



# ANALYZING POPULATION DYNAMICS OF UTTAR PRADESH AND ITS MACROECONOMIC IMPLICATIONS

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**Abstract:** Uttar Pradesh, being the most populous state, forms 16.5% of India. It is growing at a fast rate of 20.23%. Along with it, as the state witnesses demographic transition, its age composition is changing. Uttar Pradesh, with a median age of 21.9, is one of the youngest states of India. (Census, 2011) In 2021, 60% of its population was in the working age group of 15-59. This is an opportunity window for the state to reap the demographic dividend. UP is a demographically significant state for India as it is huge contributor to the total working age population of India. Given the scenario, the objective of the paper, thus, is to comprehensively understand the population dynamics of Uttar Pradesh and its macroeconomic ramifications. For this, time frame of sixty years:1961-2021 has been taken to understand UP from the time of high child dependency to growing old-age dependency. Data from the Office of Registrar General & Census Commissioner, India, RBI Handbook of Statistics on Indian States and BKPAI has been used. Measures like growth rate of population, growth rate of old age persons, growth of working age population, dependency ratio, index of ageing, median age of population has been utilized to understand demographic changes. Changes in the demographic variables have been used to explain changes in the macroeconomic variables.

**Index Terms** - Demographic dividend, Economy of Uttar Pradesh, Population ageing, Population dynamics, Uttar Pradesh.

## INTRODUCTION

Uttar Pradesh is the fourth largest state of India by geographic region. It covers 7.3% of the total area of India. It is not just the most populous state of India but also the most populous subdivision in the world. (Kopf Dan, 2017) It forms 16.5% of the total population of India. (Census, 2011) The proportion of population residing in Uttar Pradesh has been shown in Fig1.

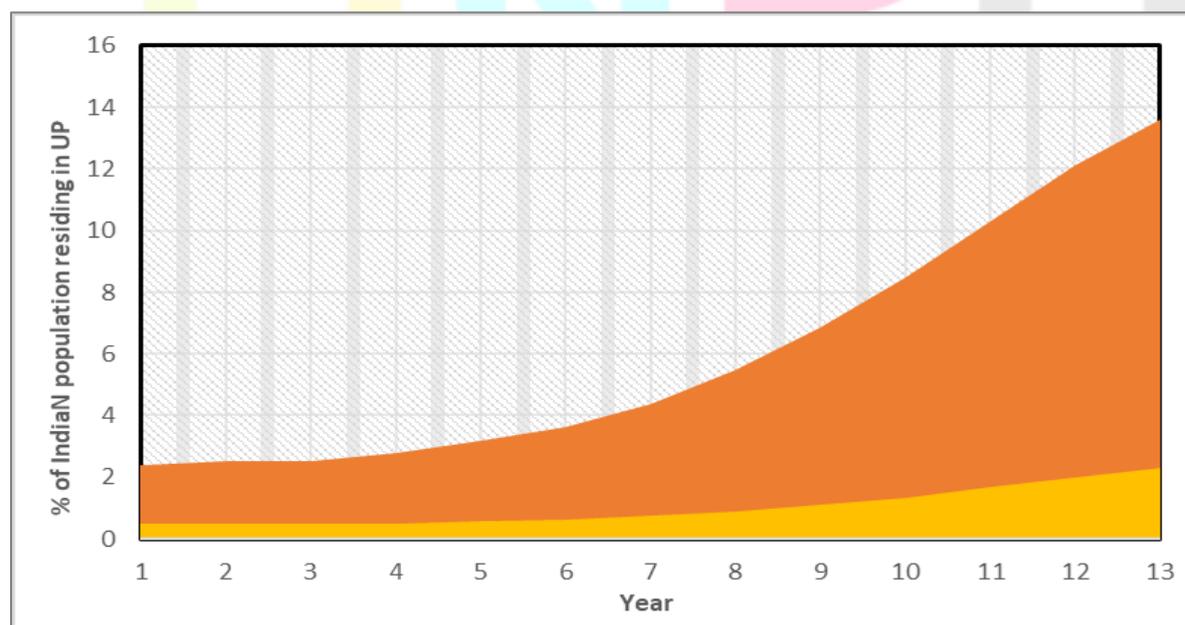


FIGURE1: % of India residing in Uttar Pradesh

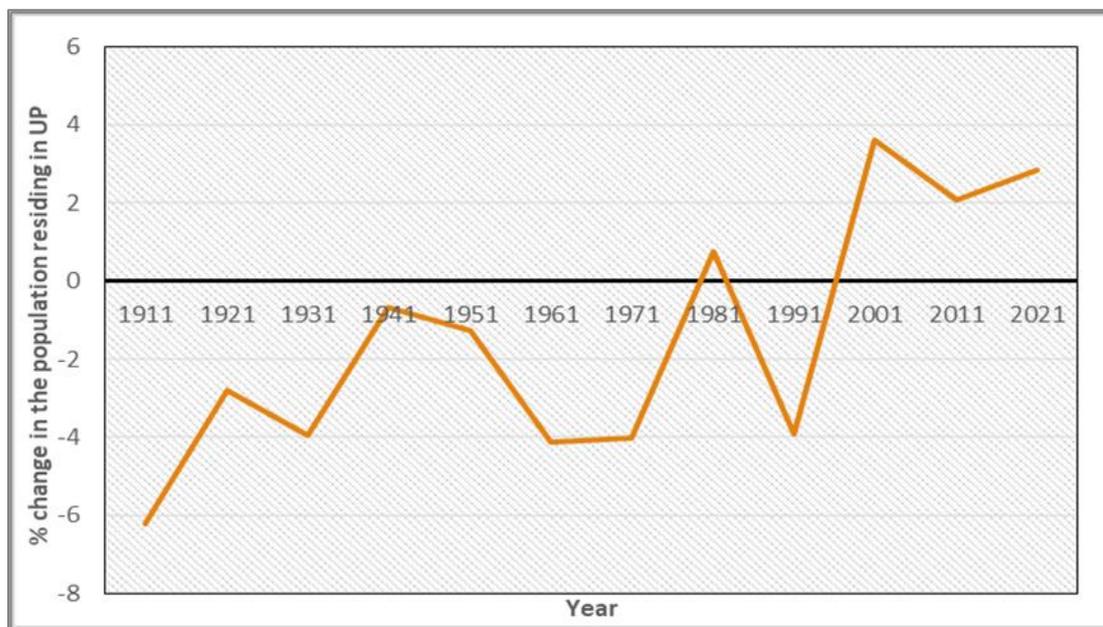


FIGURE 2: % change in the Indian population residing in Uttar Pradesh

It shows that the population residing in UP has been consistently very high. An analysis of the rate of change in the population residing in Uttar Pradesh in Figure 2 reveals that the percentage of Indian population residing in Uttar Pradesh is constantly increasing. This can be attributed to high fertility rates of UP. Uttar Pradesh is the third largest economy of India. It ranks third in terms of GDP in India. However, its rank falls to 28th position when we calculate GDP per capita. This is because of the enormous population in the state. Population of UP grew at a fast rate following the trend of India. However, its population growth rate surpassed that of India in 1981 and continues to be higher than it. (Figure 3)

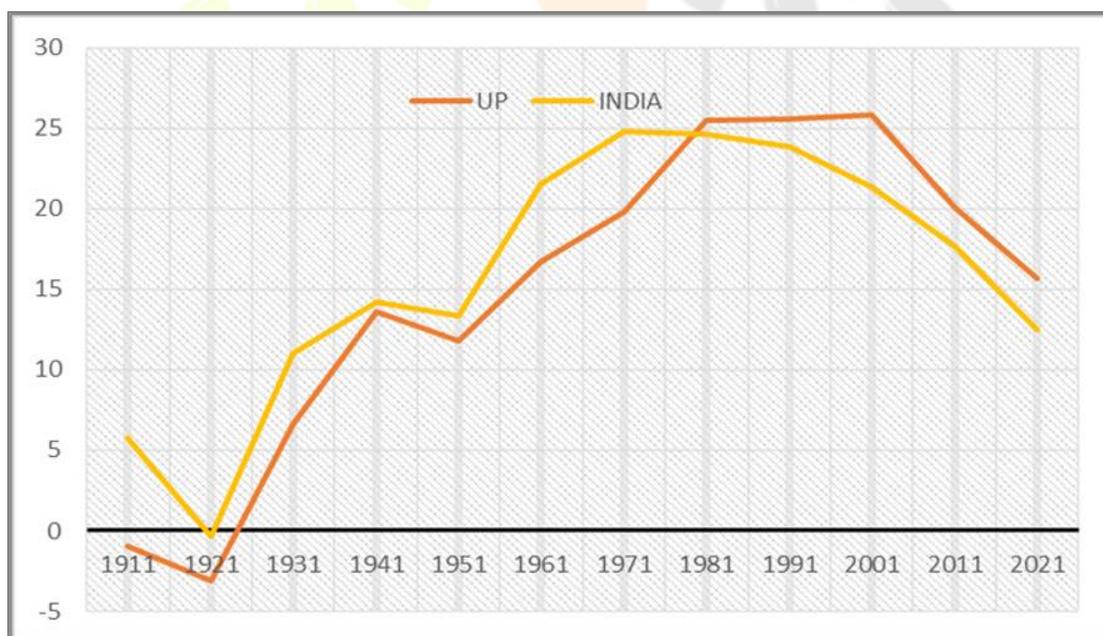


FIGURE 3: Population growth rate of UP and India

The population density of Uttar Pradesh is 828 persons per square kilometer against the country's average of 382 persons per square kilometer. This is a cause of concern given that a high-density population is an obstacle in smooth and efficient policy implementation.

The given statistics reveal that Uttar Pradesh has huge population. This is a window of possibilities not just of Uttar Pradesh but also for India. The huge population of UP has the potential to translate into huge labor force, increased production, savings, consumption and to eventually lead to overall development of the state and of India. There is, thus, need to understand Uttar Pradesh from the perspective of its changing population dynamics and analyze what are its economic implications.

## **OBJECTIVES AND METHODOLOGY**

The objectives of the research are thus to:

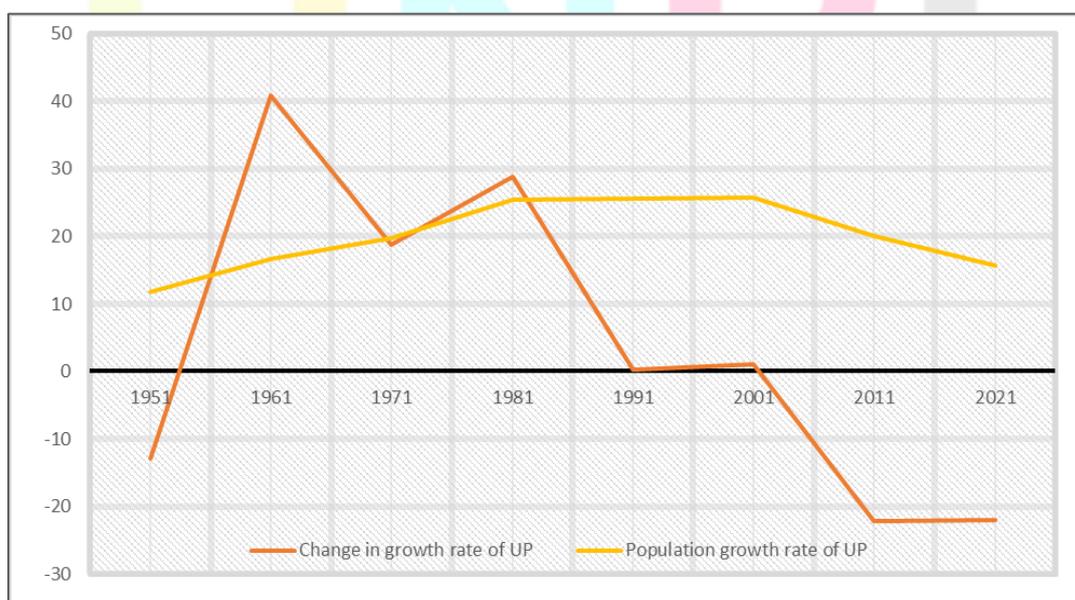
- ❑ To analyze the population dynamics of Uttar Pradesh.
- ❑ To analyze the associative relationship population dynamics have with macroeconomic variables.

The paper utilizes help of demographic indicators like population growth rate, rate of change in growth rate, broad age groups, age dependency ratio, child dependency ratio, share of working age population, ageing index and growth of elderly population. Population growth rate =  $((\text{population in Current Year} - \text{population in Previous Year}) / \text{population in Previous Year}) * 100$ . Rate of change in growth rate =  $((\text{Population growth rate in Current Year} - \text{Population growth rate in Previous Year}) / \text{population growth rate in Previous Year}) * 100$ . Broad age groups refer to the proportion of population in various age groups i.e. population in age groups of 0-14, 15-59 and above 60. Child dependency ratio refers to  $(\text{population in 0-14 age group} / \text{population in 15-59 age group}) * 100$ . Ageing index refers to  $(\text{population in 60 \& above age group} / \text{population in 0-14 age group})$ ; expressed per 100. Dependency ratio refers to  $(\text{population in 0-14 age group} + \text{population in 60 \& above age group}) / \text{population in working age group}$ . For economic variables, data on real GDP (2011-12 prices), per capita income, capital formation and gross fiscal deficit has been utilized. Data for the above analysis has been collected from Office of the Registrar General & Census Commissioner, India; BKPAI; RBI Handbook of statistics on Indian States. The paper has made use of various indexes and graphs to show trend in the population dynamics of UP. Correlation coefficient has been calculated to understand the associative relationship population dynamics have with macroeconomy. It helps in testing the strength of correlation and also the direction of relation. The correlation coefficient has been tested at 1%, 5%, and 10% level of significance.

## **FINDINGS AND DISCUSSION**

### **Changes in the growth rate of Uttar Pradesh**

Uttar Pradesh has been witnessing a high population growth rate. However, the analysis of the growth trends, reveals a new picture. (Figure 4) The rate of population growth changes as population passes the demographic transition stages. Initially, population increased at an increasing rate. The rate of population growth, comparatively, slowed down making it increase at a decreasing rate. Eventually, rate of population growth became negative making the growth of population slow down even further.



**Figure 4: Population growth rate of UP & change in population growth rate of UP**

**Changes in the age composition of UP (broad age groups)**

The population of working age population is highest in the total population followed by proportion of children in the population. Population of elderly is the least. Even though working age population is highest at all the times and elderly population is lowest at all the times, (Table 1; Figure 5) when analyzed, there are changes in the rate of change in the proportion of broad age groups in total population. (Figure 6) This can be understood by calculating % change in age group population.

	1961	1971	1981	1991	2001	2011	2021
<i>Proportion of population in 0-14 age group</i>	40.4	41.8	42.6	40.6	41.1	35	31.3
<i>Proportion of population in 15-59 age group</i>	53.4	51.4	50.9	52.8	52.9	57.9	60
<i>Proportion of population in 60 &amp; above age group</i>	6.3	6.8	6.5	6.6	6.1	7.1	8.7

Table 1: Proportion of population in Broad age groups 1961 – 2021

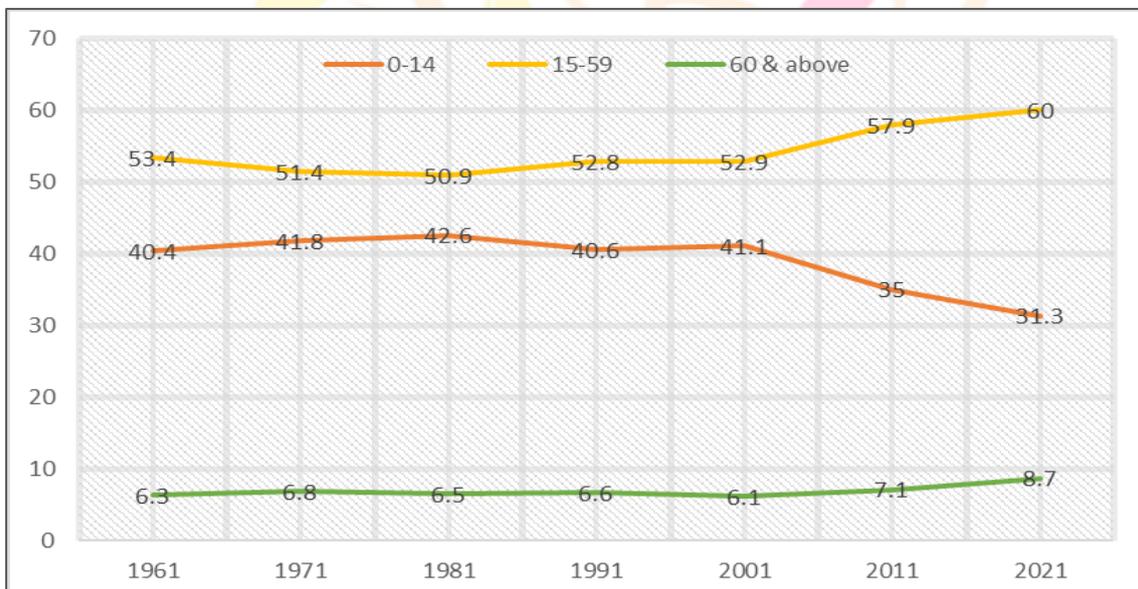


Figure 5: Proportion of population in Broad age groups 1961 – 2021

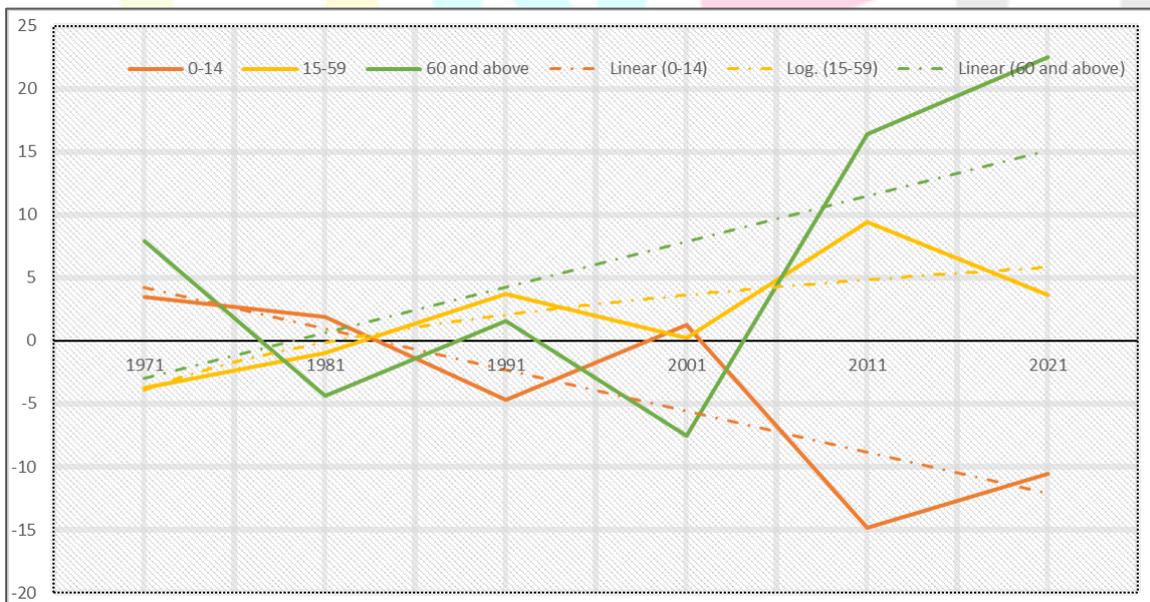


Figure 6: Rate of change in the proportion of population in broad age groups

### Rate of change in proportion of population by age group

Beginning with the population of children (0-14), the proportion of population in total population increased from 1961 to 1981 and again in 2001. However, it decreased all through after that given the falling TFR in UP. The proportion of population in age group (15-59) decreased from 1971 to 1981 because of increasing child proportion. However, it increased at increasing rate initially as baby boom grew up but thereafter the growth in working age population increased at a decreasing rate because of lower birth rates. The population of elderly has been low and stable and around 6% till 2001. However, post that population of elderly is only increasing. This happens because of demographic transition coupled with increased life expectancy. Major demographic development in UP took place in the time span of 1971 to 2011.

The general linear trend in growth of population has been shown by dotted trend lines of the specific age groups. A downward falling orange dotted line shows declining proportion of child population. A moderately upward moving yellow dotted line shows increasing proportion of working age population. An increasing trend in elderly population is shown by green dotted line with higher slope.

The change in age composition of Uttar Pradesh can be understood by analyzing the trends in dependency ratio, child dependency ratio and index of ageing.

	1961	1971	1981	1991	2001	2011	2021
<b>Age Dependency Ratio</b>	87.5	94.6	96.5	89.4	89.2	72.7	66.7
<b>Child Dependency</b>	75.7	81.3	83.7	76.9	77.7	60.4	52.2
<b>Ageing Index</b>	15.6	16.3	15.3	16.3	14.8	20.3	27.8

Table 2: Various ratios of dependency for year 1961-2021

A declining dependency ratio shows that the proportion of population that is dependent is reducing in UP. Or, put in the other words, the number of people who can support dependent population i.e. the working age group is increasing. A declining child dependency ratio of UP shows the number children is decreasing per old person. An increasing ageing index, especially after 2011 indicates towards the gradual movement of UP towards greying of population.

As the three ratios are on different bases to bring them equal parameter for analysis, change in these indexes/ratios has been plotted on graph. The following graph reveals the trend of change in child dependency ratio, age dependency ratio, and ageing index. Child dependency ratio has shown a declining trend (table 2). The rate of change in increasingly negative shown by orange line. Consequently, dependency ratio too has been decreasing post 1981. However, the decrease of dependency ratio has not been mirroring the decrease in child dependency ratio because of its old age dependent component. The population of aged has been increasing after 2001. The increasing rate of old age person can be seen through the green line.



Figure 7: % change in the various dependency ratios 1971-2021

Conclusively, it can be inferred from the above analysis that child dependency ratio and age dependency ratio has been decreasing but, the fall in child dependency ratio has been higher than in age dependency ratio. Dependency ratio decreased lesser because increase in the old age dependents.

Correlation coefficient has been calculated to understand the relation between the demographic variables and macroeconomic variables. Significance of the correlation coefficient is tested at 1%, 5% and 10% level of significance. Significant values are shown by \* mark.

### **Macroeconomic implications of population dynamics of Uttar Pradesh:**

The growth of population, dependency ratio especially dependents in child age group (% of child population) and has a very strong negative relationship with GDP, per capita income, capital formation and gross fiscal deficit. This comes from the fact that high population growth stems from high birth rate. High birth rate has a negative influence on women education and their participation in workforce, thus, distancing actual GDP from potential GDP. In a high fertility population, major proportion of population are in child age group. This age group is economically dependent. As the majority proportion is consumed, savings are very less leading to lesser capital formation. Also, as the population of dependents increase resources have to be diverted from productive purposes to providing for needs of the dependent population. Moreover, excessive pressure on resources due to increasing population also has a negative impact on the macroeconomic variables.

	<i>GSDP</i>	<i>Per capita NSDP</i>	<i>Capital formation</i>	<i>Gross fiscal deficit</i>
<i>Population growth rate</i>	-0.961****	-0.963****	-0.981***	-0.887***
<i>Dependency ratio</i>	-0.980****	-0.989****	-0.979***	-0.868**
<i>% of Child Population</i>	-0.986****	-0.990****	-0.991****	-0.909***
<i>% of Working Age Population</i>	0.984****	0.991****	0.984***	0.878**
<i>% of Old Age Population</i>	0.899***	0.888***	0.820*	0.940***

**Table 3: Bivariate correlation coefficients**

\*\*\*, \*\* and \* represent significance 1%, 5% and 10% level of significance

Working age population has a very strong positive correlation with GDP, per capita income, capital formation, gross fiscal deficit in UP. This comes from the fact that higher proportion of working age population in population translates to a large labor force enhancing the production in economy. As dependent population reduces, savings increase leading to more capital formation. The demographic variables have positive relationship with gross fiscal deficit as a society develops the demand for better infrastructure and employment increases. Thus, increasing the fiscal deficit. UP is a young population and is likely to be so for the coming decades.

## **CONCLUSION & RECOMMENDATIONS**

From the analysis, it can be concluded that:

Population of Uttar Pradesh has been increasing in terms of absolute numbers, in growth rate and in proportion of Indian population in the state. Year 1971 – 2001 have been most crucial in terms of demographic developments in Uttar Pradesh. Uttar Pradesh is changing not just in terms of population growth rate but also in terms of its age composition. Over the years, at all times, working age population has been more than child population and child population has been more than elderly population. However, fluctuations have occurred in the rate of growth broad age group. The general trend that has become clearer after 2001 that the child population is decreasing, working age population is increasing at a moderate rate, elderly population is increasing at an increasing rate.

The aggregate impact of these demographic developments on macroeconomy has been that Uttar Pradesh has developed using the demographic dividend that accrued to it. However, low investment socio economic infrastructure stands as an obstacle to completely utilize the demographic dividend as unemployment, low skills and poor human capital formation are an issue. Although the UP still has an opportunity window as this demographic dividend is expected to last coming few decades. However, situation is likely to get tricky as the population ages (given the increasing old age population.) How well the economy is able adapt to the increasing old age population will depend on its preparation for the future. It is recommended that:

- ❖ Government should thus focus immensely on human capital formation via investment in health, education, and skill development.
- ❖ Targeted efforts have to be made to engage socially and economically marginalized people into the labour force. It is actually the labour force increase that has a positive impact on economic growth.
- ❖ Given the trends, ageing of population will be the next important landmark demographic development. Preparation for it has to start before hand to avoid the negative impacts of ageing while simultaneously reaping dividend from ageing too.



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