UNIT 11 : POPULATION DYNAMICS

UNIT STRUCTURE

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11.1 LEARNING OBJECTIVES

After going through this unit, you will be able to-

- describe the concept of population dynamics;
- identify the components of population dynamics;
- explain the demographic characteristics of population dynamics and
- discuss population explosion and measures to control it.

11.2 INTRODUCTION

Population is a group of individuals of the same species that occupy a specific area over a certain period of time. Population dynamics refers to how population of a species changes over time. The study of a species' population dynamics usually seeks to answer questions such as: What explains average abundance of a population? What causes fluctuations in abundance? This Unit will discuss how and why population changes in size and structure over time. Important factors in population dynamics include rates of reproduction, death and migration will be discussed in this Unit.

11.3 NATURE OF POPULATION DYNAMICS

There are several processes that occur simultaneously that can affect population size and dynamics. First, population size is influenced by the per capita population growth rate, which is the rate at which the population size changes per individual in the population. This growth rate is determined by the birth, death, emigration, and migration rates in the population. When the per capita growth rate remains constant, the population can experience exponential growth followed by exponential decline. Interestingly, Charles Darwin was one of the first scientists to realize that high rates of population growth can cause massive mortality events. He related this to evolutionary changes in heritable traits or genes. The maximum per capita growth rate for a population is called the intrinsic rate of increase.

As a population grows in an area, a population may experience the effects of increased densities. In a given area, the maximum population size of the species that the environment can sustain is called the carrying capacity. Carrying capacity is determined by the amount of available resources (food, habitat, water etc.). As the density of individual in a population increases, these individuals must begin competing for limited resources with each other (same species, or intra-specific competition) or with other species (inter-specific competition). If the population grows indefinitely, less and less resources will be available to sustain the population. This process in which per capita population growth changes when population density changes is referred to as **density dependence**.

Humans can be studied from a variety of academic perspectives. In some biological disciplines the focus may be on parts of individuals, perhaps even molecular parts, while in others humans are considered zoologically as an entire species, *Homo sapiens*, in the order *Primatii*. Some biologists are concerned with the physiological functioning body of an individual, while others are interested in world-wide human diversity, distribution and population groupings. Among the social sciences, the focus is also frequently on the group, but here the emphasis tends to be upon the social and cultural factors which underpin the way such phenomena as societies, communities and ethnic groups are constructed, delimited and defined.

There are also the behavioural sciences, which utilize both biological and social information in relation to the study of the group, the individual or elements in the behaviour of the individual. The twentieth century began with observers of the human condition integrating, in what we now recognize to be a confused way, their ideas on the biological and social nature of humans. During the century the fragmentation of all disciplines grew, something exemplified most particularly in the divergence between biological and social pursuits of knowledge. This in turn fuelled many bitter debates between some biologists and some social scientists who were insufficiently informed on the theories and use of language of their antagonists.

11.4 COMPONENT OF POPULATION DYNAMICS

The major components of **population dynamics** are Birth Rate, Death Rate and Migration. Birth rate is the number of live births per thousand persons in a year. It is a major component of growth because in India, birth rates have always been higher than death rates. Death rate is the number of deaths per thousand persons in a year and Migration is the movement of people across regions and territories. Migration can be internal or international. Internal migration does not change the size of the population, but influences the distribution of population within the nation. Migration plays a very significant role in changing the composition and distribution of population.

The change in the population from births and deaths is often combined and referred to as *natural increase* or *natural change*. Population grows or shrinks depending on if they gain people faster than they lose them. Looking at an area's unique combination of natural change and migration helps us to understand why its population is changing, and how quickly the change is occurring.

11.4.1 Natural Increase

Natural change is the difference between births and deaths in a population. Often times, natural change is positive, which means

that more babies are being born than people are dying. This positive natural change is referred to as *natural increase*. Examples of natural increase exist across the United States, one being the Salt Lake City metro area in Utah. Between 2014 and 2015, Salt Lake City had around 19,100 births and 6,400 deaths. Since there were about 12,700 more births than deaths, Salt Lake City had a natural increase of about 12,700 people, making natural increase a key reason why its population grew over the year.

The opposite of natural increase is called *natural decrease*, where more people are dying than babies being born, which can cause a population to shrink. Areas with aging populations often have natural decrease. Two states had natural decrease between 2014 and 2015, Maine and West Virginia. Between 2014 and 2015, Maine had 450 more deaths than births and West Virginia had 940 more deaths than births. In both cases, natural decrease was one of the reasons why their population shrank between 2014 and 2015.

11.4.2 Migration

Migration is the movement of people from one area to another. It is often expressed as *net migration*, which is the difference between how many people move into and out of an area. When net migration is positive, a population has more people moving in than out. We split migration into *domestic migration* and *international migration*. Here, we give you two examples below from the United States of America (USA) to understand the domestic migration and international migration.

Domestic migration refers to people moving between areas within the state, and is often one of the largest contributors to population change. In the USA, regionally, the South gains the most net domestic migrants, with roughly 440,000 more people moving into southern states than leaving them between 2014 and 2015. Sometimes net domestic migration is negative, in which case more people are moving away than are moving in. For example-the

Chicago metro areas in Illinois, Indiana, and Wisconsin lost about 80,000 people through migration between 2014 and 2015, which is consistent with a long-standing pattern of negative net domestic migration for the metro area.

International migration refers to people moving into and out in a nation. For example- the United States consists of a diverse group of people such as foreign-born immigrants from many countries around the world, members of the U.S. Armed Forces, and U.S. citizens working abroad. Some areas, like the Miami metro area in Florida, grow (in part) due to net international migration. Miami gained about 70,000 net international migrants between 2014 and 2015, making net international migration a major factor in Miami's population growth.

Natural change and net migration both contribute to population change, sometimes with unexpected results. Frequently, natural change and net migration push a population in opposite directions, making it more difficult to determine whether a population is growing or shrinking.

Overall, population grows or shrinks through two very basic components – natural change (births minus deaths) and migration (domestic plus international). As illustrated here, the balance between these components is unique in each area, while following general patterns across states or regions. This balance gives areas their own unique story as they change over time. Through the production of annual population estimates, and the types of analysis provided here, demography continues to be an important, ongoing focus of study at the Census Bureau that contributes to our understanding of where we've been and where we're headed in the future.



CHECK YOUR PROGRESS

Q. 1: What do you mean by population dynamics?

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Q. 2: Explain the concept of Migration.

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11.5 DEMOGRAPHIC CHARACTERISTICS

The term *demographics* refer to particular characteristics of a population. The word is derived from the Greek words for *people* (*demos*) and *picture* (*graphy*). Examples of demographic characteristics include age, race, gender, ethnicity, religion, income, education, home ownership, sexual orientation, marital status, family size, health and disability status, and psychiatric diagnosis. Demography is, in essence, the calculation of population numbers and population changes, and brings to bear many per species on the causes, patterns and consequences of fertility, mortality and migration. Since births, deaths and migration are central variables in the work of practitioners of the other disciplines which together form the 'Human Sciences', a full understanding of demography involves consideration of these other disciplinary approaches.

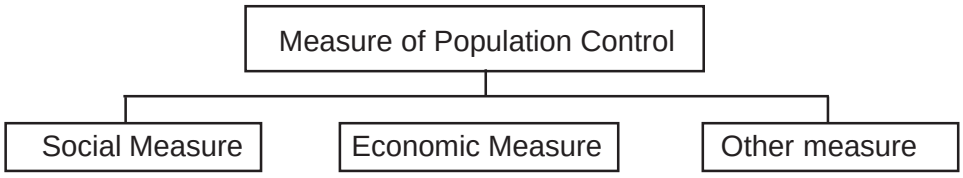
Demography is about analysing the growth (or decline) of human populations and changes in their structure. We cannot analyse population growth without some straightforward and unambiguous way of enumerating the members of a population, and this can only exist if we can work out who is, and who is not, to be included in the enumeration. To demographers, a *population* consists of any group of persons who can be delimited on the basis of some observable characteristic. The most common way is to define the population on the basis of residence within a given geographical area. Thus we speak, for example, of the 'population of England' as being all

those persons normally resident in England. However, residence is not the only criterion. We could delimit populations on the basis of tribal affiliation: the Luo population of Kenya, for example, using both geographical residence and membership of a particular tribe as criteria. Necessary features or characteristics used to delimit a population are that they be observable and well defined, so that we can use them to say whether any individual is or is not a member of the population at a given time. Notice that although these characteristics are used to distinguish populations, they themselves are inclusive: they are shared features which bind the members of a distinct population together. In order to be able to analyse population growth and change, it is essential to be able to identify the processes by which people enters or leaves population. It is fortunate for demographers that population only changes in size because of a limited, countable range of events. Consider, for example, the population of a particular country at some time, say 1 January 2000, which we might call P 2000.Then the population of that country on 1 January 2001, P2001, is equal to P 2000 plus the number of births during the year 2000, minus the number of deaths, plus the number of people who migrated into the country during the year, minus the number of persons who migrated out. The difference between the number of births and the number of deaths is known as *natural increase* (or *decrease* if deaths exceed births) and the difference between the number of immigrants and the number of emigrants is known as *net migration.* Analyzing changes in the size of human populations, therefore, involves the analysis of the processes by which births, deaths and migration events come about. The process which produces births is known as fertility; the corresponding process which results in deaths is called mortality. The three processes of fertility, mortality and migration are known as the components of population change. Demographers are interested particularly in the intensity with which these events occur in a particular population. Since a large population will tend to generate more events than a small population, the absolute numbers of, say, births and deaths in a particular time period are of limited use as measures of this intensity. Therefore, demographers use what are called rates. A demographic rate is a ratio of events of a particular type, for example

deaths, to the number of persons exposed to the risk of experiencing that type of event. Thus the crude death rate is equal to the number of deaths in a given period divided by the 'average' population during that period. It is normally important that the events and the population 'exposed to risk' correspond. That is, we need to make sure that the persons exposed to risk really are at risk of experiencing the event in question, and that we do not include events in the numerator which do not occur to persons in the denominator. There are some exceptions to this, one being the crude birth rate (number of births in a given period divided by the 'average' population during that period) in which men, who do not give birth, are included in the denominator. Because people are not all identical, all human population has a structure. By population structure demographers mean the distribution of various characteristics across the members of a population. The characteristics most commonly considered by demographers are sex and age.

11.6 POPULATION CONTROL MEASURES

Population of India is quite large and rapidly increasing. One percent growth rate means an addition of 1 crore people every year but actually speaking 2 crore persons are being adding every year. So, an effective population control measure is the need of the hour. We know that birth rate is mainly responsible for rapid population growth. Hence measures which can reduce the birth rate should be adopted. These measures can be classified into 3 heads.



A. Social Measure:

Population explosion is a social problem and it is deeply rooted in the society. So efforts must be taken to remove the social evils in the country.

1. **Minimum age of Marriage:** Fertility depends on the age of marriage. So the minimum age of marriage should be raised. In India minimum age for marriage, 21 years for men and 18 years for women have been fixed by law. This law should be firmly implemented and people should also be made aware of this through publicity.
2. **Raising the Status of Women:** There is still discrimination to the women. They are confined to four walls of house. They are still confined to rearing and bearing of children. So women should be given opportunities to develop socially and economically. Free education should be given to them.
3. **Spread of Education:** The spread of education changes the outlook of people. The educated men prefer to delay marriage and adopt small family norms. Educated women are health conscious and avoid frequent pregnancies and thus help in lowering birth rate.
4. **Adoption:** Some parents do not have any child, despite costly medical treatment. It is advisable that they should adopt orphan children. It will be beneficial to orphan children and childless couples.
5. **Change in Social Outlook:** Social outlook of the people should undergo a change. Marriage should no longer be considered a social binding. Issueless women should not be looked down upon.
6. **Social Security:** More and more people should be covered under-social security schemes. So that they do not depend upon others in the event of old age, sickness, unemployment etc. with these facilities they will have no desire for more children.

B. Economic Measures:

The following are the economic measures:

1. **More employment opportunities:** The first and foremost measure is to raise, the employment avenues in rural as well as urban areas. Generally in rural areas there is disguised unemployment. So efforts should be made to migrate unemployed persons from rural side to urban side. This step can check the population growth.
2. **Development of Agriculture and Industry:** If agriculture and industry are properly developed, large number of people will get employment.

When their income is increased they would improve their standard of living and adopt small family norms.

3. **Standard of Living:** Improved standard of living acts as a deterrent to large family norm. In order to maintain their higher standard of living people prefer to have a small family. According to A.K. Das Gupta those who earn less than Rs. 100 per month have on the average a reproduction rate of 3.4 children and those who earn more than Rs. 300 per month have a reproduction rate of 2.8 children.
4. **Urbanisation:** It is on record that people in urban areas have low birth rate than those living in rural areas. Urbanisation should therefore be encouraged.

C. Other Measures:

The following are the other measures:

1. **Late Marriage:** As far as possible, marriage should be solemnized at the age of 30 years. This will reduce the period of reproduction among the females bringing down the birth rate. The govt. has fixed the minimum marriage age at 21 yrs. for males and 18 yrs. for females.
2. **Self Control:** According to some experts, self control is one of the powerful methods to control the population. It is an ideal and healthy approach and people should follow it. It helps in reducing birth rate.
3. **Family Planning:** This method implies family by choice and not by chance. By applying preventive measures, people can regulate birth rate. This method is being used extensively; success of this method depends on the availability of cheap contraceptive devices for birth control. According to Chander Shekher, “Hurry for the first child, Delay the second child and avoid the third.”
4. **Recreational Facilities:** Birth rate will likely to fall if there are different recreational facilities like cinema; theatre, sports and dance etc. are available to the people.
5. **Publicity:** The communication media like T.V., radio and newspaper are the good means to propagate the benefits of the planned family to the uneducated and illiterate persons especially in the rural and backward areas of country.

6. **Incentives:** The govt. can give various types of incentives to the people to adopt birth control measures. Monetary incentives and other facilities like leave and promotion can be extended to the working class which adopts small family norms.
7. **Employment to Woman:** Another method to check the population is to provide employment to women. Women should be given incentive to give services in different fields. Women are taking active part in competitive examinations. As a result their number in teaching, medical and banking etc. is increasing rapidly. In brief by taking, all these measures we can control the growth of population.

Population explosion is a vital issue now a day. This aspect of study is directly related to environmental consequences. Therefore, population education receives much importance these days, especially from lower level to higher level of education. Population education should not be misunderstood as sex education, family planning, family welfare project, family life education. But population education is an educational programme which studies the population situation in the family, in the community, in the nation and in the world. It is a relationship between population change and quality of life at the micro and macro-level. Population education enables those students to be aware of the process and consequences of the population growth on the quality of our lives and the environment. The child gets an opportunity to investigate and explore the interaction between population and their environments. The child also knows the causes and consequences of population increase at local, national and global level.



CHECK YOUR PROGRESS

Q. 3: What is social measure of population control?

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Q. 4: Explain women employability as a measure of population control tool.

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11.7 LET US SUM UP

- **Population dynamics** refers to how population of a species change over time. As a population grows in an area, a population may experience the effects of increased densities. In a given area, is the maximum population size of the species that the environment can sustain is called the **carrying capacity**. Carrying capacity is determined by the amount of available resources (food, habitat, water).
- Natural change is the difference between births and deaths in a population. Often times, natural change is positive, which means that more babies are being born than people are dying.
- Migration is the movement of people from one area to another. It is often expressed as net migration, which is the difference between how many people move into and out of an area. When net migration is positive, a population has more people moving in than out. We split migration into domestic migration and international migration.
- Demography is, in essence, the calculation of population numbers and population changes, and brings to bear many per species on the causes, patterns and consequences of fertility, mortality and migration.
- Population Control measures are some of the steps through which we can control the growth rate of population. These measures are categorized into social measure, economic measure and other measures.



11.8 FURTHER READING

1) Dash, B.N. (1996): “Principles of Education and Education in the Emerging Indian Society”, Delhi.

2) Macbeth, Helen, Collinson, Paul, and Collinson Paul (2002): “Human Population Dynamics: Cross- Disciplinary Perspectives”, Cambridge University Press.



11.9 ANSWERS TO CHECK YOUR PROGRESS

Ans. to Q. No. 1: Population dynamics refers to how population of a species change over time. There are several processes that occur simultaneously that can affect population size and dynamics. First, population size is influenced by the per capita population growth rate, which is the rate at which the population size changes per individual in the population. This growth rate is determined by the birth, death, emigration, and migration rates in the population.

Ans. to Q. No. 2: Migration is the movement of people from one area to another. It is often expressed as net migration, which is the difference between how many people move into and out of an area. When net migration is positive, a population has more people moving in than out. We split migration into domestic migration and international migration.

Ans. to Q. No. 3: Population explosion is a social problem and it is deeply rooted in the society. So efforts must be taken to remove the social evils in the country. Some of the social measures are minimum age of marriage, raising the status of women, spread of education, adoption etc,

Ans. to Q. No. 4: Women should be given incentive to give services in different fields. Women are taking active part in competitive examinations. As a result their number in teaching, medical and banking etc. is increasing rapidly. In brief by taking, all there measures we can control the growth of population.



11.10 POSSIBLE QUESTIONS

A) Very Short Questions (Answer each question in about 50 words)

Q 1: What do you mean by carrying capacity?

Q 2: What is the meaning of density dependence?

Q 3: What do you mean by domestic migration?

B) Short Questions (Answer each question in about 150 words)

Q 1: Explain how international migration fuels in the growth of population.

Q 2: Explain the demographic characteristics of population.

C. Long Questions (Answer each question in about 300-500 words)

Q 1: Define the concept population dynamics. Describe the components of population dynamics.

Q 2: Describe the different measures taken to control population growth.

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