

The Chandrasekan - Deming method is a statistical approach used to assess the completeness of a registration system, such as birth or death registration, by leveraging the concept of dual record systems. This method estimates the total population (or total events) by matching records from two independent sources.

If  $N$  represents the total number of events then the Chandrasekan Deming estimate  $N$  may be written as

$$N = C + N_1 + N_2 + X$$

Where  $X$  represents the number of events missed by both Civil Registration System (CRS) and Sample Registration System (SRS)

$N_1$  represents the number of events recorded by SRS.  
 $N_2$  represents the number of events recorded by CRS.  
 $C$  represents the number of events recorded by both registration and survey.

Tabular representation:

		CRS	
		Yes	No
SRS	Yes	C	$N_1$
	No	$N_2$	X

Let, the probability of  $R$ , detecting an event recorded in SRS be  $P_1$  and the probability of  $S$ , detecting an event recorded in CRS be  $P_2$ .

Therefore,  $P_1 = \frac{C+N_1}{N}$  and  $P_2 = \frac{C+N_2}{N}$

Therefore, the probability of an event being missed by SRS and CRS is respectively given by

$$q_1 = (1 - P_1) = \left(1 - \frac{C+N_1}{N}\right) \quad \text{and} \quad q_2 = (1 - P_2) = \left(1 - \frac{C+N_2}{N}\right)$$

$\therefore P(\text{The numbers of people being missed by both SRS and CRS})$

$$= \left(1 - \frac{C+N_1}{N}\right) \left(1 - \frac{C+N_2}{N}\right)$$

Therefore, the numbers of events missed by both SRS and CRS is given by

$$X = N \left(1 - \frac{C+N_1}{N}\right) \left(1 - \frac{C+N_2}{N}\right)$$

$$\text{or, } X = N \frac{(N - C - N_1)(N - C - N_2)}{N^2}$$

$$\text{or, } X = \frac{(N - C - N_1)(N - C - N_2)}{N}$$

$$\text{or, } NX = (C + N_1 + N_2 + X) - (C - N_1)(N_1 + N_2 + C + X - C - N_2)$$

$$\text{or, } NX = (N_2 + X)(N_1 + X)$$

$$\text{or, } NX = N_1 N_2 + N_1 X + N_2 X + X^2$$

$$\text{or, } (C + N_1 + N_2 + X)X = N_1 N_2 + N_1 X + N_2 X + X^2$$

$$\text{or, } CX + N_1 X + N_2 X + X^2 = N_1 N_2 + N_1 X + N_2 X + X^2$$

$$\text{or, } CX = N_1 N_2$$

$$\text{or, } X = \frac{N_1 N_2}{C}$$

Thus, we have

$$N = C + N_1 + N_2 + \frac{N_1 N_2}{C}$$

This may be re-written as

$$N = \frac{(C + N_1)(C + N_2)}{C}$$

$$= \frac{S.R.}{C}$$

Rearranging this it can be seen that the Chandrasekaran-Deming formula estimates the completeness of the coverage of the Civil Registration System (CRS) as the match rate of the Sample Registration System (SRS) and estimates the completeness of the coverage of the Sample Registration System (SRS) as the match rate of the Civil Registration System (CRS).

$$\text{i.e. } \frac{R}{N} = \frac{C}{S} \quad \text{and} \quad \frac{S}{N} = \frac{C}{R}$$

# Validity of the above system will depend on the following assumptions:

- i) The two systems are independent; meaning the probability of an event being recorded in one system is unrelated to it being recorded in the others.
- ii) The matching procedure successfully identifies all true matches.
- iii) The population is closed to migration i.e. it doesn't experience significant migration on other factors affecting the Count.
- iv) All events identified in either of the events are true events.

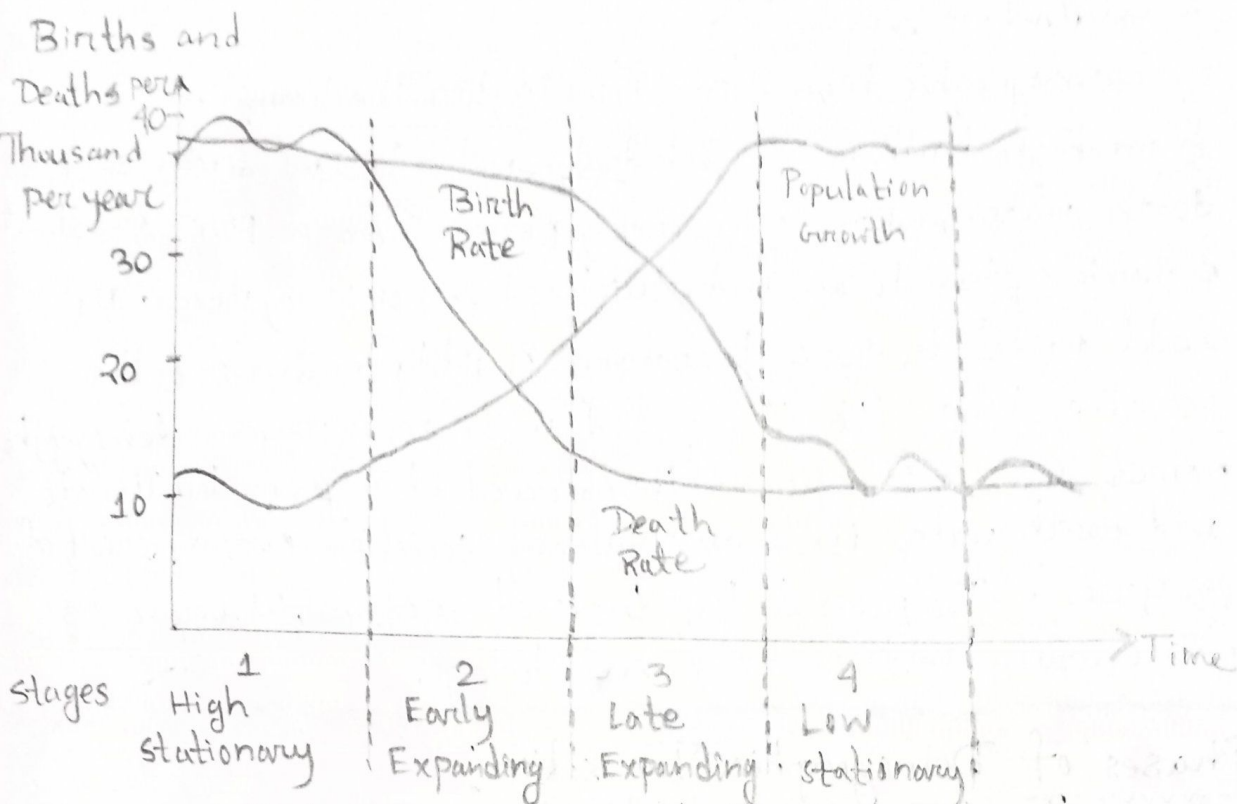
## Demographic Transition:-

Demographic transition (DT) implies the transition from high birth rates and death rates to low birth and death rates, when an economy passes from a pre-industrial economic system to an industrialized economic system. DT model predicts ever decreasing fertility rates over the period of time. It is associated with an American demographer named Warren Thompson. He observed changes in birth rates and death rates in industrialized societies over a period of 200 years. In present day developed nations, DT began in 18th century and continues even today.

## Phases of Demographic Transition:-

The demographic transition involves four stages as below:

1. First stage - In the 1st stage, death rates and birth rates are high and roughly in balance. This stage is termed as high stationary stage. All human populations are believed to have had this balance until the late 18th century. This balance in death rates and birth rates ended in western Europe. Both birth and death rates tend to be very high in this stage. As a result, the population growth is very slow in the 1st stage.
2. Second stage - In this stage, there is a fall in death rates, which causes an increase in population. Countries in this stage include developing countries like Yemen, Afghanistan, Bhutan. There have been significant improvements in public health, which reduced mortality, particularly infant mortality, improvements in food handling, education and social status of mothers. This stage is termed as early expanding phase.



3. Third stage In stage three, there is a population stability due to a decline in birth rate. The birth rate <sup>has</sup> declined due to access to birth spacing devices like contraception, more urbanization, improvement in women education, status. A major factor in reducing birth rates in stage three developing countries such as ~~My~~ Malaysia is the availability of family planning facilities. This stage is called late expanding phase.

4. Fourth stage:- In fourth stage, both birth ~~rate~~ and death rates are low. Birth rates may drop to well below replacement level. This leads to fall in population growth rate significantly. This stage is called low stationary phase. This ~~has~~ has happened mostly in Germany, Japan, Italy. Death rates may remain consistently low or increase slightly due to increases in lifestyle disease due to low exercise levels.

As a result, the process of an aging population in developed countries has occurred. Countries in fourth stage include the United States, Canada, China, Australia, Iran, South Korea etc.

*(with few lines on fifth or sixth stage)*

5. Fifth stage: Both more-fertile and less-fertile futures have been claimed as stage five. Some countries have sub-replacement level of fertility (below 2.1 children per woman). At advanced human development levels, fertility rebound. Currently, most advanced countries have increased fertility.

Q.10

② Factors affecting death registration in India:

Ans: Here are six factors affecting death registration in India:-

(i) Awareness and Education:- Many people, especially in rural areas, may not be aware of the legal requirement to register deaths leading to low registration rates.

(ii) Access to Registration Service:- Limited access to death registration offices, particularly remote regions can hinder timely registration. Long distances and lack of transportation can complicate the process.

(iii) Cultural practices and Beliefs:- certain cultural or religious practices may prioritize traditional rituals over formal documentation, leading families to neglect the official registration of deaths.

(iv) Socioeconomic Factors:- Families facing economic hardships may prioritize immediate concerns over bureaucratic processes like death registration, resulting in delays or non-registration.

(v) Bureaucratic challenges:- Inefficiencies in the local administrative systems, such as delays in processing or lack of trained personnel, can deter families from completing the registration process.

(vi) Legal and Documentation Requirements:- The need of specific documents (identity or residence) can pose challenges for families especially those who may not have proper documentation in transitional living situations.

## ① Factors affecting Birth Registration in India. ⑧

Solution: Here are seven factors affecting birth registration in India:

- (i) Awareness and Education: Lack of awareness about the importance of birth registration among parents, especially in rural and unprivileged areas, can lead to low registration rates.
- (ii) Access to Registration Facilities: Limited access to registration offices, especially in remote or rural areas, can hinder the ability of parents to register births promptly.
- (iii) Cultural Beliefs and Practices: In some communities, traditional beliefs and practices may discourage formal registration or prioritize other rituals over legal documentation.
- (iv) Government policies and Efficiency: The effectiveness of government initiatives and the efficiency of local administrative bodies play a crucial role in facilitating the registration process.
- (v) Language and Communication Barriers: Language differences and lack of understanding of the registration process can deter parents from registering their children's birth.
- (vi) Legal and Documentation Issues: The requirement for certain documents can pose challenges for families, especially those without proper documentation or those who have migrated.
- (vii) Socioeconomic Status: Families with lower socioeconomic status may prioritize immediate survival needs over bureaucratic processes like birth registration, leading to delays or non-registration.