic burden in the form of basic needs, including formal healthcare giving, and nursing facilities. Needless to add, the Indian way of life in many respects is orthogonal to the western lifestyle⁴⁵. The conclusions thus derived from the

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global (predominantly western) evidence on the enabling factors may have varying relevance in the Indian context. The contextualized information on dietary habits, healthcare, and lifestyle behavior practices of Indian centenarians therefore can be vital to shape policies toward healthy aging.

Concluding Remarks

This elementary profiling of the centenarians and near-centenarians establishes the feasibility of longevity research from available nationally representative datasets in India. The consistency of broad descriptive features of the Indian sample with the widely discussed supercentenarian studies is reassuring in several ways. However, this by no means discards the quality concerns associated with data on oldest-old population in India.

This analysis, nevertheless, prompts several enquiries which may not necessarily be tied to sample surveys. For instance, it is an indisputable fact that countries with highest life-expectancies have witnessed continual improvements in longevity and that scientific advancements (including AI) can further boost the prospects of eternity gains. Even though this is a curious phase in biodemography but the longevity trends can still prove to be a concern for certain quarters in policymaking. A bulk of the population born in the 20th century are yet to be fully exposed to the phenomenon of advanced aging. In near future, it will be no surprise that several of the individuals may enjoy a post-retirement life equivalent to or greater than their entire working life. While private solutions for their wellbeing may be too far-fetched plan but elaborate social security arrangements can also prove to be counterproductive.

The situation can be salvaged only with strategies to harness the longevity dividend in near future. With India projected to be the home for highest numbers of centenarians and near centenarians by 2050, policymaking can benefit from exclusive insights from longevity research. Studies from developed countries have shown encouraging evidence for decoding the secret of longevity from clinical, biological, physiological, genetic, demographic, and socioeconomic perspectives⁴⁶. Both demography and economics places India at the forefront to contribute to these developments though the intent cannot proceed very far without adequate scientific and policy research on aging. Alas, one cannot naively escape the moral valuation of such extraordinary investments. In this regard, the life of Jeanne Calment certainly proves to be an inspiration for the art and science of human longevity. For all we know, the next oldest person can be in India. Engaging with centenarians is, therefore, a prerequisite.

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"Happiness is the meaning and the purpose of life, the whole aim and end of human existence."

- Aristotle





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