Human Population & Environment

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Introduction

- Human society thrives on interaction and cooperation among individuals.
- Despite advancements in technology and medical knowledge aimed at controlling population growth and enhancing health, population numbers are still rising, exacerbating poverty.
- Humans, as social creatures, possess freedom of choice, often guided by emotions rather than rational thinking, as evidenced by historical, social, ethical, and religious factors.
- Addressing the population issue now hinges more on philosophical, theological, political, and sociological considerations rather than purely biological factors.
- Understanding the root causes of population growth is crucial for effectively tackling the issue.

Carrying Capacity

- ➔ - Carrying capacity refers to the maximum number of individuals of a species that can **sustainably** exist in an area.
- ➔ - Four primary factors determine the carrying capacity:
  availability of raw materials,
  energy,
  waste accumulation,
  and interactions among organisms.
- ➔ - Environmental resistance is the collective force of these factors that limits population size.
- ➔ - Certain limiting factors play a crucial role in population size regulation, such as food availability, oxygen levels, competition with other species, and disease outbreaks.

Population Characteristics

- A **population** comprises individuals of the same species inhabiting a specific area.
- Population characteristics include **natality (birth rate), mortality (death rate), sex ratio, age distribution, growth rates, and spatial distribution.**
- **Natality** refers to individuals added to the population through reproduction, often measured as the birth rate per thousand individuals per year.
  Formula: B (Natality rate) = Nn/t, where B = Natality rate,
  N = number of new individuals added to the population, n = time.
- **Mortality** represents the number of deaths per year, usually discussed as the death rate per thousand individuals per year.
- **Population Density** is the population size relative to space and time,
  measured as D = (N/a)/t, where D = population density, N = number of individuals,
  a = area, and t = time.
- **Population Age Distribution** refers to individuals categorized into different age groups, affecting natality and mortality rates.
- **Biotic Potential** signifies the maximum reproductive power of a population under optimum conditions, represented by the constant percent growth rate (g).
- **Sex Ratio** indicates the proportion of males to females in the population.

The Human Population Issues

- Population growth contributes to famine in regions where food production cannot match the pace of population increase.
- Disparities in resource availability, including jobs and goods, can lead to political unrest in certain areas.
- Poor agricultural practices contribute to environmental degradation, such as erosion and desertification.
- Human and industrial waste pollute water sources, while energy consumption for personal and industrial purposes leads to air pollution.
- Conversion of natural ecosystems into managed agricultural areas by humans leads to species extinctions.
- Exploitation of natural resources, such as strip mining and oil spills, has destructive effects on the environment.
- Highly industrialized populations impose greater demands on energy and material resources compared to less-developed populations.

Population growth curve

- Sex ratios and age distributions impact the reproductive rate of a population.
- Each species has a **biotic potential**, representing its inherent ability to produce offspring.
- High reproductive potential leads to population growth, as seen in the example of mice producing offspring.
- Population growth typically follows a pattern: lag phase, exponential growth phase, and stable equilibrium phase.
- The lag phase is characterized by slow population growth due to the time required for reproduction and offspring development.
- Organisms must mature into adults before reproducing, followed by mating and the development of young into independent individuals.
- As more organisms reach sexual maturity and reproduce, the population enters the exponential growth phase, where growth accelerates.
- Exponential growth continues as long as the birth rate exceeds the death rate.
- Eventually, the birth and death rates equalize, leading to a stable population size known as the stable equilibrium phase.
- Populations cannot grow indefinitely due to the concept of carrying capacity, which sets limits on population size.

S-Shaped growth curve

- When a species is introduced to a new habitat, its population initially grows exponentially.
- As the population becomes numerous, environmental resistance factors come into play, causing the growth rate to decline.
- Population growth eventually reaches zero growth (constant) and stabilizes at a certain level, known as the carrying capacity (K).
- This pattern of growth is represented by sigmoid curves.
- In the S-shaped growth pattern, growth rate increases with density until it reaches a limit, K.
- If the limitation is linearly proportional to density, a symmetrical S-curve is formed, approaching the carrying capacity.
- This growth pattern enhances stability as the population regulates itself.
- Population density often exceeds K due to time lags in feedback control, leading to oscillations in population size.

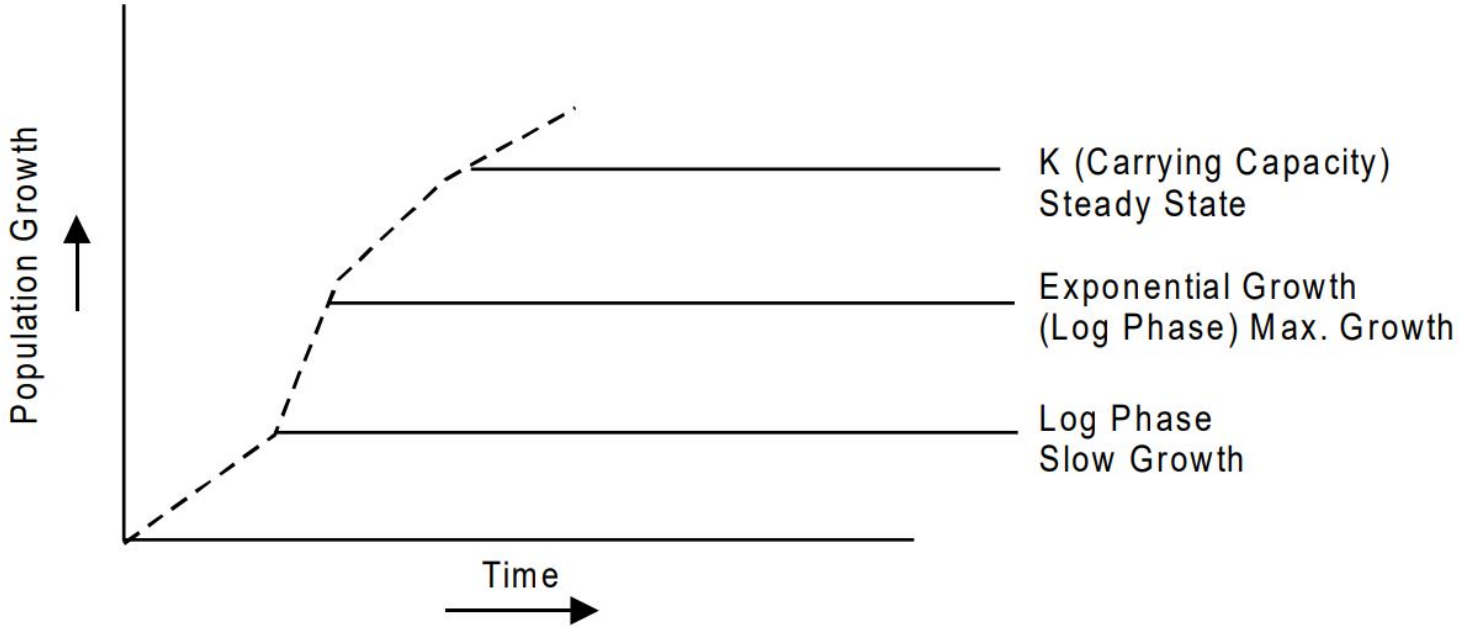


Figure 7.2. S-shaped growth curve.

J-Shaped growth curve

- Population increases when birth rate exceeds death rate.
- If environmental resistance factors fail to check or stabilize population growth, a J-shaped curve is observed.
- Speculating on the future shape of human population growth curves (S-shaped or J-shaped) is challenging.
- Growth curves represent the population's graphical depiction over a specific time period, which may be S-shaped or J-shaped.
- In exponential or geometric population growth (e.g., 2, 4, 8, 16, 32...), growth continues until resources are depleted or limitations are encountered.
- Growth then halts abruptly, and population density usually declines rapidly until conditions for another rapid growth are restored.
- Populations with this growth pattern may face instability unless regulated by external factors.
  - Growth rate decreases as density increases (self-limiting or inverse density-dependent).
  - Growth rate remains high until density becomes high and external limiting factors come into play (density-independent).
  - The growth rate is highest at intermediate density.

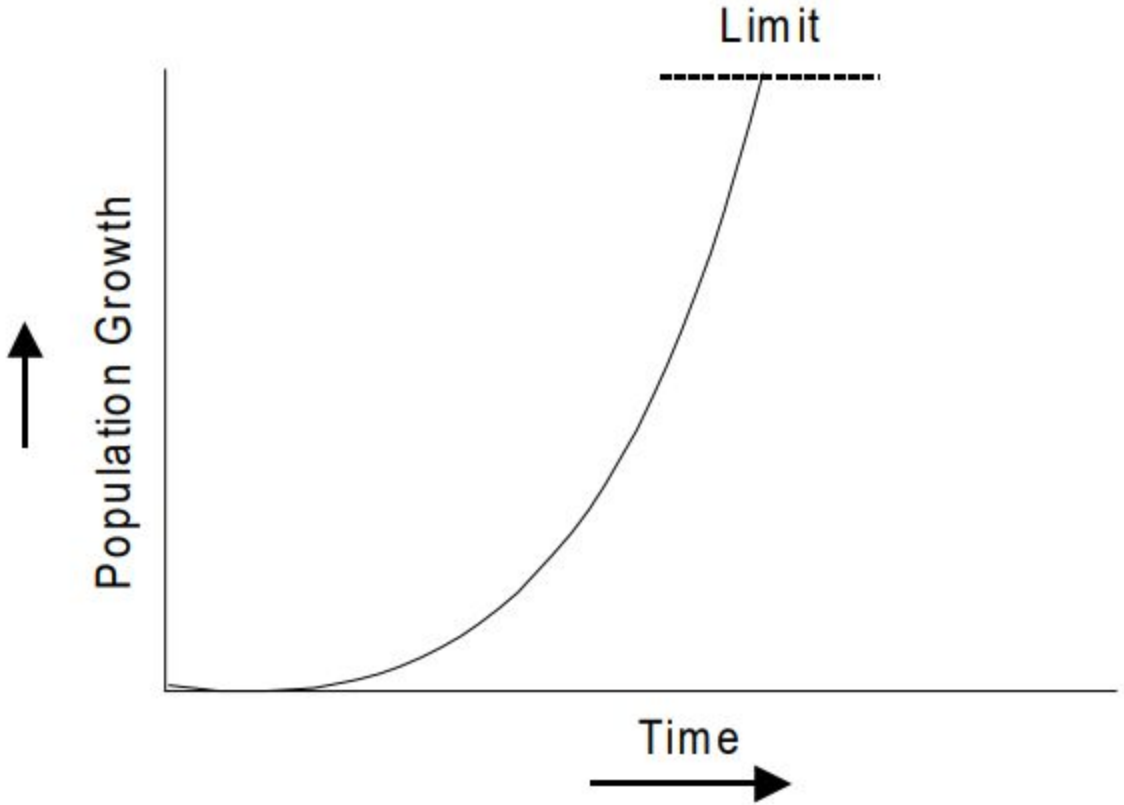


Figure 7.3. J-shaped growth curve.

Population growth :< or :>

- Population growth is ultimately constrained by a carrying capacity, where limiting factors stabilize populations.
- Human populations differ from other organisms due to influences from social, political, economic, and ethical factors.
- Humans can anticipate future events and make conscious decisions to adapt accordingly.
- With increasing populations, death rates and birth rates are expected to equalize.
- Population stabilization can occur by allowing the death rate to rise or by implementing measures to limit the birth rate.
- While controlling human population may seem straightforward, it is complicated by societal complexities and individual choices.
- Lowering the birth rate is often considered more humane than allowing the death rate to rise, but societal decision-making is not always straightforward.

Biological reasons for population growth

- The study of human populations and their characteristics is known as demography.
- Demographers predict population growth by analyzing birth rates and death rates.
- In most countries, the birth rate exceeds the death rate, leading to population growth.
- Countries with high birth rates and high death rates, such as Afghanistan and Ethiopia, experience rapid population growth due to high infant mortality rates.
- Countries with high birth rates and low death rates, like Guatemala and Syria, also grow rapidly, with moderately high infant mortality rates.
- Countries with low birth rates and death rates that closely match each other, such as Sweden and the United Kingdom, experience slow population growth with very low infant mortality rates.
- The rate of population growth primarily depends on the number of women having children and the number of children each woman has.
- The total fertility rate (TFR) indicates the number of children born per woman in her lifetime, with a TFR of 2.1 considered replacement fertility ,since in the long run, if the total fertility rate is 2.1, population growth will stabilize
- Zero population growth occurs when the number of births equals the number of deaths, stabilizing population growth.
- The age structure of a population, particularly the presence of a large number of young people, influences population growth even if families limit themselves to two children.

Factors Controlling Population Growth

- Factors controlling population growth include:
  (i) Famines leading to destruction.
  (ii) Natural calamities such as floods, droughts, earthquakes, volcanic eruptions, hurricanes causing mass casualties.
  (iii) Epidemic and endemic diseases wiping out populations.
  (iv) Wars causing heavy casualties.
  (v) Unnatural accidents during transportation, fires, etc.
- Factors aiding population growth:
  (a) Increased food production and advancements in storage, processing, and distribution technologies.
  (b) Improved medical facilities for childbirth and immunization of children under five years.
- Factors can be grouped into three categories:
  (i) Geographic factors like climate, soil, water, mineral resources, and transportation.
  (ii) Demographic factors such as birth rates (natality), death rates (mortality), and sex ratio.
  (iii) Socio-economic factors like marriages, job availability, and resources.
- Developed countries experience population decline due to:
  (i) Better medical and family planning facilities.
  (ii) Low death rates and high birth rates.
  (iii) Education leading to awareness about the consequences of overpopulation and smaller family sizes.

Population & Standard of living

- Standard of living varies across cultures and is challenging to quantify due to differing attitudes and values.
- A comparison is made among three countries:
  (1) The United States, a highly developed and industrialized country.
  (2) Argentina, a moderately developed country.
  (3) Zimbabwe, a less developed country.
- Significant disparities exist in the standard of living among these countries.
- What may be considered poverty in the United States could be considered luxury in less developed countries.
- Standard of living appears to be strongly linked to energy consumption.

Population Explosion

- Population explosion refers to the significant and continuing increase in human population in modern times, posing a hazard to national development and prosperity.
- Emigration involves individuals leaving a population to join another population, resulting in a decrease in the original.
- population.
- Immigration is the addition of new individuals to a population from other areas.
- **Density-dependent factors**: Population growth leads to competition for resources such as food and space, potentially causing death due to starvation.
- **Density-independent factors**: Interaction between populations in an area can result in mutual benefits, competition for resources, or dependence on each other.
- Consequences of population explosion include **resource depletion, severe competition for food and space, increased psychological stress, environmental pollution, and widespread unemployment.**
- To meet the demands of a growing population, **forests are cut down, oceans are exploited, and the natural equilibrium is disturbed.**
- Rapid population growth leads to challenges such as **food scarcity, inadequate shelter, and various socio-economic problems.**
- Secondary problems arising from population explosion include **increased competition for shelter, education, healthcare, rising prices, and ecological crises.**

Human Population: Malthus's Human Population Theory

- In 1798, T.R. Malthus published an essay on population outlining the issue of population growth.
- Malthus proposed that human population tends to increase exponentially (1-2-4-8...) while food production increases linearly (1-2-3-4...), termed the theory of human population growth.
- Malthus's theory was largely forgotten for nearly 150 years due to technological advancements.
- World population during the Stone Age was estimated at 10 million.
- Annual growth rate over the last three centuries was approximately 0.4-0.5%, increasing to 2% in the last two decades.
- The doubling time of the population decreased from 200 years in 1650 A.D. to 35 years in 1980.
- In 1800 A.D., the birth rate and death rate were nearly balanced.

Table 7.1: World Population Increase

S.No.	Date	Population (million)
1.	5000 B.C.	50
2.	800 B.C.	100
3.	200 B.C.	200
4.	1200 A.D.	400
5.	1700 A.D.	800
6.	1900 A.D.	1,600
7.	1965 A.D.	3,200
8.	1990 A.D.	5,300
9.	2020 A.D. (estimate)	8,230

Source: Population Reference Bureau, Inc., Washington, DC.

Current Population Trends

- The current world population exceeds 5.5 billion people.
- It is projected to reach just over 7 billion by the year 2010.
- Africa, Asia, and Latin America collectively hold nearly 80% of the world's population.
- The total population of these regions is expected to increase from 4.4 billion to over 7 billion by 2010, making up 83% of the world's population.
- These regions exhibit both the highest population growth rates and the lowest per capita gross national product (GNP).
- GNP measures the total goods and services generated within a country.
- The disparity in economic well-being is reflected in differences in the standard of living, which measures the degree to which daily life necessities and comforts are met.

Table 7.2: Population growth rates in selected countries (1993)

S.No.	Country	Births per 1,999	Deaths per 1,000	Infant Mortality Rate (deaths per 1,000)	Rate of natural increase (annual %)	Time Needed to double population (years)
1.	Germany	10	11	6.7	0.1	-
2.	Belgium	13	11	8.4	0.2	330
3.	United Kingdom	14	11	7.1	0.3	267
4.	Japan	10	7	4.7	0.3	217
5.	Sweden	14	11	6.2	0.3	210
6.	USSR (Former)	16	11	2.8	0.6	123
7.	United States	16	9	8.6	0.8	82
8.	Canada	15	7	6.8	0.8	87
9.	Argentina	21	8	25.6	1.3	53
10.	Turkey	29	7	59.0	2.2	32
11.	Paraguay	34	6	48.0	2.7	26
12.	Afghanistan	49	22	168.0	2.8	25
13.	Ethiopia	47	20	127.0	2.8	25
14.	Zimbabwe	41	11	59.0	3.0	23
15.	Guatemala	39	7	59.0	3.1	22
16.	Syria	45	7	48.0	3.8	18

Source: Enger & Smith, 1995

Table 7.3: Twelve most populous countries in 2025 (population in millions)

S.No.	Country	1950	1992	2025
1.	China	554.8	1,165.8	1,590.8
2.	India	357.6	882.8	1,383.1
3.	United States	152.3	255.6	295.5
4.	Indonesia	49.5	184.5	285.9
5.	Pakistan	79.5	121.7	281.4
6.	Brazil	39.5	150.8	237.2
7.	Nigeria	53.4	90.1	216.2
8.	Bangladesh	32.9	114.4	211.6
9.	Russia	41.8	149.3	170.7
10.	Iran	16.9	59.7	159.2
11.	Mexico	28.0	87.7	143.3
12.	Japan	83.6	124.4	124.1

Source: Data from the Population Reference Bureau, Inc., 1993.

Population trends in India

- India comprises approximately 1.5% of the world's population.
- Over the past 80 years, India's population has increased approximately threefold.
- In 1901, India's population was 235,396,327, which slightly decreased in 1921 due to epidemics.
- The population was 361,008,090 in 1951, 439,234,771 in 1961, and 548,159,652 in 1971.
- The rapid population growth is primarily attributed to a decrease in the death rate due to improved medical care.
- In 1981, the sex ratio in India was 1071 males per 1000 females, with variations across regions such as Punjab (1138 males per 1000 females) and Kerala (969 males per 1000 females).
- The age ratio of the Indian population indicates a high proportion of young people in the pre-reproductive age group, with 42.2% belonging to the 0-14 years age group.

Table 7.4: Population estimates for some of the states in India (1991)

S.No.	State/Union territory	Population
1.	Uttar Pradesh	1,38,760,417
2.	Bihar	86,338,853
3.	Maharashtra	78,706,719
4.	West Bengal	67,982,732
5.	Andhra Pradesh	66,304,854
6.	Madhya Pradesh	66,135,862
7.	Tamil Nadu	55,638,318
8.	Karnataka	44,817,398
9.	Rajasthan	43,880,640
10.	Gujarat	41,174,060
11.	Orissa	31 ,512,070
12.	Kerala	29,011,237
13.	Assam	22,294,562
14.	Punjab	20,190,795
15.	Haryana	16,317,715
16.	Delhi	9,370,475

Measures to Control over Population

- Education: Educating people about the consequences of overpopulation and promoting population education, along with emphasizing the importance of food production and self-employment.
- Family Planning: Providing free family planning aids and encouraging individuals to undergo sterilization procedures to control birth rates.
- Incentives: Offering more incentives to families that adhere to family planning norms, encouraging limited family size.
- Legal Restrictions: Implementing legal restrictions through laws to regulate population growth.
- Major Steps to Solve the Population Problem:
  (a) Education: Addressing illiteracy and ignorance by educating people about the consequences of overpopulation and promoting the benefits of planned and small families.
  (b) Family Planning: Encouraging deliberate efforts to restrict family growth through suitable methods, such as:
  - Use of contraceptives (mechanical, chemical, and natural methods).
  - Sterilization.
  - Abortion.
  - Utilization of other natural methods.

Environment & Human Health

- Health is defined as the state of being physically, mentally, and socially well-being, free from disease or pain.
- Community health services encompass various aspects such as medical treatment, disease control, pest control, social welfare, maternity and child welfare, school medical services, and research institutions.
- Lack of proper nutrition, clothing, and housing can lead to the spread of communicable diseases and contribute to issues like maternal and infant mortality, poverty, child abuse, addiction, exploitation, and crimes against women.
- The environment and health are interdependent, with physical, biological, social, and economic factors influencing health standards.
- Socio-economic factors contribute to inadequate family resources, poor sanitation habits, inappropriate nutrition, and illiteracy, which affect health standards.
- Communicable diseases are prevalent in India due to factors such as contaminated food and water, poor sanitation, improper ventilation, overcrowding, and lack of hygiene.
- Diseases like cholera, diarrhea, typhoid, malaria, and plague are spread through air, contact, contaminated food and water, insects, and microbial parasites.

Human Rights

- A right is something to which an individual has a just claim, and human rights are those inherent to individuals by virtue of their existence as human beings.
- Human rights are traditionally categorized into natural rights and civil rights.
  - **Natural rights** are inherent to individuals by virtue of their humanity, such as the right to life, sustenance, and following one's conscience.
  - **Civil rights** are derived from laws and judicial decisions, granted by a government.
- The Universal Declaration of Human Rights, adopted by the United Nations General Assembly in 1948, defines human rights as a common standard of achievement for all people and nations.
- Human rights encompass various aspects related to environmental protection, which are crucial for human health and survival:
  - **The right to life.**
  - **The right to an adequate standard of living, including social security.**
  - **The right to education.**
  - **Protection for children against exploitation.**
  - **Access to healthcare services, with a focus on reducing infant and child mortality and eliminating harmful traditional practices.**
  - **Access to clean air and water.**
  - **Living in a noise pollution-free environment.**
  - **Access to natural resources.**
  - **Living in a disease-free environment.**

Value Education

- Aims of Health Education:
  - Inculcating healthy practices from an early age to understand the significance of health, hygiene, and sanitation.
  - Providing knowledge about the body, organs, diseases, and common ailments to promote awareness and prevention.
  - Encouraging clean environments through awareness and provision of facilities like clean drinking water and sanitary lavatories.
  - Ensuring better health services and introducing people to governmental health programs such as mother and child welfare, family planning, etc.
  - Undertaking training programs for health workers and professionals periodically.
  - Utilizing personal contact programs for effective health education.
  - Covering topics like personal hygiene, exercise, nutrition, ventilation, pollution causes and prevention in health education.
  - Providing practical knowledge about communicable diseases, health problems, and emergency services.
- Principles of Health Education:
  - Learning capacity persists throughout life, unaffected by age but influenced by interest.
  - Individual learning methods vary due to background experiences and circumstances.
  - Individual effort plays a significant role in habit and concept changes.
  - Learning is driven by love, satisfaction, and basic human needs.
  - Clarity of objectives, goals, means, and resources enhances learning.
  - Individuals need sufficient time to absorb new knowledge.

The AIDS Pandemic

- **Introduction**: The AIDS (Acquired Immune Deficiency Syndrome) virus has led to a worldwide epidemic, termed a pandemic due to its global spread and impact. Identified in the late 1970s, millions of people have been infected worldwide.
- **Transmission**: The virus spreads through direct physical contact, primarily through body fluids entering the bloodstream. Common transmission methods include sharing contaminated needles among drug users and sexual contact. Originally perceived as affecting primarily the homosexual and intravenous drug-using communities in the United States, it now affects a broader demographic, including women and children.
- **Impact in Africa**: In parts of Africa, AIDS has primarily been a heterosexual disease, with factors like permissive sexual behavior and limited medical care contributing to its rapid spread. Villages in central Africa have witnessed significant population shifts due to AIDS-related deaths, leaving behind older individuals and children.
- **Medical Aspects**: The causative agent of AIDS is the Human Immunodeficiency Virus (HIV), detected in various body fluids. It targets the immune system, rendering individuals susceptible to infections and diseases. The incubation period can last over a decade, during which individuals may test positive for HIV (HIV-positive) without showing symptoms. Once AIDS develops fully, individuals typically succumb to infections or cancers within three years

Transmission of AIDS

- **Sexual Intercourse**: Transmission can occur between partners when one is infected. Prostitution is a significant source of transmission, emphasizing the importance of monogamous relationships.
- **Contaminated Blood Transfusions**: Blood transfusions, especially in medical emergencies or surgeries, can transmit the virus. Children with diseases like thalassemia often require regular transfusions, increasing their risk.
- **Mother to Child Transmission**: The virus can pass from an infected mother to her unborn child through the placenta.
- **Shared Injection Needles**: Sharing needles among drug users is a common mode of transmission. Hospitals now use disposable syringes to prevent this.

- **Non-Transmission Methods**: ***AIDS is not spread through casual contact like shaking hands or sharing personal items.***

Women and Child Welfare

- **Women's Role in Resource Management**: Women play essential roles in managing natural resources, including food gathering, fuel collection, and water usage. However, their contributions are often undervalued, leading to disproportionate poverty and vulnerability to hunger, illiteracy, and poor health. They also face inadequate representation in decision-making regarding environmental and developmental issues.
- **Child Power**: Children often undertake crucial tasks like caring for younger siblings and collecting resources, enabling adults to engage in wage labor. However, this can lead to adverse effects on children's education, health, and nutrition, as well as impacting women's health due to increased family sizes.

Organizations Working for Women and Child Welfare:

- **National Institute of Public Cooperation and Child Development (NIPCCD)**: Focuses on public cooperation and child development initiatives.
- **World Health Organization (WHO)**: Works on global health issues, including women's and children's health.
- **Central Social Welfare Board**: Established in 1953 under the Social Welfare Ministry, it supports various social welfare activities and provides financial aid to Panchayati Raj Institutions.
- **Voluntary Health Association of India (VHAI)**: Engages in health-related initiatives, including maternity and child health centers.
- **Indian Council of Child Welfare (ICCW)**: Established in 1952 to promote child welfare and provide health services to children.
- **United Nations Children's Fund (UNICEF)**: An international agency focused on children's rights and well-being.

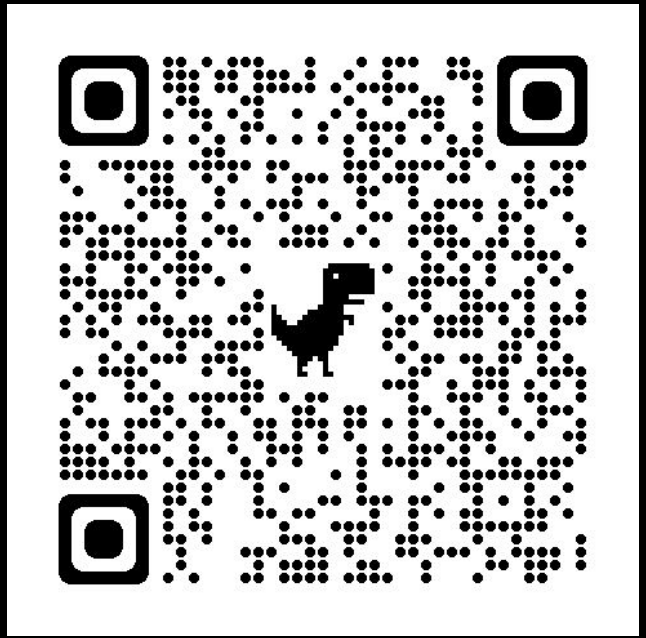
Functions and Programs of Key Organizations:

- **Central Social Welfare Board**: Facilitates welfare programs, grant aid, and support for underprivileged groups. Programs include Mahila Mandal, holiday homes for children, and creches.
- **VHAI**: Operates maternity and child health centers and supports various health initiatives.
- **ICCW**: Initiates child welfare schemes, disseminates knowledge, and cooperates with national and international organizations.
- **UNICEF**: Prioritizes child development and survival, immunization, nutrition, primary health care, education, water, sanitation, and urban services through various programs and partnerships.

"Amidst the global march towards technological advancement and resource utilization, lies the promise of a harmonious coexistence with nature. Through innovation and conservation, we tread the path towards a sustainable future, where every action contributes to the preservation of our precious environment."

You can test your knowledge about the discussed topic by attempting this quiz :>

Quiz Link



Thank You