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Research Article

PROJECTION OF ELDERLY IN INDIA DURING THE CENSUS YEARS 2021 TO 2051

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A R T I C L E I N F O

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A B S T R A C T

Introduction: The expectation of life at birth is increasing due to better availability and utilization of health care facilities at national level, but the aged population ratio and other health and demographic indicators are lacking behind in comparison of developed countries. The aged dependency ratio at national level in 2011 census was 14.2. The percentage of elderly population in total were 8.2, 9.0 and 8.6 for male, female and total respectively as per 2011 census, where as these percentage were 5.5, 5.8, and 5.6 in the census year 1961.This shows that economic burden is increasing on the care of the elderly .
Objectives: The aim of this study is project percentage of the elderly population for next four census years.
Methodology: This study is based on secondary data obtained from Population census data 2011. Cubic regression model is used to forecast.
Finding: The best fitted model is cubic equation for male, female, rural, urban, and total subgroups separately with percentage variation explained as 99.4, 99.2, 99.6, 99.8, and 99.7 respectively.
Conclusion: It is concluded that the quantum of aged population is growing thus for care of these proportion economic burden increases on the family/society /nation. The government should make the plan for elderly regarding shelter, livelihood, better QOL etc in advance.

INTRODUCTION

The elderly is defined as a person who has completed at least 60 years of age or more. The United Nations generally uses age 60 years as the lower limit to define elderly population.(unfpa-report 1993,2005). The census of India, although provide data on age in groups up to age 80, identifies the elderly as one whose aged 60 years and above. Indian demographers, while studying the demographic and socio-economic aspects of elderly, have used the proportion of persons of age 60 year and above as an indicator of ageing. (Census-1961, 2011, Bose *et al*. 1987,2004, S.rajan *et al*. 2004).

In the traditional society, ageing was considered as a natural process, whereas today ageing is a shared feeling of the organized groups' namely family, peer group and society. (Morgan *et al*. 2001). The concept of ageing had a new meaning at this time. The elderly, who were the pillars of traditional social system, were slowly removed and they became appendix in the family. The intergenerational support has drastically changed due to the new economic scenario. (Martain L *et al.* 1990).

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Demographic Profile of Elderly in the world: Current scenario

According to "*World Population Prospects: the 2015 Revision* (United Nations, 2015)", the number of older persons-those aged 60 years or over-has increased substantially in recent years in most countries and regions, and that growth is projected to accelerate in the coming decades. Between 2015 and 2030, the number of people in the world aged 60 years or over is projected to grow by 56 per cent, from 901 million to 1.4 billion, and by 2050, the global population of older persons is projected to be more than double them its size in 2015, reaching nearly 2.1 billion. Globally, the number of people aged 80 years or over, the "oldest-old" persons, is growing even faster than the number of older persons overall. Projections indicate that in 2050 the oldest-old will be 434 million, having more than tripled in number since 2015, when there were 125 million people over age 80.(World population ageing, 2015).

Demographic Profile of Elderly in India in the year 2011

According to table no 1 there were nearly 104 million elderly persons in India; 53 million females and 51 million males. Both the share and size of elderly population is increasing over time. From 5.6% in 1961 the proportion has increased up to 8.6% in 2011. For males it was marginally lower at 8.2%,

while for females it was 9.0%.As regards residential areas, 8.8% of elderly population resides in rural areas while 8.1% is in urban areas.

Table 1 Elderly Population distribution according to Gender and Place of Residence in the Census Year 2011

Total Population (In millions)	Male	Female	Total
Rural	427.8	406.0	833.8
Urban	195.5	181.6	377.1
Total	623.3	587.6	1210.9
Population Aged 60+ (In millions)			
Rural	36.0	37.3	73.3
Urban	15.1	15.5	30.6
Total	51.1	52.8	103.9
Share of Elderly Population in Total Population (%)			
Rural	8.4	9.2	8.8
Urban	7.7	8.5	8.1
Total	8.2	9.0	8.6

Sources: Population Census 2011

According to table 2 the old-age dependency ratio increased from 10.9% in 1961 to 14.2% in 2011 at National level. The gap between female and male 14.9 and 13.6 respectively in 2011.Between the old age dependency rural and urban ratios have been considerable higher in all the periods 1961 to 2011, in the rural areas and these may be due to relatively higher concentration of population in rural areas. According to 2011, census, this ratio was 15.1% and 12.4% for rural and urban areas respectively.

Table 2 Old-Age Dependency Ratio: Economic status

Year	Total	Male	Female	Rural	Urban
1961	10.9	10.9	10.9	11.4	8.7
1971	11.5	11.4	11.6	12.2	8.9
1981	12.0	11.8	12.2	13.0	9.2
1991	12.2	12.2	12.2	13.2	9.7
2001	13.1	12.5	13.8	14.1	10.8
2011	14.2	13.6	14.9	15.1	12.4

Source: Elderly in India 2016

Problem of the study

To face the challenges of elderly population, the government needs to be preparing in advance. Appropriate social and economic policies needs to be made by centre and state government.

REVIEW AND LITERATURE

The world population is expected to increase to 21.7% by 2050 from the current year 2005, 10.4%. (United nation 2005).

The projection period ranges from 2001 to 2051. It is also important to note that projected elderly population above 60 years of age in 2051 were already born in 1991 and were 10 years old in 2001.The size of India's elderly population aged 60 and above is expected to increase from proportion is likely to reach 12 per cent in 2031 and 17 per cent in 2051. (S. Raian *et al*. july 2006).

As per 2011 Census, there were 104 million elderly (60+) in India, as compared to 70.6 million in 2001 and they are expected to cross 173 million by 2026. (Registrar General, Government of India, 2013).

In 1970, Indians who reached age 60 could expect to live for only 9 more years; but recent estimates from the Sample Registration System suggest that life expectancy at age 60 is close to 20 years which implies that at 60, provisions for their security must be made for another 20 years (Bloom *et al*., 2010).

Rational of the Study

The distribution of population in the various age groups is an essential knowledge into prepare the programmes as per their need. The child and aged are dependent population whereas other is counted as productive. The elderly population has the experience of life spent and there are important stem to development of social value. Old age is itself a disease, as the age increases the problem related to health care services also increases. The required of elderly an individual as well as family/society level is different than groups. Government of India is also giving more emphasis on the welfare of the elderly. Thus knowledge of elderly population will be helpful in the prepare of plan for betterment of elderly in advance.

Aims and objective

The aim of this study is to population project the age dependency ratio for further four census years.

MATERIALS AND METHODS

This study is based on secondary data obtained from Population census years 1961 to 2011. The various mathematical regression models were fitted for known years and best model is maximum percent variation explained by the best model is selected for future projection.

RESULT

The finding of this study are based on population projection teach by using the mathematical models for this projection, census population data from the census years 1961 to 2011 is used as per gender and residential status respectively.

According to table no 3 percentage share of elderly in the total population at national level is ever increasing since 1961. While in 1961, 5.6 per cent population was in the age bracket of 60 years or more, the proportion has increased to 8.6 percent in 2011. The increased trend is observed in rural as well as in the urban areas. In rural areas while the proportion of elderly persons has increased from 5.8 per cent to 8.8 per cent, in urban areas it has increased from 4.7 percent to 8.1 percent during 1961 to 2011.

Table 3 Percentage share of elderly population in total population in India during the census years 1961 to 2011

Census Years	% Share of elderly Population in total Population in India				
	Person	Male	Female	Rural	Urban
1961	5.6	5.5	5.8	5.8	4.7
1971	6.0	5.9	6.0	6.2	5.0
1981*	6.5	6.4	6.6	6.8	5.4
1991**	6.8	6.7	6.8	7.1	5.7
2001***	7.4	7.1	7.8	7.7	6.7
2011***	8.6	8.2	9.0	8.8	8.1

Source: Population Census Data 1961 to 2011
* The 1981 Census could not be held in Assam owing to disturbed conditions. The population figures for 1981 of Assam were worked out by 'interpolation'.
** The 1991 Census was not held in Jammu & Kashmir. The population figures for 1991 of Jammu & Kashmir were worked out by 'interpolation'.
*** The figures include the estimated population of Mao Maram, Paomata and Purul sub-divisions of Senapati district of Manipur.

It is observed that the difference of percentage share of elderly population in whole population in rural and urban areas is narrowing.

Figure 1 depicts that from census year 1961 percent share of elderly population in total population has increased throughout in India. This may be attributed due to the improvement in education, agricultural productivity, water and sanitation health services etc. In the present study model predicted India's percent share of elderly population in total population to be 22.5 in 2051. It should be noted that the trend line with equation of order 3. Also R square value is 0.997 indicating that it is the approximately best fit line.

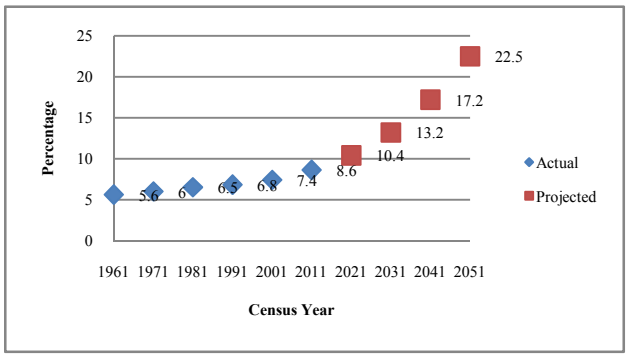

Figure 1 Year and Person, Actual and Projected Population (1961- 2051)

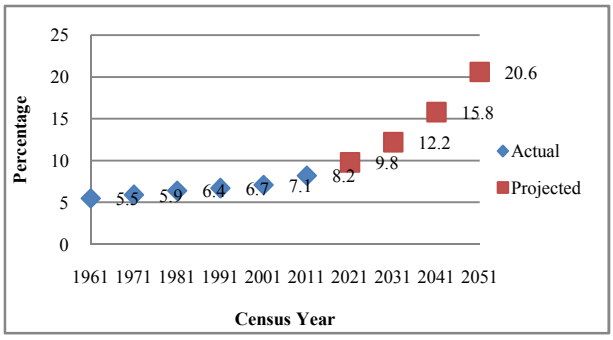

Figure 2 Year and Male, Actual and Projected Population (1961-2051)

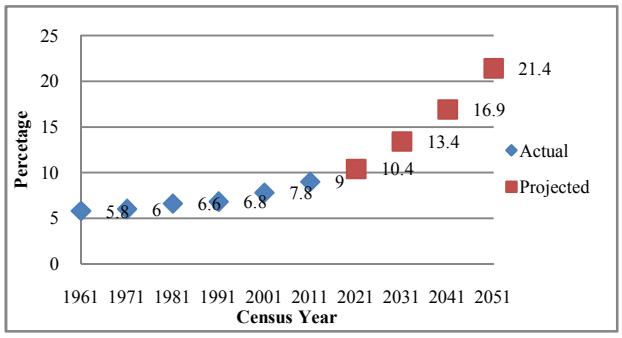

Figure 3 Year and Female, Actual and Projected Population (1961-2051)

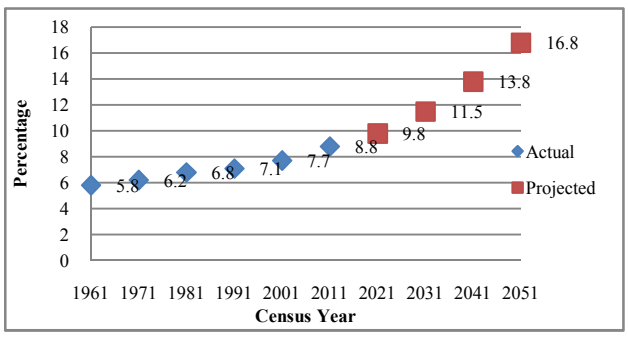

Figure 4 Year and Rural, Actual and Projected Population (1961-2051)

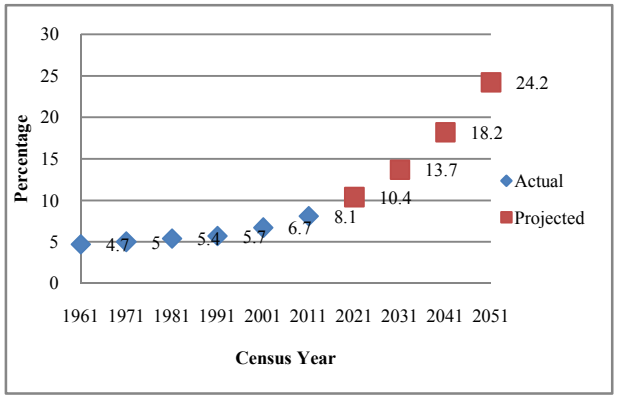

Figure 5 Year and Urban, Actual and Projected Population (1961-2051)

Table 4 R-square values by using various models for gender residence and total separately

Calculation		Gender		Residence	
Model	**Total**	**Female**	**Male**	**Rural**	**Urban**
Linear	0.942	0.916	0.950	0.971	0.895
Logarithmic	0.807	0.750	0.833	0.850	0.720
Inverse	0.616	0.541	0.651	0.659	0.514
Quadratic	0.982	0.987	0.975	0.993	0.987
Cubic	**0.997**	**0.992**	**0.994**	**0.996**	**0.998**
Compound	0.968	0.944	0.970	0.986	0.935
Power	0.857	0.796	0.879	0.890	0.782
S	0.676	0.591	0.708	0.711	0.579
Growth	0.968	0.944	0.970	0.986	0.935
Exponential	0.968	0.944	0.970	0.986	0.935
Logistic	0.968	0.944	0.970	0.986	0.935

Table No 5 Estimated values of regression constant and coefficients by using the quadratic model for socio-demographic variables

Socio-demographic variable	Constant	Regression Coefficient			
		B1	**B2**	**B3**	**R2x100**
Total	4.667	1.181	-.310	0.037	0.997
Male	4.500	1.254	-.324	0.036	0.992
Female	5.333	0.555	-.135	0.024	0.994
Rural	5.167	0.728	-.126	0.018	0.996
Urban	4.100	0.797	-.238	0.036	0.998

Table 6 Projected percentage of elderly in total population in India during 2021-2051 as per this socio-demographic variable

Years	Person	Male	Female	Rural	Urban
2021	10.4	9.8	10.4	9.8	10.4
2031	13.2	12.2	13.4	11.5	13.7
2041	17.2	15.8	16.9	13.8	18.2
2051	22.5	20.6	21.4	16.8	24.2

Person (%) = $4.667+1.181\ (Year) - 0.310(Year)^2 + 0.037(Year)^3$

Male (%) = $4.500 + 1.254\ (Year) - 0.324\ (Year)^2 + 0.036\ (Year)^3$

Female (%) = $5.333 + 0.555(Year) - 0.135\ (Year)^2 + 0.024\ (Year)^3$

Although considered the rural and urban model in figure 4 and 5, we found that predicted percent share of rural elderly population in total population is less as compared to urban in 2051. Difference between then is 7.4 percent also R square value is 0.996 and 0.998 respectively.

DISCUSSION

The population projections for India pose a number of challenges. One of the main objectives of this paper is to assess the emerging elderly scenario of the India in the first half of the 21st century. We have projected the elderly

population of India for the next 40 years, tables 3 gives a profile of the elderly Population in total Population in India 1961 to 2011. Table 6 Projected percentages of elderly in total population in India 2021 to 2051. The population aged 60 or over is growing at a faster rate than the total population in almost all world regions, globally, in 2012 people aged 60 or over present almost 11.5% of our total global population, by 2050, the proportion is projected to nearly double to 22.0%. (Aged Report, UNFPA, 2012).

Whenever my study shows, in 2011, people aged 60 or over 8.6%. (Census population 2011) and my projection is using by mathematical regression model the proportion is projected to 22.5% comparison to globally elderly population. In India is represent 22.5% whole world cause people can new live longer because of improved nutrition, sanitation, medical care advance, health care education and economic well being. The proportion of elderly person in India rose from 9.9% in 2021 to 17.3% in 2051. (S. Irudaya Rajan et. al 2003, Mishra & Sharma 1999). In India, the proportion of the population aged 60 year and above was 7% in 2009 and was projected to increase to 20 % by the year 2050. (Subaiya et. al 2011).

The projected population aged 60 and above as 10.7 % in total population. 10.2 % in male and 11.3 % in female in 2021. Elderly population of India for the next fifty years has been projected. The proportion of the elderly 9.9 % in 2021, 11.9 % in 2031, 14.5 % in 2041 and 17.3 % in 2051. (Lok shabha, reference note 2013, Sumati kulkarni *et al*).

The dependency burden of the elderly is a function of the institutional welfare systems that are in place rather than an immutable state of affairs. (Mason *et al* 2006). If today's policy makers take prompt action to prepare for the effects of aging, the next major shift is likely to cause much less hardship than many fears.

CONCLUSION

India has the second largest elderly population in the world. The number of elderly person in India is projected and according to them increase from 5.6% in 1961 to 22.5% in 2051.Which is increase 8.6%, in 2011, highest In view of the limited information available on elderly person, particularly projected population. The population projection is important government welfare schemes and programmer implication is necessary for improving the health, wellbeing and quality of life of elderly.

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