
UNIT 3 ENVIRONMENTAL HEALTH*

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Learning Objectives

After reading this unit, you would be able to:

- Understand the importance of environmental indicators for holistic understanding of health;
- Elucidate about the importance and effect of environment on human health; and
- Get an insight of efforts made in India by the legislature and judiciary to improve environment and human health.

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3.0 INTRODUCTION

Environmental health is a combination of two broad dimensions, that is, environment and health. The environment encompasses everything that surrounds us while health is a result of influence of environmental factors on us. Everything that surrounds us, be it air, water, soil etc. have influence on our physical, mental and social health. Hence, we cannot overlook the human health problems without understanding environment.

3.1 DEFINITIONS OF ENVIRONMENT AND HEALTH

As per the Merriam Webster dictionary, environment is defined as 1: the circumstances, objects, or conditions by which one is surrounded. 2a: the complex of physical, chemical, and biotic factors (such as climate, soil, and living things) that act upon an organism or an ecological community and ultimately determine its form and survival; 2b: the aggregate of social and cultural conditions that influence the life of an individual or community (<https://www.merriam-webster.com/dictionary/environment>).

Health, on the other hand, can be interpreted in various ways. There is no one strict definition of health till now and that makes the concept complex. To a medical practitioner, health is only about being free from any illness or disease. For a very long time, health was defined in this manner only and to be honest, it is a very narrow viewpoint because one may be having a disease but may still feel healthy and happy. It just depends on the personal willpower and state of mind.

The modern definition of health was given by World Health Organization (WHO) in 1948 and surprisingly it has not been modified since then. WHO considers health to be a state of complete physical, mental and social wellbeing. This definition follows the holistic approach whereby it takes into account all forms of health: physical, mental and social to be necessary for being healthy. The definition is praised for its wholesomeness but at the same time there are many drawbacks of this definition like: one, no one can be completely perfectly healthy as per this definition; what is wellbeing is still not clear; using this definition, we cannot measure the level of health and hence it is not an operational definition. However, it is best suited as it encompasses all facets of health.

Alternatively, many scholars have given the definition of health with focus on adaptation and adaptive capacity to overcome physical, emotional and social health challenges. The upcoming preferred view on health is ‘the ability to adapt and to self manage.’

3.2 UNDERSTANDING OF ENVIRONMENTAL HEALTH

Having learnt the two terms independently, now let us try to understand the concept of environmental health. In 1989, the WHO defined it ‘as comprising of those aspects of human health and disease that are determined by factors in the environment. It also refers to the theory and practice of assessing and controlling factors in the environment that can potentially effect health’.

A more recent attempt at defining the term emerged from a meeting of WHO European member states in 1993. Their proposed definition was: ‘Environmental health comprises of those aspects of human health, including quality of life, that are determined by physical, biological, social and psycho-social factors in the environment. It also refers to the theory and practice of assessing, correcting and preventing those factors in the environment that can potentially affect adversely the health of present and future generations.’

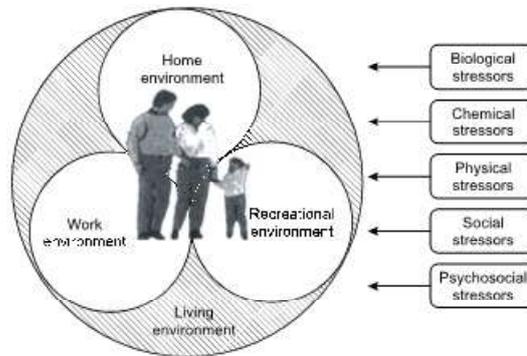


Fig. 3.1: The Interface of Environment Health

(Source: Basnett, 2004; MacArthur and Bonnefoy, 1998)

The above definitions focus on three kinds of environments: home, work and recreation. All of them are different from each other and therefore the kind of stresses or challenges are also different. Overall, in the living environment of any person, stressors like biological, chemical, physical, social and psychological influence the state of health (Figure 3.1).

It is believed that to achieve Sustainable Development Goals, policy makers should work to improve the environmental health. This can be done at three levels: to repair past damage, to control present risk and to prevent future problems.

Check Your Progress

1) What is environmental health?

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3.3 WHY IS ENVIRONMENTAL HEALTH IMPORTANT?

The health of environment is important because it relates to us, that is health of human beings. It does not exist in isolation; rather, very strong inter-relationships can be scientifically observed and proved between the two.

The health impacts from the environment can be both short term/acute or long term/chronic. The acute conditions may include cold or flu, oil spill, food poisoning or heart attack. These are relatively short lived and have sudden onset. On the other hand, chronic conditions develop or worsen over a long period of time. The causes of chronic conditions can be more than one so it is difficult to understand the real cause, for instance, asthma, cancer and diabetes. Somebody, who is a non-smoker, may be continuously exposed to air pollution on daily basis as he/she live near a factory or a traffic junction and therefore may face chronic respiratory diseases. In reality, it is not one environmental factor responsible for diseases. There may be other factors contributing like indoor pollution, housing conditions, living conditions, lifestyle, diet, genetics and many others.

3.4 GLOBAL BURDEN OF DISEASES

The effect of environmental degradation and its effect on human health is very difficult to measure as it is not only illness or disease but also loss of productivity, income and expenditure on health care that are important indicators of degrading human health. Efforts to quantify the environmental burden of disease have been spearheaded by Smith, Corvalán & Kjellström (1999). Their results provide the basis for estimating the environment's impact on health. As per their results, diarrheal diseases are 80–90% attributable to environmental causes, followed by acute respiratory infections, estimated to be 40–60% environmental. Malaria and cancer also contribute substantially to the environmental burden of disease (Figure 3.2).

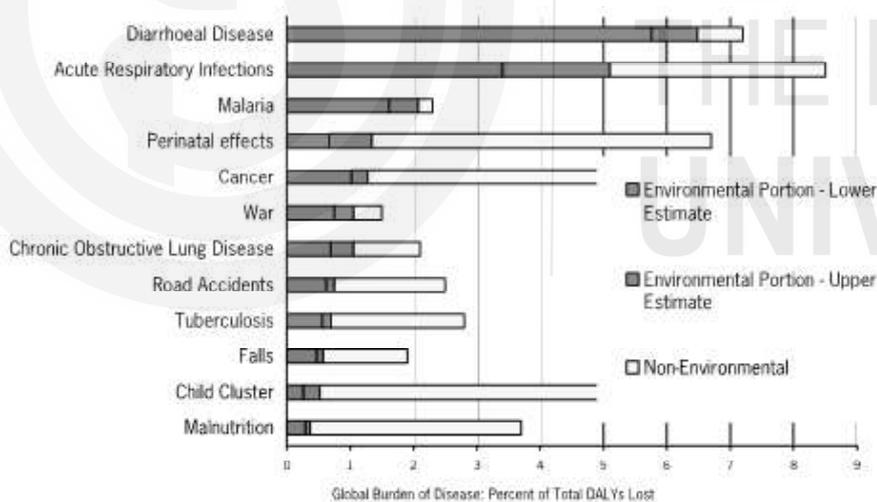


Fig. 3.2: Environmental Contribution to Global Burden of Diseases by Selected Disease Groups

(Source: Kjellén, M (2001), Smith et al. (1999))

The Global Burden of Diseases (GBD) study was started by WHO in 1990 and the latest recorded report was released in 2016 using the 2015 data. The GBD aims to systematically understand, analyze, project and measure the causes and impacts of diseases on human life expectancies. To measure the burden of disease the metric used is called DALY*. Ischemic heart disease, neonatal disorders, stroke, lower respiratory infections, diarrhea, road injuries, and chronic obstructive pulmonary disease (COPD) accounted for more than 1 million deaths each worldwide in 2017 (Figure 3.3).

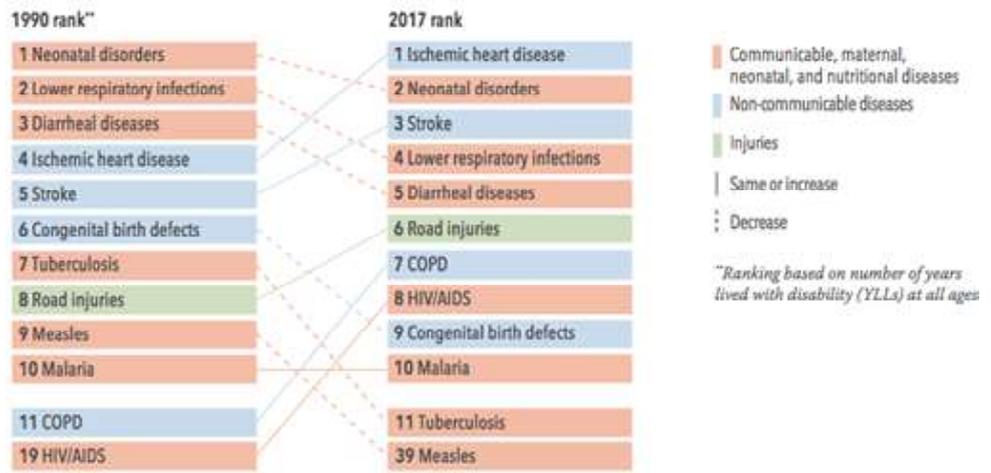


Fig. 3.3: Leading causes of early death, 1990 and 2017
(Source: IHME, The Lancet (2018))

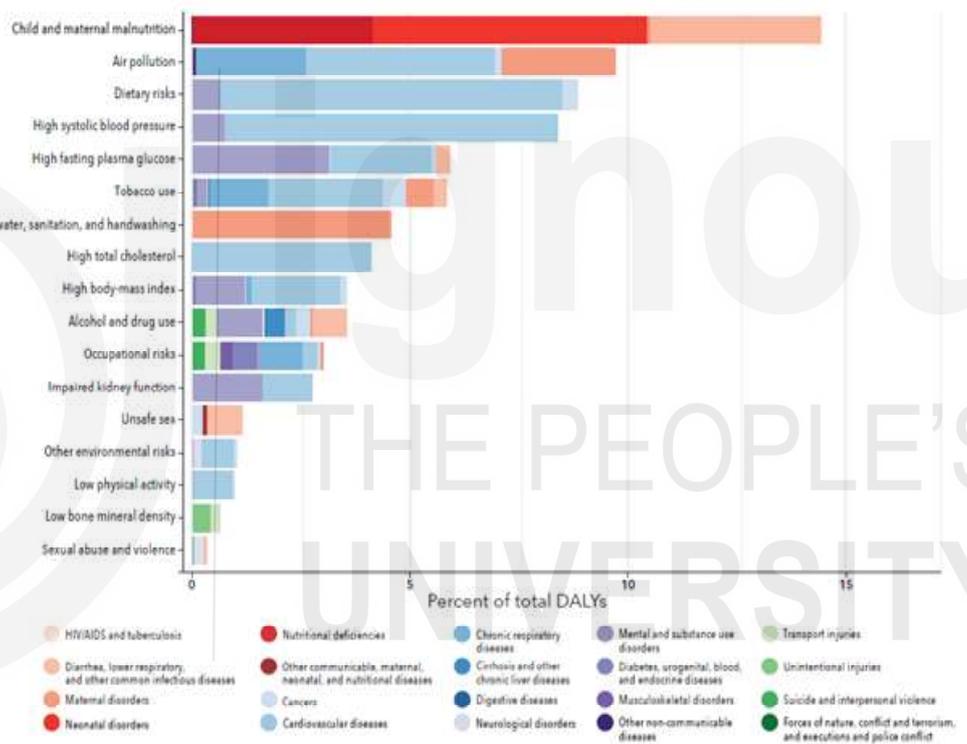


Fig. 3.4: Contribution of Various Risk Factors in DALY (in percentage), 2016

(Source: Indian Council of Medical Research, Public Health Foundation of India and Institute of Health Metrics and Evaluation (2017).)

The risk factors are the drivers of diseases and injuries that cause pre mature death and disability. The top risk factors that are causing the disease burden in 2016 were malnutrition (14.6 %), air pollution (9.8 %), dietary risks (8.9 %), high blood pressure (8.5 %) and high plasma fasting glucose (6 %) (2016) (ICMR et al. 2017) (Figure 3.4).

**Note:* The Disability Adjusted Life Year (DALY) is a health gap measure that extends the concept of potential year of life lost due to premature death (PYLL) to include equivalent years of “healthy” life lost by virtue of being in states of poor health or disability.

3.5 DETERMINANTS OF HEALTH

Broadly, physical, social and individual factors influence human health. Physical may include factors like air, water, soil, food availability, pollution, noise etc.; social includes health care facilities, education, race, income etc. and individual includes behaviors and genetics. Other than these government policies, subsidies, programmes for betterment of environment and accessibility to health services are necessary.

There are chemicals, toxins, radiation, diseases causing micro-organisms and plants, pesticides and heavy metals in our physical environment that can cause damage to human health. These environmental substances related to air affect the lungs, food affects the digestive system, water and soil related substances affect digestive system and skin. All these are released by human activities of agriculture, transportation and industrialization. Health conditions that may be linked to environment are cancers of liver, bladder, lungs; asthma and respiratory diseases; diseases of the nervous system; Parkinson's diseases, Alzheimer's diseases; autism, birth defects and developmental disabilities. These illnesses are not solely caused due to environmental conditions, rather may be aggravated due to them. Various population characteristics like age, gender, race and ethnicity and socio-economic environment may also influence human health.

3.6 EFFECTS OF BIOLOGICAL, CHEMICAL, AND PHYSICAL AGENTS ON WATER, AIR, FOOD AND LAND RESOURCES

The environment, as discussed, can be divided into three components: Biological composed of plants, animals, rodents, viruses and other life forms; Physical made of non-living things like air, water, soil, housing, waste, radiation etc. and social environment that include customs, culture, habits, income, religion, occupation, education, lifestyle etc. There are various agents (biological, chemical and physical) in the environment that influence human health through the physical environment that is discussed below.

3.6.1 Effects of Biological, Chemical, and Physical Agents in Water on Human Health

Water borne diseases are one of the main causes of illness and disease in India and many other developing countries. Safe and wholesome water is free of pathogens, chemical substances and is pleasant to taste. But due to the human activities like industrial discharge, urbanization, agricultural sources of pollution and municipal sewage water becomes polluted and unsafe for consumption.

3.6.1.1 Classification of Water Borne Diseases According to Causative Agents

- a) **Physical and Chemical Pollutants:** The chemical pollutants are derived from human activities such as agriculture, industries and urban growth. These can be organic (detergents, tar, plastic, pesticides) or inorganic (nitrites, phosphates, chlorides, fluorides, salts etc.) in nature. These pollutants include

detergent solvents, cyanides, heavy metals, minerals and organic acids, nitrogenous substances, fertilizers, soaps, oil spill, chlorine, bleaching agents, dyes, pigments, sulphides, ammonia, toxic and biocidal organic compounds of great variety. Chemical pollutants may affect human health not only directly, but also indirectly by accumulating in aquatic life (e.g. fish) used as human food (https://shodhganga.inflibnet.ac.in/bitstream/10603/99825/11/11_chapter%202%20final.pdf).

- b) Biological agents can be broadly divided into two types: Pathogenic (Bacteria, virus, nematodes, worms, protozoans) and nuisance organisms (Slime, mollusc, algae, Asellus, nematodes). Biological water borne diseases are caused by biological agents / infective agent that may include viral (Viral Hepatitis A, Hepatitis E), Bacterial (Typhoid, dysentery), Protozoal (Amemobiasis), Helminthic (Roundworm, Threadworm) or Leptospiral (weil's disease). The hosts maybe aquatic like Cyclops (Guinea worm, fish tape worm). Malaria-stagnant water and Mosquito-Plasmodium vivax is a good example here. Other than these, many biological diseases causing agents thrive in water that are cause of concern such as disease carrying insects breeding in or near water, like: malaria, filaria, arboviruses, onchocerciasis, African trypanosomiasis.
- c) Physical: Changes in temperature, turbidity, colour and suspended and floating matter in water bodies are responsible for human health illnesses. These changes may take place due to mixing of waste water and industrial effluents with rivers and ground water or addition of silt, sand, metal pieces, rubber, wood chips, paper, foam, scum, carcasses and sewage through various human activities.

3.6.1.2 Effects of Water Pollution on Human Health

- a) Occurrence of pesticides in water adversely affects human health and research reveals its strong linkages with cancer (leukemia, lymphoma, brain, kidney, breast, prostate, pancreas, liver, lung and skin cancers), neurological disorders, birth defects, fetal death and altered fetal growth.
- b) Thermal pollution results in excessive heat production, which are detrimental for human health and aquatic organisms.
- c) Marine pollution that is caused by oil spill, waste disposal, esp. plastic is extremely damaging for marine and human life. Tons of plastic wastes are found in stomach of dead whales, asbestos and other animals.
- d) Radioactive waste produced for harnessing nuclear energy or defense purposes and the left over waste from the experiments conducted are dumped into oceans. This waste has extremely long life and has effect on health of ecosystem.
- e) Pollutants like zinc cause vomiting, renal damage, cramps; copper - hypertension, sporadic fever, uremia, coma; barium - excessive salivation, colic, vomiting, diarrhoea, tremors, paralysis of muscles or nervous system, damage to heart and blood vessels; cadmium - vomiting, diarrhoea, abdominal pains, softening of bones, fractures, skeletal deformations, damage of kidney, hypertension, tumor formation, heart disease, impaired

reproductive function, genetic mutation; mercury — impairment of vision and muscles, paralysis; lead — high rate of miscarriages, affects skin, and respiratory system, damages kidney, liver and brain cells; arsenic — cancer of skin, lungs and liver, chromosomal aberration and damage, gangrene, loss of hearing, injury to nerve tissue, liver and kidney damage; fluoride -rippling scourge (sponging)/fluorosis of bones, teeth; chromium – cancer; manganese - sexual impotence, muscles fatigue, eye blindness (https://shodhganga.inflibnet.ac.in/bitstream/10603/99825/11/11_chapter%20%20final.pdf).

3.6.2 Effects of Biological, Chemical and Physical Agents in Air on Human Health

Our immediate surroundings comprise of air upon which all life forms depend for oxygen. Besides this, air helps in cooling of body, transmit sense of hearing and smell and also may spread disease-causing agents. Pollution of air by dust, smoke, toxic gases and chemical vapours has resulted in sickness and death.

Air is a mechanical mixture of gases. The normal composition of external air by volume is approximately as follows: Nitrogen - 78.1 per cent; Oxygen - 20.93 per cent; Carbon dioxide - 0.03 per cent. The balance is made up of other gases that occur in traces, e.g., argon, neon, krypton, xenon and helium. In addition to these gases, air also contains water vapour, traces of ammonia and suspended matter such as dust, bacteria, spores and vegetable debris. Air is rendered impure by (1) Respiration of humans and animals (2) Combustion of coal, gas, oil, etc. (3) Decomposition of organic matter and (4) Trade, traffic and manufacturing processes which give off dust, fumes, vapours and gases.

3.6.2.1 Physical, Chemical and Biological Agents

The physical agents like temperature, humidity, wind velocity and atmospheric pressure of the outdoor air many cause discomfort and air borne diseases. As we know that temperature of air varies in different parts of the day and also in the different seasons and the factors which influence the temperature are latitude of the place, altitude, direction of wind and proximity to sea. The temperature of the ground surface is always higher than that of the air. All these factors may cause extreme temperatures leading to heat stress or cold waves. Heat stress or excess of heat exposure has been well documented and may cause heat stroke, heat hyperpyrexia, heat cramps, heat syncope and heat exhaustion. On the other extreme, cold stress may cause numbness, loss of sensation, muscular weakness, desire for excess sleep, coma and even death. Frostbite and trench foot are common diseases caused in higher latitudes. Humidity or moisture is always present in the atmosphere. The amount of moisture which air can hold depends upon its temperature. Humidity levels, amount of precipitation, wind velocity also influence human health physically and mentally.

Chemical agents like dust, soot, smoke, other organic and inorganic particles emanating from houses, factories and vehicles, etc. are main sources of air pollution. These can be summarized as:

- a) Automobiles: Motor vehicles are a major source of air pollution throughout the urban areas. They emit hydrocarbons, carbon monoxide, lead, nitrogen

oxides and particulate matter. In strong sunlight, certain of these hydrocarbons and oxides of nitrogen may be converted in the atmosphere into “photochemical” pollutants of oxidizing nature. In addition, diesel engines, when misused or badly adjusted are capable of emitting black smoke and malodorous fumes.

- b) Industries: Combustion of fuel to generate heat and power produces smoke, sulphur dioxide, nitrogen oxides and fly ash. Petrochemical industries generate hydrogen fluoride, hydrochloric acid and organic halides. Many industries discharge carbon monoxide, carbon dioxide, ozone, hydrogen sulphide and sulphur dioxide. Industries discharge their wastes from high chimneys at high temperature and high speed.
- c) Domestic Sources: Incomplete combustion due to lack of oxygen is a major source of toxic gases.
- d) Miscellaneous: These comprise burning agricultural refuse, incinerators, pesticide spraying, natural sources (e.g., wind borne dust, fungi, molds, bacteria) and nuclear energy programmes. Add an example of the effect on health.

Biological Agents: Bacteria and viruses may pollute the air and may be carried to some distances along with dust particles. They may be inhaled or swallowed with water, milk or food polluted with infected dust. The chances of spread of disease in this way are remote because of great dilution and because of exposure to ultraviolet light in the open. This mode of infection may be responsible for wound infections with tetanus bacilli. It may also lead to inhalation of tubercle bacilli and scales of measles and chickenpox (Park, 2015).

3.6.2.2 Housing and Air Pollution

Other than the outdoor air, indoor air is influenced by various housing characteristics. “Housing”, in the modern concept includes not only the ‘physical structure’ providing shelter, but also the immediate surroundings, and the related community services and facilities. It has become part of the concept of “human settlement”, which is defined as “all places in which a group of people reside and pursue their life goals; the site of the settlement may vary from a single family to millions of people”.

Healthy housing should provide physical protection and shelter; be adequate for cooking, eating, washing, and excretory functions; prevent the spread of communicable diseases; provide for protection from hazards of exposure to noise and pollution; and should be free toxic or harmful materials promoting good health.

Due to poor housing, respiratory infections (common cold, tuberculosis, influenza, diphtheria, bronchitis, measles, whooping cough, etc.), skin infections (scabies, ringworm, impetigo, leprosy), rat infestation (Plague), arthropods (from Houseflies, mosquitoes, fleas and bugs) related diseases might be caused. It also has influence on the psychology and mental health and wellbeing of residents. Additionally, cluttered houses may be causes of accidents due to overcrowding and suffocation.

3.6.2.3 Indoor Air Pollution: Sources and Impacts

The indoor environment is also very critical as this is the place where we spend substantial time. Apart from chemical air pollutants, physical characteristics of house are important in determining the influence of indoor air pollution and its impacts. These include ventilation, number of windows, exhaust fans, temperature and humidity. The major sources of indoor air pollution worldwide include combustion of solid fuels indoors, tobacco smoking, outdoor air pollutants, emissions from construction materials and furnishings, and improper maintenance of ventilation and air conditioning systems. Major indoor pollutants are fine particles, carbon monoxide, nitrogen oxide, polycyclic aromatic hydrocarbons (PAH), sulfur dioxide, arsenic, fluorine, lead, asbestos, radon and biological pollutants. In 2004, nearly 2 million deaths were attributed to household air pollution from the use of open fires and simple stoves for cooking—accounting for 2.7% of the global disease burden.

Women, elders and children are most exposed to indoor pollutants. However, the extent and magnitude of consequent health risks, however, remain poorly understood. It is estimated that 4.3 million people die every year prematurely from illness attributable to the household air pollution caused by inefficient use of solid fuels. Among these deaths 12 per cent are due to pneumonia, 34 per cent from stroke, 26 per cent from Ischaemic Heart Disease, 22 per cent from COPD and 6 per cent from lung cancer (Park, 2015). Acute lower respiratory infections (ALRI) caused are due to particulate matter inhaled from indoor air pollution and chronic obstructive pulmonary diseases (COPD) are caused due to exposure to household air pollution.

3.6.2.4 Effects of Air Pollution

Worldwide, air pollution is one of the top five risk factors responsible for human mortality. Urban air pollution causes over 1.2 million deaths per year. The health effects of air pollution are both immediate and delayed. The immediate effects are mainly borne by the respiratory system, the resulting state is acute bronchitis. Irritation in eyes, nose, suffocation, breathlessness are immediate effects while chronic bronchitis, lung cancer, bronchial asthma, emphysema, and respiratory allergies are delayed impacts. It is linked with cardiovascular disease, diabetics and neuropsychological disorders also. Air pollution leads to destruction of plant and animal life; corrosion of metals; damage to buildings; cost of cleaning and maintenance and repairs and aesthetic nuisance. It also reduces visibility in towns that may cause transport accidents.

Check Your Progress

2) What is smog?

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3.6.3 Effects of Biological, Chemical and Physical Agents in Food Resources on Human Health

Unclean environment has the potential to contaminate food and water that are consumed by human causing widespread diseases. Environmental cleanliness and maintaining personal hygiene is therefore necessary to reduce food borne diseases. Food borne diseases include food-borne intoxications and food-borne infections consumed by human beings, commonly referred to as food poisoning. Use of chemicals to ripen fruits/antibiotic and hormone injections for better yield are in turn consumed and enter into our food cycle.

As per the Global burden of diseases, food borne diseases are one of the major causes of illness and death. Diarrheal diseases alone are responsible for 3-5 million illnesses and nearly 1.5 million deaths annually (Directorate General of Health Services, 2017). Contaminated and infected food diseases are spread through various biological causative agents. For instance, Anthrax, Cholera, Dysentery and Typhoid fever by bacteria, Amoebiasis and Clonorchiasis by parasites.

Types of Food Borne Diseases

a) Food borne diseases of infectious origin

The pathogenic organisms transmitted through contaminated foods are bacteria, viruses, protozoa and helminthes. Foods that are contaminated may not look, taste or smell any different from foods that are safe to eat. A review of recorded foodborne disease outbreaks in India from 1980 to 2016 shows *Staphylococcus aureus* (grows on food), *Listeria monocytogenes* (grow inside the refrigerator or in ready-to-eat food), *Vibrio sp*, *Salmonella sp*, *E. coli*, *Yersinia enterocolitica* and Norwalk-like virus are some important microbial pathogens responsible for foodborne illnesses. Of these, *Salmonella* is the most common cause of food borne illnesses (Directorate General of Health Services, 2017). In India, milk and milk products, poultry, sea foods and street foods are major causes of infections.

Cases of Nipah virus infection (transmitted from animals to humans) can be transmitted through contaminated food or directly between people. The virus can also cause severe disease in animals such as pigs, resulting in significant economic losses for farmers.

Nipah virus has caused severe disease and death in people, making it a public health concern in Malaysia, Bangladesh, Cambodia, Ghana, Indonesia, Madagascar, the Philippines and Thailand (<https://www.who.int/news-room/fact-sheets/detail/nipah-virus>). In India, the Nipah virus outbreak was confirmed in Kozhikode and Malappuram districts of Kerala in 2017. Recently, SARS-Cov-2, originating from bats has caused heavy loss of life in many countries, and as a result is declared a pandemic.

b) Food borne diseases due to chemical contamination

Chemical contamination of food may result from industrial sources or agricultural practices through which heavy metals such as mercury, lead and cadmium may enter the food chain. To increase the food production, the government initiated rampant use of pesticides and fertilizers that replaced

the traditional agricultural practices for soil replenishment and use of manure. On the negative side, the excessive and repeated use of chemicals in agricultural fields eventually have led to several short term and long term effects on land and food. The chemicals discharged also enter the water resources through ground water leading to contamination of water as well as soil affecting both land and water resources.

Food poisoning may also occur due to consumption of contaminated food like wild mushroom contaminated with *Amatoxin*. Besides this, chemical food poisoning occurs through adulteration. Adulteration is a mal-practice involving addition of prohibited ingredients (solid, liquid or coloring) to food products. Now-a-days if you scrap apple with edge of knife wax would come out. This is adulteration wherein the apple is made to look fresh and red by chemicals. Similarly, green color is added to peas and other green vegetables and this can be noticed if we soak them in water for 30-40 minutes. Many fruits and vegetables are reported to be injected with chemicals like urea for faster growth. All these methods are unethical and unhealthy and may cause liver and kidney damage. Arsenic is another predominant chemical that has entered our food chain. The paddy rich areas like West Bengal and districts of the Ganga belt reveal high concentration of arsenic. Arsenic is highly toxic chemical and long term intake can lead to arsenic poisoning (arsenicosis), diabetes, cardiovascular diseases and cancer.

Adulteration of milk and milk products with detergents, foreign proteins, sugar; turmeric powder with Metanil Yellow; Honey with sugar; food grains with stones, jute, insects; coffee powder with tamarind seed, chicory powder; and tea leaves with dye, gypsum are common practices noted by FSSAI (Food Safety and Standards Authority of India) in India. Recently in 2018, FSSAI reported that 68 per cent of milk and milk products in India are not up to the standards.

The poultry and meat industry too use excess chemicals and antibiotics that are extremely harmful for human health. One must be careful to purchase non-vegetarian food from reputed shops only as the animals and birds are kept in highly unhygienic places, given lower quality feed and over-injected with chemicals.

3.6.4 Effects of Biological, Chemical and Physical Agents in Land/Soil Resources on Human Health

Due to static nature of land, the pollution caused on land is much more harmful. It takes longer time to replenish and may stay at a location for many years. Solid waste is a major problem in urban areas, more so as the population is constantly rising. The domestic, agricultural and industrial sources together with e-waste, hospital waste, radioactive waste adds to the woes of land pollution.

Different types of wastes impact physical, mental and social health such as biological agents which pollute water and food and cause alimentary infections like cholera, typhoid, dysentery, infective hepatitis, polio, ascariasis and hookworm disease, etc.; Mosquitoes transmit insect-borne diseases like malaria and filaria; Common house flies transmit infections; dust may harbor tubercle bacilli and other germs (which cause diseases if inhaled).

Types of Land Pollution

Land pollution can be classified into different types based on the source of pollutants. These can broadly be industrial and urban waste, agricultural waste, radioactive waste and biological waste.

Industrial and urban waste

All kind of industries, be it small scale or large scale are responsible for industrial waste, though most polluting are the iron and steel, coal metal mines and metal processing industries. The industrial waste is quite harmful as it may be toxic in nature.

Since industrial areas are also urban areas, waste from households is disposed off in large quantities that are dumped on landfill sites. These sites are breeding grounds of various vector borne and infectious diseases.

Agricultural waste

Though agriculture seems to be a cleaner economic activity, it's a myth. To increase the food production for rising population, modernization of agriculture was introduced but nothing comes with a cost. Fertilizers, pesticides and farming practices cause soil pollution that affects the productivity of soil for long term. Fertilizers (especially nitrates), when repeatedly used, are washed to the water system contaminate ground water. Pesticides like chlorinated hydrocarbons and organophosphorus compounds too are very harmful. The traces of pesticides are detected to enter into the crops too. For example, Lindane has been detected in carrots. Besides these, soil conditioners and fumigants such as mercury, arsenic and lead compounds stay in soil permanently and enter the crops causing major health hazards. The allied agricultural activities including cattle farming and poultries are also not devoid of generating land pollution. Generally, the waste is not suitably dumped that causes nuisance of smell and sight in addition to public health problems.

Radioactive waste

The sources of radioactive waste are laboratories, industries or nuclear explosion. With rising power demands, nuclear energy production is on a constant rise that impedes the environmental health. This waste is safely dumped in oceans or on land but since the effects of radioactive substances is long lasting, they are potential health hazards, especially for scientists.

Biological agents as source of waste

Open defecation by humans and animal excreta contaminate the soil with bacteria and parasites. Additionally, discharge of untreated or incompletely treated sewage on land and dumping of sewage sludge also cause soil pollution. Maintaining hygiene is thus necessary to reduce ill-health caused by land pollution.

3.7 ECOLOGICAL MODEL OF POPULATION HEALTH

Ecological model of population health is also called as the social-ecological model. The ecological model of health has its origins in the fields of psychology and

human development, in the mid-20th century work of Lewin, Barker, and Bronfenbrenner, and others who began to understand behaviour in a context of the interplay of the individual and the environment. This work was taken up by public health fields like health promotion, health psychology, epidemiology, and maternal and child health. The Institute of Medicine (IOM) has defined the ecological model as “a model of health that emphasizes the linkages and relationships among multiple factors (or determinants) affecting health.” (Institute of Medicine, 2003).

Check Your Progress

3) What is ecological model?

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What are these factors affecting health? Well, there are too many to list in detail, ranging from the micro level to the macro level. Typically, they’re grouped into categories roughly like this (Figure 3.5):

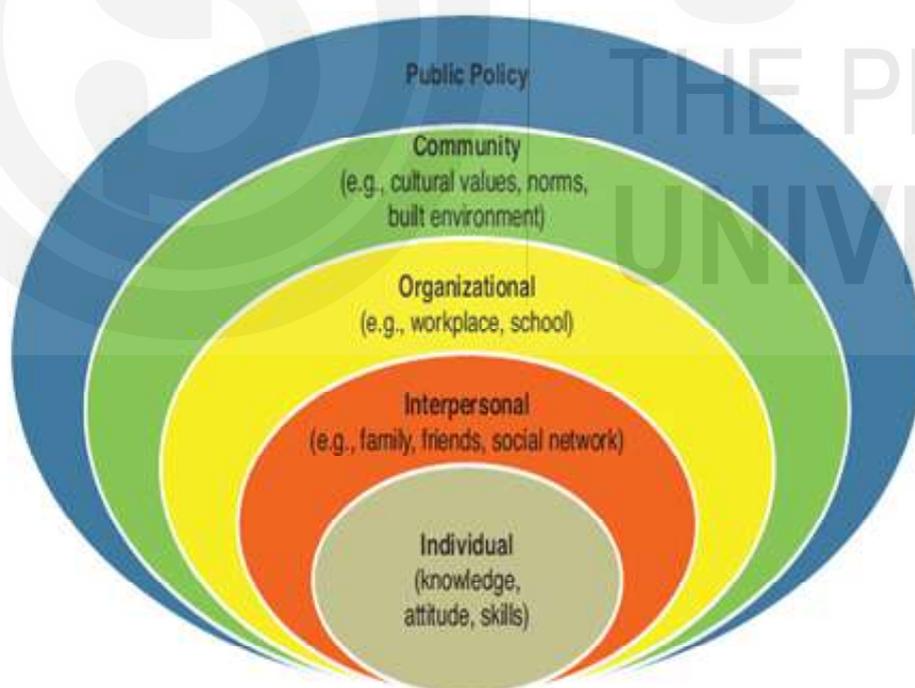


Fig. 3. 5: Determinants of Health

(Source: Institute of Medicine, 2003)

- Intrapersonal/individual factors, which influence behavior such as knowledge, attitudes, beliefs, and personality.
- Interpersonal factors, such as interactions with other people, which can provide social support or create barriers to interpersonal growth that promotes healthy behavior.

- Institutional and organizational factors, including the rules, regulations, policies, and informal structures that constrain or promote healthy behaviors.
- Community factors, such as formal or informal social norms that exist among individuals, groups, or organizations, can limit or enhance healthy behaviors.
- Public policy factors, including local, state, and federal policies and laws that regulate or support health actions and practices for disease prevention including early detection, control, and management

3.8 CURRENT LEGAL FRAMEWORK POLICIES, AND PRACTICES ASSOCIATED WITH ENVIRONMENTAL HEALTH TO IMPROVE PUBLIC HEALTH: INDIAN EXAMPLES

As we already discussed that the World Health Organization (WHO) defined health as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity”, it is well-reminded that environmental health can affect human health. Therefore, governments and organizations shall create policies where they see the issues arising in the health of their jurisdiction related to the environment.

3.8.1 Health Sector in India

The health sector in India is organized under three categories based on ownership: public, government, private or individual owned. Charitable institutions, religious organisations like churches and NGOs and public sector bodies like atomic energy, railways and armed forces also own part of health facilities.

3.8.2 Role of Government of India in Preservation and Promotion of Public Health: Health Missions, Plans, Programmes and Policies

The central government provides a broader framework for specific programmes to be undertaken like small pox, malaria, tuberculosis, HIV AIDS, leprosy and others. These programs are implemented at the state level uniformly. The states also implement all centrally funded programs like the family planning, Swachh Bharat Mission and universal immunization. The Union Ministry of Health and Family Welfare is responsible for implementation of various programmes, undertaking research and providing funds.

3.8.2.1 Health Missions

With respect to missions on health, National Rural Health Mission (NRHM) and National Urban Health Mission (NUHM) have had significant achievements. Recently, the Swachh Bharat Mission aims to achieve sanitation facilities, cleaner environment and surroundings for all. AMRIT launched in 2015 aims to reduce the expenditure incurred by patients on treatment of non-communicable diseases like cancer and heart diseases. The world’s largest health insurance scheme, Ayushman Bharat Yojana (National Health Protection Mission), was launched in 2018. It promises health cover worth Rs. 500,000 to every poor family for treatment of serious ailments.

3.8.2.2 Landmark Health Policies, Plans and Programmes in India

The first comprehensive health policy and plan document, Health Survey and Development Committee Report that is also called the Bhore Committee Report was prepared in 1946. Post-independence, in 1983 the first health policy was formulated and adopted. But before 1983, schemes made under the Five Year plans were fulfilled. These had specific targets like in 1950s and 1960s the focus was on managing the epidemics. Widespread national level campaigns were started to overcome the loss by malaria, small pox, tuberculosis, leprosy, filaria, cholera and others. The fifth plan focused on accessibility of health services in the rural areas through the Minimum Needs Programme. The aim was on eradication of communicable diseases, provision of safe drinking water and sanitation. The sixth plan was influenced by the international declaration 'Health for all by 2000 AD' that is universal health care that is affordable and as per the needs of the people.

On the eve of the 10th plan the draft of National Health Policy (NHP) was announced and called for feedbacks from the public. Finally in 2002, NHP document was released with the objective of achieving acceptable standards of good health of Indian population, decentralization, equity, accessibility of health services and provision of affordable private health care (Duggal, 2014). The role of traditional medicines was also acknowledged by this policy. Further, in the 11th plan, the central theme with respect to the health sector is 'inclusive growth'. The 12th plan was prepared after the consultation of public. It called for Universal Health Coverage through Essential Health Package and to assess the social determinants of health.

The National Health Policy 2017 came after 14 years gap. The policy aims at providing health care in 'assured manner' to all. The Make in India model governs the manufacturing of drugs and devices. AYUSH (Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy) is given special emphasis, especially yoga (Planning Commission 2013a, 2013b; Government of India 2017).

Other than the NHPs, many other policies were announced from time to time that are closely linked with improving the health status of people. These are National Population Policy, National Nutrition Policy, National Water Policy and National Environmental Policy to name a few. The list is given below (Table 3.1):

Table 3.1: National Health Policies / other Related Environmental Health Policies in India

Year	Name of Policy
1983	National Health Policy
1993	National Nutrition Policy
2000	National Population Policy
2002	National Policy on Indian System of Medicine and Homeopathy
2002	National Health Policy
2005	National Rural Health Mission

2006	National Environment Policy
2012	National Water Policy
2017	National Health Policy

Other than these, Ministry of Health and Family Welfare launched Pradhan Mantri Swasthya Suraksha Yojana (PMSSY) in 2006, Janani Shishu Suraksha Karyakram (JSSK) and Janani Suraksha Yojana for insuring the health care. Various programmes undertaken by the Ministry of Social Justice and Empowerment / Ministry of Child Development and Women are Integrated Child Development Services (ICDS) scheme, Mid-day Meal (MDM) Programme, Special Nutrition Programme, National Nutritional Anaemia Prophylaxis Programme (NNAPP), Reproductive and Child Health Programme and School Health Programme. With respect to supply of clean drinking water, Ministry of drinking water and sanitation introduced the Rajiv Gandhi National Drinking Water Mission (RGNDWM) (Lakshminarayanan 2016; Patel 2015; Grover and Singh 2020).

3.8.2.3 Lacunae and Gaps in Policies and Programmes in India

Although innumerable direct and indirect plans, programmes and policies have been made with respect to health system in India, the success has been limited. Various reasons can be cited for this, such as, shortage of health care workers, infrastructure, poor governance, low affordability, neglected preventive, promotive, rehabilitative and public health measures, inadequate funds (only 0.9% of the GDP was allocated to health care as per National Health Policy, 2002), social inequality, privatization and minimal involvement of local bodies like Panchayats.

3.9 SUMMARY

From the above discussion it is clear that human health cannot be studied with a watertight compartment view in which health is improved by medical intervention only. Rather, health is interplay of various factors of which environment is very important. If we improve the surroundings and living conditions, the human health and wellbeing can be improved easily. So, policies, programmes and actions of government should focus on improving and cleaning environment that will promote prevention of diseases instead of focusing on curing the diseases. Truly, prevention is better than cure and it is cheaper and healthier option too!

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3.11 ANSWERS TO CHECK YOUR PROGRESS

- 1) Environmental health comprises of those aspects of human health, including quality of life, that are determined by physical, biological, social and psychosocial factors in the environment. It also refers to the theory and practice of assessing, correcting and preventing those factors in the environment that can potentially affect adversely the health of present and future generations.
- 2) Air pollution is a growing menace in Delhi since last 4-5 years, especially during the festival of Diwali during the month of October end–November. There are multiple reasons cited for sudden increase in pollution levels including vehicular pollution, burning of crackers, burning of agricultural stubble in Punjab and Haryana, changing winds, construction activities and industrial effluents. The major cause of concern is the particulate matter (SPM and RSPM) that causes respiratory and cardiovascular diseases, burning of eyes and nose, skin illness and even cancer. This is particularly concern for children, pregnant women and aged population.
- 3) The ecological model emphasizes the importance of the social and physical environments that strongly shape patterns of disease and injury as well as our responses to them over the entire life cycle.