Population Projections: Meaning, Types and Importance

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Meaning of Population Projections:

Population projections are calculations of future birth rate, death rate and migration of population based on their past and present conditions. They are neither predictions, nor forecasts, nor estimates. Rather they are in between predictions and forecasts.

According to a UN Study, "Population projections are calculations which show the future course of fertility, mortality and migration. They are in general purely formal calculations, developing the implications of the assumptions that are made."

I n fact, they are only statements about birth rate, death rate and migration of population at some future date, based on certain assumptions. On the other hand, a "population forecast is a projection in which the assumptions are considered to yield a realistic picture of the probable future development of a population." Generally, forecasts are for short term while projections are for long term.

Types of Population Projections:

Population projections are of various types.

We discuss them as under:

(1) Total Projections and Regional Projections:

Projections made for the whole country are called total projections. But when projections are made for a region, state or province, district or ethnic group, they are called regional or sectoral projections. Total projections are easy to make as compared with regional projections. This is because present and past data about birth and death rates and internal migration are not easily and accurately available for a region.

(2) High, Medium and Low Projections of Population:

Population projections are made on the basis of certain assumptions relating to birth rate, death rate and migration. If it is assumed that the birth rate is high, death rate is low, immigration rate is high and emigration rate is low, there is high projection of population. Such a projection is for less developed countries that are passing through the demographic transition stage.

If it is assumed that there is medium increase in birth rate and death rate and medium increase in immigration rate and emigration rate, it is known as medium projection of population. Such a projection shows a medium increase in the growth rate of population due to the success of family planning and health services. Projection of this type is useful in fast developing countries.

If it is assumed that both birth rate and death rate are high and both immigration and emigration rates are also high, there is low projection of population. Such a situation exists in very backward poor countries of Africa.

Low projection of population is also suitable for developed countries on the assumptions that there are low birth and death rates and both immigration and emigration rates are also low.

Methods of Population Projection:

There are three methods of population projection – Mathematical Method, Growth Component Method, and Economic Method.

We discuss them as under:

(1) Mathematical Method:

The mathematical method is the earliest one to be used for population projection.

The resistance or the sum of the obstacles opposed to the unlimited growth of population increases in proportion to the square of the velocity with which the population tends to increase." It means that the growth of population declines in proportion to the increase in density of population.

Verhulst in 1838 developed the S-shaped logistic curve. Recently, Pearl and Reed experimenting on fruit flies derived the logistic curve based on their conclusion that to begin with population grows at a slower rate and then exponentially at a faster rate. After a certain stage, it again grows at a slower rate and subsequently at a faster rate until it becomes stationary.

The S-shaped logistic curve is useful for making population projections. But because of its complicated mathematical formula, it is not used by demographers.

However, demographers use simple arithmetic and geometric formulas and graphs for population projection.

Arithmetic Method:

In the arithmetic projection method, it is assumed that the annual change (increase or decrease) in population remains the same throughout the projection period and the crude birth and death rates are taken. The formula for such linear interpolation is

$$P_p = P_t + \frac{n(P1 - P2)}{N}$$

where,

P_p– Population projection in the future;

P_1 = Present population as per the recent census;

P_2= Size of population in the previous census;

n = Number of years between the projection year and the previous census; and

N= Total number of years between the recent and previous census.

Geometric Method:

In the geometric method of projection, the formula is

$P_p = P_1(1 + r)n$

where,

P_p= Projected population;

P_1 = Population as per the recent census;

r= Annual rate of increase or decrease of population; and

n = Number of years.

This formula is the basis of Malthus's population projection.

It can be easily calculated like geometrical progression of the compound interest:

Limitations of Mathematical Method:

The mathematical method of population projection has been widely used. But it has its limitations.

1. It is neither an adequate nor a complete method of population projection to give information regarding age group.

2. The projection is done on the axiomatic assumption that the demographic projection of the future is based on the growth rate of the past and that the prevailing situation will remain in the future too. It is thus not a real index of either the future or past trends of population.

3. This method fails to make projections about birth rate, death rate and migration because it assumes them as constant.

4. It ignores the past and future socio-economic changes which affect population growth significantly. In fact, socio-economic changes can prove the projected information wrong.

5. It is possible that the formula for the logistic curve may not give an S- shaped curve due to the time series involved in it.

2) Growth Component Method:

This method is more practical than the mathematical method of population projection. The growth component method, also known as the cohort component method, makes separate projections for birth rate, death rate and migration by age-sex groups.

In making projections for the birth rate by age sex groups, the effects of fertility rate in females, marriage and re-marriage rate, sterilization rate of socioeconomic factors, of education, of divorce, of net reproduction rate, etc. on the birth rate are taken into account.

Similarly, in making projections for the death rate, the infant mortality rate, expectation of life at birth, the ratio of the aged in the total population, maternity deaths, etc. are estimated on the basis of past census figures. At the same time, the effects of medical and public health services on the death rate are also taken into consideration.

For making projections on migration, the past trends of emigration and immigration and changes in the rules of migration by other countries vis-a-vis the home country are used.

Thus by calculating separately the effects of birth rate, death rate and migration by age-sex group in each case, the projected total population is estimated by their summation.

The correctness of growth component depends upon the assumptions made about birth rate, death rate and migration rate. But there is every possibility that the assumptions may not be true and the projections may turn out to be incorrect.

(3) Economic Method:

In the Mathematical Method and Growth Component Method of population projections, demographic estimates of future are given on the basis of population growth rate, birth rate, death rate and migration rate. But the factors really affecting them are not kept in mind due to which the projected statistical information remains changeable.

Thus, in the effective economic method of population projection, how and to what extent the birth, death and migration rates are affected by economic factors are considered. Economic development is important for knowing the effects of migrations.

Due to regional economic development, people migrate from the backward areas to developed areas in search of jobs. In addition, the rural, urban, age and sex-wise number of projected labourers are to be estimated. Such changes, their effects on urbanisation and the consequent growth of towns, cities and

urban centres and birth rate, death rate and growth rate of population in them are projected. This method is more useful for region-wise projections rather than for the entire country.

Importance of Population Projections:

Population projections have become very important in recent times in every field of the economy.

1. For Economic Development:

The process of industrialisation and urbanisation, the knowledge regarding the future conditions is not only limited to planners, economists or administrators but today entrepreneurs, traders and customers, too are worried about the future conditions.

On the prevailing growth rate of population in developing countries that are passing through the stage of demographic transition, it is essential for the planners to know that how many houses, schools, teachers, job opportunities and how many quintals of food grains, and how many metres of cloth are to be increased.

All these can be ascertained with the help of projections. Moreover, what should be the trends of export and import and how much foreign investment is required can be roughly estimated through population projections.

The size of population in rural areas, the pace of urbanisation, the possibilities of balanced regional development according to rural-urban population ratio, the contribution of agricultural resources in planning irrigation facilities, the rate of industrial development, etc. are some of the factors which require population projections.

2. For Social Development:

For looking into the future birth rate it becomes necessary to project the factors like level of education, development of education, female education and size of the family, propaganda of family planning, effects of family planning on people, and by how much will the birth rate decline and how many years it will take to achieve any particular growth rate and what will be the changes in the age composition of the population. The birth rate can be projected on the basis of these factors.

3. For Business Classes:

Population projections are also necessary for entrepreneurs or business classes. If they know at what rate and of what size the population will increase in future, they will engage their productive resources in accordance with the demand estimated for the future, based on the projected figures.

On the basis of age and sex-wise population projections they can estimate the future demand for their products and plan and produce accordingly. Thus projections play an important role in market mechanism.

4. For Demographic Theory:

In the 1930s, the popularity of the theory of demographic transition created the environment for population projections and its importance. With the help of the theory of demographic transition, the particular stage of demographic transition of any country can be known and after how many years it will reach the stage of economic development or what time will it take to pass from one stage to another, can be known by population projections.

5. For Planners:

Population projections help the planners to find out the trends in the growth of population between two censuses.

6. For Migration:

They provide estimates of future trends relating to migration at the national and international levels.

7. For Planning Adequate Investments:

According to the Indian Ninth Five Year Plan, population projections are required for planning adequate investments for: (i) essential necessities such as food, shelter and clothing; (ii) essential prerequisites for human development such as education, employment and health care; and (iii) optimal utilisation of the available human resources for economic and social development.

Limitations of Population Projections:

Population projections are made by institutions and demographers but they are often incorrect.

The following are the limitations of population projections:

1. Wrong Assumptions:

Demographers do not use a uniform method for making population projections. The projections are bound to be incorrect because the mathematical and growth component methods are based on different assumptions. As pointed out by J.S. Davis, “It is not calculation of projection that is wrong but assumptions make a projection wrong.”

2. Estimation of Mobility of Labour Difficult:

It is not possible to estimate correctly birth rate, death rate and migration rate due to the mobility of labour, especially in a developing economy. With development and structural transformation, there is large scale mobility of labour within and outside the country which cannot be projected correctly even for a short period.

3. Difficult to Estimate Age-Sex Structure:

Population projections may turn out to be wrong during the demographic transition stage because it is difficult to estimate correctly the age-sex structure of the population.

4. Conditions Likely to Change:

According to Gauman, "Demographic projections are like weather forcasting." Like weather, they are based on conditions and if conditions change during the calculation of projections, they may be incorrect.

5. Based on Hypothesis:

As population projections are based on hypothesis, they are many a time turn out to be untrue. W.G. Barclay opines: "Any calculations of future population are by their nature hypothetical."

6. Artificial and Undependable:

J.J. Spengler qoutes Schoeffler that, "economists have become accustomed to committing a considerable variety of artificialities in their collection, treatment, and interpretation of data. They artificially mechanize, simplify, generalize, systematize, fixate, factorize, close, semi-close, and isolate. Unavoidably, therefore, predictions about economic reality which are produced with the aid of those techniques are quite undependable."

Despite these limitations, demographers and institutes continue to make population projections.

Conclusion to Population Projections:

Population Projections are important only when they are for a short period. The projections for long period are possible only in a static economy. When the economy is dynamic, and social, political and external factors affect it, the projections are rarely true. Pravin Visaria has shown that all projections in 1961 regarding India and Pakistan proved to be false. This does not mean that projections should not be made or used.

While making projections regarding birth and death rates, it should be kept in mind that the projections for birth rate are only successful if the information like total number of females having fertility, marriage-remarriage rate, effect of family planning on citizens and its acceptance etc., is available.

Similarly, for making projections of death rate, the number of population per doctor, daily calorie intake, disease-resistance power, per-capita income, development of medical facilities and economic development, etc. are the factors to be taken into account.

If definite information is available regarding these and the projections are made consciously on the basis of such information for a short period, the projections are useful for demographic analysis.