2 Concept of Health and Disease

"Health is NOT mainly an issue of doctors, social services and hospitals. It is an issue of social justice."

CONCEPT OF HEALTH

Health is a common theme in most cultures. In fact, all communities have their concepts of health, as part of their culture. Among definitions still used, probably the oldest is that health is the "absence of disease". In some cultures, health and harmony are considered equivalent, harmony being defined as "being at peace with the self, the community, god and cosmos". The ancient Indians and Greeks shared this concept and attributed disease to disturbances in bodily equilibrium of what they called "humors".

Modern medicine is often accused for its preoccupation with the study of disease, and neglect of the study of health. Consequently, our ignorance about health continues to be profound, as for example, the determinants of health are not yet clear; the current definitions of health are elusive; and there is no single yardstick for measuring health. There is thus a great scope for the study of the "epidemiology" of health.

However, during the past few decades, there has been a reawakening that health is a fundamental human right and a worldwide social goal; that it is essential to the satisfaction of basic human needs and to an improved quality of life; and, that it is to be attained by all people. In 1977, the 30th World Health Assembly decided that the main social target of governments and WHO in the coming decades should be "the attainment by all citizens of the world by the year 2000 of a level of health that will permit them to lead a socially and economically productive life", for brevity, called "Health for All" *(1)*. With the adoption of health as an integral part of socio-economic development by the United Nations in 1979 *(2)*, health, while being an end in itself, has also become a major instrument of overall socio-economic development and the creation of a new social order.

CHANGING CONCEPTS

An understanding of health is the basis of all health care. Health is not perceived the same way by all members of a community including various professional groups (e.g., biomedical scientists, social science specialists, health administrators, ecologists, etc) giving rise to confusion about the concept of health. In a world of continuous change, new concepts are bound to emerge based on new patterns of thought. Health has evolved over the centuries as a concept from an individual concern to a worldwide social goal and encompasses the whole quality of life. A brief account of the changing concepts of health is given below:

1. Biomedical concept

Traditionally, health has been viewed as an "absence of disease", and if one was free from disease, then the person was considered healthy. This concept, known as the "biomedical concept" has the basis in the "germ theory of disease" which dominated medical thought at the turn of the 20th century. The medical profession viewed the human body as a machine, disease as a consequence of the breakdown of the machine and one of the doctor's task as repair of the machine *(3)*. Thus health, in this narrow view, became the ultimate goal of medicine.

The criticism that is levelled against the biomedical concept is that it has minimized the role of the environmental, social, psychological and cultural determinants of health. The biomedical model, for all its spectacular success in treating disease, was found inadequate to solve some of the major health problems of mankind (e.g., malnutrition, chronic diseases, accidents, drug abuse, mental illness, environmental pollution, population explosion) by elaborating the medical technologies. Developments in medical and social sciences led to the conclusion that the biomedical concept of health was inadequate.

2. Ecological concept

Deficiencies in the biomedical concept gave rise to other concepts. The ecologists put forward an attractive hypothesis which viewed health as a dynamic equilibrium between man and his environment, and disease a maladjustment of the human organism to environment. Dubos *(4)* defined health saying : "Health implies the relative absence of pain and discomfort and a continuous adaptation and adjustment to the environment to ensure optimal function". Human, ecological and cultural adaptations do determine not only the occurrence of disease but also the availability of food and the population explosion. The ecological concept raises two issues, viz. imperfect man and imperfect environment. History argues strongly that improvement in human adaptation to natural environments can lead to longer life expectancies and a better quality of life – even in the absence of modern health delivery services *(5)*.

3. Psychosocial concepts

Contemporary developments in social sciences revealed that health is not only a biomedical phenomenon, but one which is influenced by social, psychological, cultural, economic and political factors of the people concerned *(5)*. These factors must be taken into consideration in defining and measuring health. Thus health is both a biological and social phenomenon.

4. Holistic concept

The holistic model is a synthesis of all the above concepts. It recognizes the strength of social, economic, political and

environmental influences on health. It has been variously described as a unified or multidimensional process involving the well-being of the whole person in the context of his environment. This view corresponds to the view held by the ancients that health implies a sound mind, in a sound body, in a sound family, in sound environment. The holistic approach implies that all sectors of society have an effect on health, in particular, agriculture, animal husbandry, food, industry, education, housing, public works, communications and other sectors *(6)*. The emphasis is on the promotion and protection of health.

DEFINITION OF HEALTH

"Health" is one of those terms which most people find it difficult to define, although they are confident of its meaning. Therefore, many definitions of health have been offered from time to time.

WHO definition

The widely accepted definition of health is that given by the World Health Organization (1948) in the preamble to its constitution, which is as follows :

> *"Health is a state of complete physical, mental and social well-being and not merely an absence of disease or infirmity"*

In recent years, this statement has been amplified to include the ability to lead a "socially and economically productive life" *(6)*.

The WHO definition of health has been criticized as being too broad. Some argue that health cannot be defined as a "state" at all, but must be seen as a process of continuous adjustment to the changing demands of living and of the changing meanings we give to life. It is a dynamic concept. It helps people live well, work well and enjoy themselves.

Inspiteof the above limitations, the concept of health as defined by WHO is broad and positive in its implications; it sets out the standard, the standard of "positive" health. It symbolizes the aspirations of people and represents an overall objective or goal towards which nations should strive.

Operational definition of health

The WHO definition of health is not an "operational" definition, i.e., it does not lend itself to direct measurement. Studies of epidemiology of health have been hampered because of our inability to measure health and well-being directly. In this connection an "operational definition" has been devised by a WHO study group *(7)*. In this definition, the concept of health is viewed as being of two orders. In a broad sense, health can be seen as "a condition or quality of the human organism expressing the adequate functioning of the organism in given conditions, genetic or environmental".

In a narrow sense – one more useful for measuring purposes – health means: (a) there is no obvious evidence of disease, and that a person is functioning normally, i.e., conforming within normal limits of variation to the standards of health criteria generally accepted for one's age, sex, community, and geographic region; and (b) the several organs of the body are functioning adequately in themselves and in relation to one another, which implies a kind of equilibrium or homeostasis – a condition relatively stable but which may vary as human beings adapt to internal and external stimuli.

New philosophy of health

In recent years, we have acquired a new philosophy of health, which may be stated as below :

- health is a fundamental human right
- health is the essence of productive life, and not the result of ever increasing expenditure on medical care
- health is intersectoral
- health is an integral part of development
- health is central to the concept of quality of life
- health involves individuals, state and international responsibility
- health and its maintenance is a major social investment
- health is a worldwide social goal.

DIMENSIONS OF HEALTH

Health is multidimensional. The WHO definition envisages three specific dimensions – the physical, the mental and the social. Many more may be cited, viz. spiritual, emotional, vocational and political dimensions. As the knowledge base grows, the list may be expanding. Although these dimensions function and interact with one another, each has its own nature, and for descriptive purposes will be treated separately.

1. Physical dimension

The physical dimension of health is probably the easiest to understand. The state of physical health implies the notion of "perfect functioning" of the body. It conceptualizes health biologically as a state in which every cell and every organ is functioning at optimum capacity and in perfect harmony with the rest of the body. However, the term "optimum" is not definable.

The signs of physical health in an individual are: "a good complexion, a clean skin, bright eyes, lustrous hair with a body well clothed with firm flesh, not too fat, a sweet breath, a good appetite, sound sleep, regular activity of bowels and bladder and smooth, easy, coordinated bodily movements. All the organs of the body are of unexceptional size and function normally; all the special senses are intact; the resting pulse rate, blood pressure and exercise tolerance are all within the range of "normality" for the individual's age and sex. In the young and growing individual there is a steady gain in weight and in the future this weight remains more or less constant at a point about 5 lbs (2.3 kg) more or less than the individual's weight at the age of 25 years *(8)*. This state of normality has fairly wide limits. These limits are set by observation of a large number of "normal" people, who are free from evident disease.

Evaluation of physical health

Modern medicine has evolved tools and techniques which may be used in various combinations for the assessment of physical health. They include :

- self assessment of overall health
- inquiry into symptoms of ill-health and risk factors
- inquiry into medications
- inquiry into levels of activity (e.g., number of days of restricted activity within a specified time, degree of fitness)
- inquiry into use of medical services (e.g., the number of visits to a physician, number of hospitalizations) in the recent past
- standardized questionnaires for cardiovascular diseases
- standardized questionnaires for respiratory diseases
- clinical examination
- nutrition and dietary assessment, and
- biochemical and laboratory investigations.

At the community level, the state of health may be assessed by such indicators as death rate, infant mortality rate and

expectation of life. Ideally, each piece of information should be individually useful and when combined should permit a more complete health profile of individuals and communities.

2. Mental dimension

Mental health is not mere absence of mental illness. Good mental health is the ability to respond to the many varied experiences of life with flexibility and a sense of purpose. More recently, mental health has been defined as "a state of balance between the individual and the surrounding world, a state of harmony between oneself and others, a coexistence between the realities of the self and that of other people and that of the environment" *(9)*.

A few short decades ago, the mind and body were considered independent entities. However, researchers have discovered that psychological factors can induce all kinds of illness, not simply mental ones. They include conditions such as essential hypertension, peptic ulcer and bronchial asthma *(10)*. Some major mental illnesses such as depression and schizophrenia have a biological component. The underlying inference is that there is a behavioural, psychological or biological dysfunction and that the disturbance in the mental equilibrium is not merely in the relationship between the individual and the society *(11)*.

Although mental health is an essential component of health, the scientific foundations of mental health are not yet clear. Therefore, we do not have precise tools to assess the state of mental health unlike physical health. Psychologists have mentioned the following characteristics as attributes of a mentally healthy person:

a. a mentally healthy person is free from internal conflicts; he is not at "war" with himself.
b. he is well-adjusted, i.e., he is able to get along well with others. He accepts criticism and is not easily upset.
c. he searches for identity.
d. he has a strong sense of self-esteem.
e. he knows himself: his needs, problems and goals (this is known as self-actualization).
f. he has good self-control-balances rationality and emotionality.
g. he faces problems and tries to solve them intelligently, i.e., coping with stress and anxiety.

Assessment of mental health at the population level may be made by administering mental status questionnaires by trained interviewers. The most commonly used questionnaires seek to determine the presence and extent of "organic disease" and of symptoms that could indicate psychiatric disorder; some personal assessment of mental well-being is also made. The most basic decision to be made in assessing mental health is whether to assess mental functioning, i.e., the extent to which cognitive or affective impairments impede role performance and subjective life quality, or psychiatric diagnosis *(11)*.

One of the keys to good health is a positive mental health. Unfortunately, our knowledge about mental health is far from complete.

3. Social dimension

Social well-being implies harmony and integration within the individual, between each individual and other members of society and between individuals and the world in which they live *(12)*. It has been defined as the "quantity and quality of an individual's interpersonal ties and the extent of involvement with the community" *(13)*.

The social dimension of health includes the levels of social skills one possesses, social functioning and the ability to see oneself as a member of a larger society. In general, social health takes into account that every individual is part of a family and of wider community and focuses on social and economic conditions and well-being of the "whole person" in the context of his social network. Social health is rooted in "positive material environment" (focusing on financial and residential matters), and "positive human environment" which is concerned with the social network of the individual *(11)*.

4. Spiritual dimension

Proponents of holistic health believe that the time has come to give serious consideration to the spiritual dimension and to the role this plays in health and disease. Spiritual health in this context, refers to that part of the individual which reaches out and strives for meaning and purpose in life. It is the intangible "something" that transcends physiology and psychology. As a relatively new concept, it seems to defy concrete definition. It includes integrity, principles and ethics, the purpose in life, commitment to some higher being and belief in concepts that are not subject to "state of the art" explanation *(14)*.

5. Emotional dimension

Historically the mental and emotional dimensions have been seen as one element or as two closely related elements. However, as more research becomes available a definite difference is emerging. Mental health can be seen as "knowing" or "cognition" while emotional health relates to "feeling". Experts in psychobiology have been relatively successful in isolating these two separate dimensions. With this new data, the mental and emotional aspects of humanness may have to be viewed as two separate dimensions of human health *(14)*.

6. Vocational dimension

The vocational aspect of life is a new dimension. It is part of human existence. When work is fully adapted to human goals, capacities and limitations, work often plays a role in promoting both physical and mental health. Physical work is usually associated with an improvement in physical capacity, while goal achievement and self-realization in work are a source of satisfaction and enhanced self-esteem *(15)*.

The importance of this dimension is exposed when individuals suddenly lose their jobs or are faced with mandatory retirement. For many individuals, the vocational dimension may be merely a source of income. To others, this dimension represents the culmination of the efforts of other dimensions as they function together to produce what the individual considers life "success" *(14)*.

7. Others

A few other dimensions have also been suggested such as *(16)*:

- philosophical dimension
- cultural dimension
- socio-economic dimension
- environmental dimension
- educational dimension
- nutritional dimension
- curative dimension
- preventive dimension.

A glance at the above dimensions shows that there are many "non-medical" dimensions of health, e.g., social, cultural, educational, etc. These symbolize a huge range of factors to which other sectors besides health must contribute if all people are indeed to attain a level of health that will permit them to lead a socially and economically productive life.

POSITIVE HEALTH

Health in the broad sense of the world does not merely mean the absence of disease or provision of diagnostic, curative and preventive services. It also includes as embodied in the WHO definition, a state of physical, mental and social well-being. The harmonious balance of this state of the human individual integrated into his environment, constitutes health, as defined by WHO.

The state of positive health implies the notion of "perfect functioning" of the body and mind. It conceptualizes health **biologically**, as a state in which every cell and every organ is functioning at optimum capacity and in perfect harmony with the rest of the body; **psychologically**, as a state in which the individual feels a sense of perfect well-being and of mastery over his environment, and **socially**, as a state in which the individual's capacities for participation in the social system are optimal *(17)*. These ideas were widely ventilated some years ago but now appear slightly ridiculous *(18)*.

Dubos *(4)* said, "The concept of perfect positive health cannot become a reality because man will never be so perfectly adapted to his environment that his life will not involve struggles, failures and sufferings". Positive health will, therefore, always remain a mirage, because everything in our life is subject to change. Health in this context has been described as a potentiality – the ability of an individual or a social group to modify himself or itself continually, in the face of changing conditions of life. In working for positive health the doctor and the community health expert are in the same position as the gardener or farmer faced with insects, moulds and weeds. Their work is never done *(19)*.

A broader concept of health has been emerging – that of improving the quality of life of which health is an essential component. This at once brings to focus that positive health depends not only on medical action, but on all the other economic, cultural and social factors operating in the community.

HEALTH – A RELATIVE CONCEPT

An alternative approach to positive health conceptualizes health not as an ideal state, but as a biologically "normal" state, based on statistical averages *(3)*. For example, a newborn baby in India weighs 2.8 kg on an average compared to 3.5 kg in the developed countries, and yet compares favourably in health. The height and weight standards vary from country to country, and also between socio-economic groups. Many normal people show heart murmurs, enlarged tonsils and X-ray shadows in the chest and yet do not show signs of ill-health. Thus health is a relative concept *(7)* and health standards vary among cultures, social classes and age-groups. This implies that health in any society should be defined in terms of prevailing ecological conditions. That is, instead of setting universal health standards, each country will decide on its own norms for a given set of prevailing conditions and then look into ways to achieve that level *(20)*.

CONCEPT OF WELL-BEING

The WHO definition of health introduces the concept of "well-being". The question then arises: what is meant by well-being? In point of fact, there is no satisfactory definition of the term "well-being *(8)*.

Psychologists have pointed out that the "well-being" of an individual or group of individuals have objective and subjective components. The objective components relate to such concerns as are generally known by the term "standard of living" or "level of living". The subjective component of well-being (as expressed by each individual) is referred to as "quality of life" *(21)*. Let us consider these concepts separately.

1. Standard of living

The term "standard of living" refers to the usual scale of our expenditure, the goods we consume and the services we enjoy. It includes the level of education, employment status, food, dress, house, amusements and comforts of modern living *(21)*.

A similar definition, corresponding to the above, was proposed by WHO: "Income and occupation, standards of housing, sanitation and nutrition, the level of provision of health, educational, recreational and other services may all be used individually as measures of socio-economic status, and collectively as an index of the "standard of living" *(22)*.

There are vast inequalities in the standards of living of the people in different countries of the world. The extent of these differences are usually measured through the comparison of per capita GNP on which the standard of living primarily depends.

2. Level of living

The parallel term for standard of living used in United Nations documents is "level of living" *(23)*. It consists of nine components: health, food consumption, education, occupation and working conditions, housing, social security, clothing, recreation and leisure, and human rights. These objective characteristics are believed to influence human well-being. It is considered that health is the most important component of the level of living because its impairment always means impairment of the level of living.

3. Quality of life

Much has been said and written on the quality of life in recent years. It is the "subjective" component of well-being. "Quality of life" was defined by WHO *(24)* as: "the condition of life resulting from the combination of the effects of the complete range of factors such as those determining health, happiness (including comfort in the physical environment and a satisfying occupation), education, social and intellectual attainments, freedom of action, justice and freedom of expression".

A recent definition of quality of life is as follows *(21)*: "a composite measure of physical, mental and social well-being as **perceived** by each individual or by group of individuals – that is to say, happiness, satisfaction and gratification as it is experienced in such life concerns as health, marriage, family work, financial situation, educational opportunities, self-esteem, creativity, belongingness, and trust in others".

Thus, a distinction is drawn between the concept of "level of living" consisting of objective criteria and of "quality of life" comprising the individual's own subjective evaluation of these. The quality of life can be evaluated by assessing a person's subjective feelings of happiness or unhappiness about the various life concerns.

People are now demanding a better quality of life. Therefore, governments all over the world are increasingly concerned about improving the quality of life of their people by reducing morbidity and mortality, providing primary health care and enhancing physical, mental and social well-being. It is conceded that a rise in the standard of living of the people is not enough to achieve satisfaction or happiness. Improvement of quality of life must also be added, and this means increased emphasis on social policy and on reformulation of societal goals to make life more liveable for all those who survive.

Physical quality of life index (PQLI)

As things stand at present, this important concept of quality of life is difficult to define and even more difficult to measure. Various attempts have been made to reach one composite index from a number of health indicators. The "Physical quality of life index" is one such index. It consolidates three indicators, viz. infant mortality, life expectancy at age one, and literacy. These three components measure the results rather than inputs. As such they lend themselves to international and national comparison.

For each component, the performance of individual countries is placed on a scale of 0 to 100, where 0 represents an absolutely defined "worst" performance, and 100 represents an absolutely defined "best" performance. The composite index is calculated by averaging the three indicators, giving equal weight to each of them. The resulting PQLI thus also is scaled 0 to 100.

It may be mentioned that PQLI has not taken per capita GNP into consideration, showing thereby that "money is not everything". For example, the oil-rich countries of Middle East with high per capita incomes have in fact not very high PQLIs. At the other extreme, Sri Lanka and Kerala state in India have low per capita incomes with high PQLIs. In short, PQLI does not measure economic growth; it measures the results of social, economic and political policies. It is intended to complement, not replace GNP *(25)*. The ultimate objective is to attain a PQLI of 100.

Human Development Index (HDI) *(26)*

Human development index (HDI) is defined as "a composite index combining indicators representing three dimensions – longevity (life expectancy at birth); knowledge (mean years of schooling and expected years of schooling. Before the year 2009, the indicators used were adult literacy rate and gross enrolment ratio) and income (GNI per capita in purchasing power parity in US dollars)". Fig. 1 summarizes how the human development index is constructed.

Thus the concept of HDI reflects achievements in the most basic human capabilities, viz. leading a long life, being knowledgeable and enjoying a decent standard of living. Hence, these three variables have been chosen to represent those dimensions. The HDI is a more comprehensive measure than per capita income. Income is only a means to human development, not an end. Nor is it a sum total of human lives. Thus by focusing on areas beyond income and treating income as a proxy for a decent standard of living, the HDI provides a more comprehensive picture of human life than income does.

The HDI values range between 0 to 1. The HDI value for a country shows the distance that it has already travelled towards maximum possible value to 1, and also allows comparisons with other countries.

STEPS TO ESTIMATE THE HUMAN DEVELOPMENT INDEX *(27)*

There are two steps to calculating the HDI.

Step 1. Creating the dimension indices

Minimum and maximum values (goalposts) are set in order to transform the indicators into indices between 0 and 1. The maximums are the highest observed values in the time series (1980–2011). The minimum values can be appropriately conceived of as subsistence values. The minimum values are set at 20 years for expectancy, at 0 years for both education variables and at $100 for per capita gross national income (GNI).

Goalposts for the Human Development Index

DIMENSION	OBSERVED MAXIMUM	MINIMUM
Life expectancy	83.4 (Japan, 2011)	20.0
Mean years of schooling	13.1 (Czech Republic, 2005)	0
Expected years of schooling	18.0 (capped at)	0
Combined education index	0.978 (New Zealand, 2010)	0
Per capita income (PPP $)	107,721 (Qatar, 2011)	100

Having defined the minimum and maximum values, the subindices are calculated as follows:

$$\text{Dimension index} = \frac{\text{Actual value} - \text{Minimum value}}{\text{Maximum value} - \text{Minimum value}} \quad (1)$$

For education, equation 1 is applied to each of the two subcomponents, then a geometric mean of the resulting indices is created and finally, equation 1 is reapplied to the geometric mean of the indices using 0 as the minimum and the highest geometric mean of the resulting indices for the time period under consideration, as the maximum. This is equivalent to applying equation 1 directly to the geometric mean of the two subcomponents.

Step 2. Aggregating the subindices to produce the Human Development Index

The HDI is the geometric mean of the three dimension indices:

$$(I_{Life}^{1/3} \times I_{Education}^{1/3} \times I_{Income}^{1/3}) \quad (2)$$

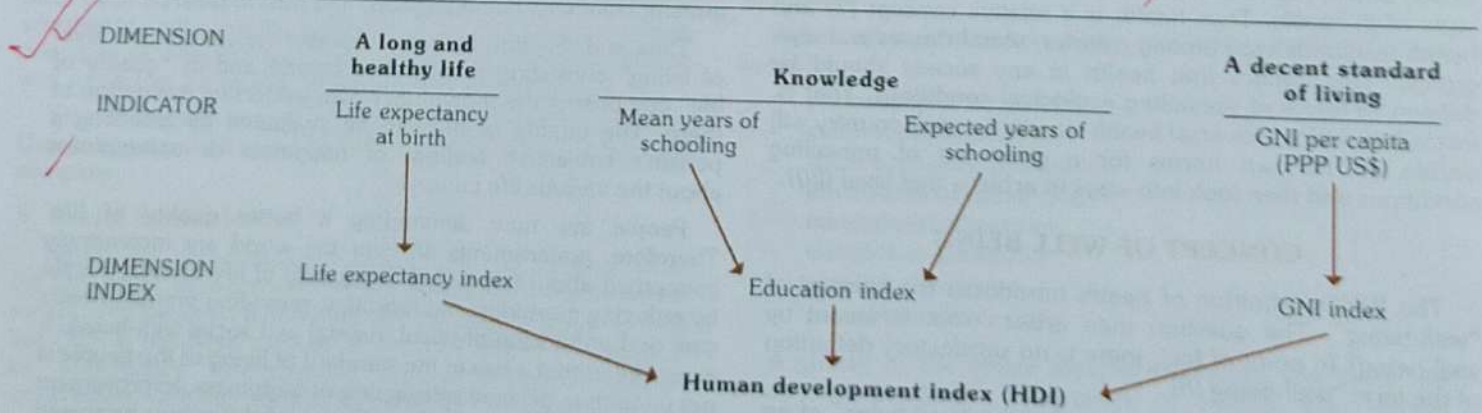


FIG. 1
Calculating the Human Development Index

Source : *(27)*

The construction of HDI methodology can be illustrated with the example of India for the year 2010.

Indicator	Value
Life expectancy at birth (years)	65.4
Mean years of schooling (years)	4.4
Expected years of schooling (years)	10.3
GNI per capita (PPP $)	3,468

$$\text{Life expectancy index} = \frac{65.4 - 20}{83.4 - 20} = \frac{45.4}{63.4} = 0.716$$

$$\text{Mean years of schooling index} = \frac{4.4 - 0}{13.1 - 0} = 0.335$$

$$\text{Expected years of schooling index} = \frac{10.3 - 0}{18 - 0} = 0.572$$

$$\text{Education index} = \frac{\sqrt{0.335 \times 0.572} - 0}{0.978 - 0} = 0.447$$

$$\text{Income index} = \frac{\ln(3468) - \ln(100)}{\ln(107{,}721) - \ln(100)} = 0.508$$

$$\text{Human development index} = \sqrt[3]{0.716 \times 0.447 \times 0.508}$$

$$= 0.547$$

Of the 187 countries for which HDI has been constructed for the year 2011, 44 countries have very high HDI (more than 0.8), 47 are between 0.8 and 0.7, 55 countries between 0.7, and 0.5 and 41 are below 0.5. New Zealand, Norway and Australia are at the top of HDI ranking and D.R. of Congo, Niger and Zimbabwe at the bottom. India comes in the medium human development category, ranking at number 134 *(27)*.

Disparities between regions can be significant with some regions having more ground to cover in making the shortfall than others. The link between the economic prosperity and human development is neither automatic nor obvious. Two countries with similar income per capita can have very different HDI values and countries having similar HDI can have very different income levels.

SPECTRUM OF HEALTH

Health and disease lie along a continuum, and there is no single cut-off point. The lowest point on the health-disease spectrum is death and the highest point corresponds to the WHO definition of positive health (Fig. 2). It is thus obvious that health fluctuates within a range of optimum well-being to various levels of dysfunction, including the state of total dysfunction, namely the death. The transition from optimum health to ill-health is often gradual, and where one state ends and the other begins is a matter of judgment.

The spectral concept of health emphasizes that the health of an individual is not static; it is a dynamic phenomenon and a process of continuous change, subject to frequent subtle variations. What is considered maximum health today may be minimum tomorrow. That is, a person may function at maximum levels of health today, and diminished levels of health tomorrow. It implies that health is a state not to be attained once and for all, but ever to be renewed. There are degrees or "levels of health" as there are degrees or severity of illness. As long as we are alive there is some degree of health in us.

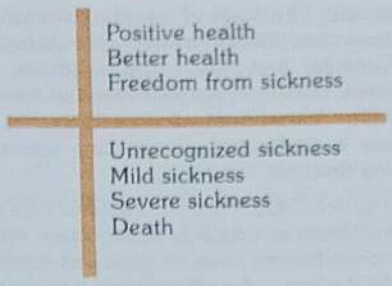
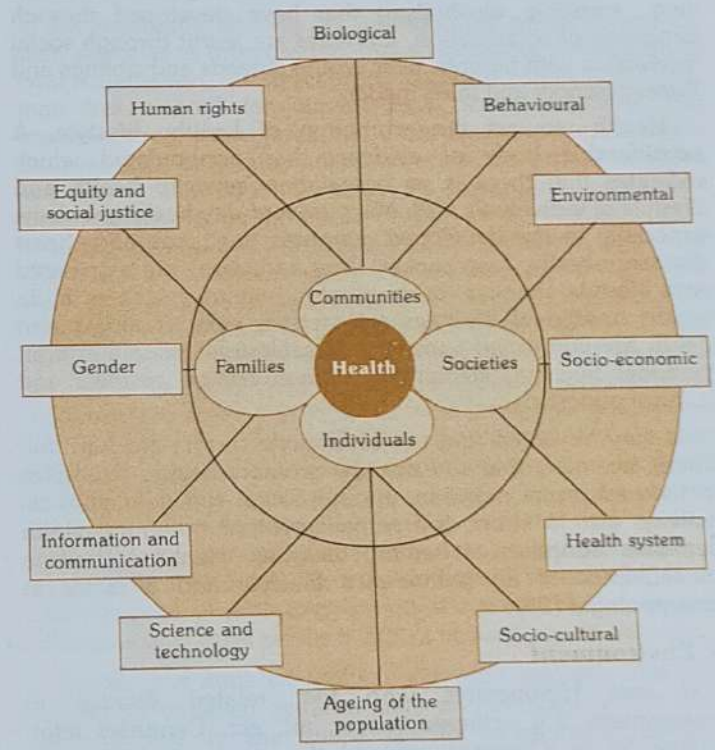


FIG. 2
The health sickness spectrum

DETERMINANTS OF HEALTH

Health is multifactorial. The factors which influence health lie both within the individual and externally in the society in which he or she lives. It is a truism to say that what man is and to what diseases he may fall victim depends on a combination of two sets of factors – his genetic factors and the environmental factors to which he is exposed. These factors interact and these interactions may be health-promoting or deleterious. Thus, conceptually, the health of individuals and whole communities may be considered to be the result of many interactions. Only a brief indication of the more important determinants or variables are shown in Fig. 3.



Source : *(28)*

FIG. 3
Determinants of health

1. Biological determinants

The physical and mental traits of every human being are to some extent determined by the nature of his genes at the moment of conception. The genetic make-up is unique in that it cannot be altered after conception. A number of diseases are now known to be of genetic origin, e.g., chromosomal anomalies, errors of metabolism, mental retardation, some

types of diabetes, etc. The state of health, therefore depends partly on the genetic constitution of man. Nowadays, medical genetics offers hope for prevention and treatment of a wide spectrum of diseases, thus the prospect of better medicine and longer, healthier life. A vast field of knowledge has yet to be exploited. It plays a particularly important role in genetic screening and gene therapy.

Thus, from the genetic stand-point, health may be defined as that "state of the individual which is based upon the absence from the genetic constitution of such genes as correspond to characters that take the form of serious defect and derangement and to the absence of any aberration in respect of the total amount of chromosome material in the karyotype or stated in positive terms, from the presence in the genetic constitution of the genes that correspond to the normal characterization and to the presence of a normal karyotype" *(8)*.

The "positive health" advocated by WHO implies that a person should be able to express as completely as possible the potentialities of his genetic heritage. This is possible only when the person is allowed to live in healthy relationship with his environment – an environment that transforms genetic potentialities into phenotypic realities *(19)*.

2. Behavioural and socio-cultural conditions

The term "lifestyle" is rather a diffuse concept often used to denote "the way people live", reflecting a whole range of social values, attitudes and activities *(29)*. It is composed of cultural and behavioural patterns and lifelong personal habits (e.g., smoking, alcoholism) that have developed through processes of socialization. Lifestyles are learnt through social interaction with parents, peer groups, friends and siblings and through school and mass media.

Health requires the promotion of healthy lifestyle. A considerable body of evidence has accumulated which indicates that there is an association between health and lifestyle of individuals *(30)*. Many current-day health problems especially in the developed countries (e.g., coronary heart disease, obesity, lung cancer, drug addiction) are associated with lifestyle changes. In developing countries such as India where traditional lifestyles still persist, risks of illness and death are connected with lack of sanitation, poor nutrition, personal hygiene, elementary human habits, customs and cultural patterns.

It may be noted that not all lifestyle factors are harmful. There are many that can actually promote health. Examples include adequate nutrition, enough sleep, sufficient physical activity, etc. In short, the achievement of optimum health demands adoption of healthy lifestyles. Health is both a consequence of an individual's lifestyle and a factor in determining it *(29)*.

3. Environment

It was Hippocrates who first related disease to environment, e.g., climate, water, air, etc. Centuries later, Pettenkofer in Germany revived the concept of disease–environment association.

Environment is classified as "internal" and "external". The **internal** environment of man pertains to "each and every component part, every tissue, organ and organ–system and their harmonious functioning within the system". Internal environment is the domain of internal medicine. The **external** or macro-environment consists of those things to which man is exposed after conception. It is defined as "all that which is external to the individual human host" *(31)*. It can be divided into physical, biological and psychosocial components, any or all of which can affect the health of man and his susceptibility to illness. Some epidemiologists have used the term "micro-environment" (or domestic environment) to personal environment which includes the individual's way of living and lifestyle, e.g., eating habits, other personal habits (e.g., smoking or drinking), use of drugs, etc. It is also customary to speak about occupational environment, socio-economic environment and moral environment.

It is an established fact that environment has a direct impact on the physical, mental and social well-being of those living in it. The environmental factors range from housing, water supply, psychosocial stress and family structure through social and economic support systems, to the organization of health and social welfare services in the community.

The environmental components (physical, biological and psychological) are not water-tight compartments. They are so inextricably linked with one another that it is realistic and fruitful to view the human environment in toto when we consider the influence of environment on the health status of the population. If the environment is favourable to the individual, he can make full use of his physical and mental capabilities. Protection and promotion of family and environmental health is one of the major issues in the world today.

4. Socio-economic conditions

Socio-economic conditions have long been known to influence human health. For the majority of the world's people, health status is determined primarily by their level of socio-economic development, e.g., per capita GNP, education, nutrition, employment, housing, the political system of the country, etc. Those of major importance are :

(i) *Economic status* : The per capita GNP is the most widely accepted measure of general economic performance. There can be no doubt that in many developing countries, it is the economic progress that has been the major factor in reducing morbidity, increasing life expectancy and improving the quality of life (Table 4). The economic status determines the purchasing power, standard of living, quality of life, family size and the pattern of disease and deviant behaviour in the community. It is also an important factor in seeking health care. Ironically, affluence may also be a contributory cause of illness as exemplified by the high rates of coronary heart disease, diabetes and obesity in the upper socio-economic groups.

(ii) *Education* : A second major factor influencing health status is education (especially female education). The world map of illiteracy closely coincides with the maps of poverty, malnutrition, illhealth, high infant and child mortality rates. Studies indicate that education, to some extent, compensates the effects of poverty on health, irrespective of the availability of health facilities. The small state of Kerala in India is a striking example *(32)*. Kerala has an estimated infant mortality rate of 13 compared to 47 for all-India in 2010 *(33)*. A major factor in the low infant mortality of Kerala is its high female literacy rate of 91.98 per cent as compared to 65.46 per cent for all-India *(34)*.

(iii) *Occupation* : The very state of being employed in productive work promotes health, because the unemployed usually show a higher incidence of illhealth and death. For many, loss of work may mean loss of income and status. It can cause psychological and social damage.

(iv) *Political system* : Health is also related to the country's political system. Often the main obstacles to the implementation of health technologies are not technical, but rather political. Decisions concerning resource allocation, manpower policy, choice of technology and the degree to which health services are made available and accessible to different segments of the society are examples of the manner in which the political system can shape community health services *(35)*. The percentage of GNP spent on health is a

quantitative indicator of political commitment. The WHO has set the target of at least 5 per cent expenditure of each country's GNP on health care. However India spends about 2 per cent of its GNP on health and family welfare *(36)*. What is needed is political commitment and leadership which is oriented towards social development, and not merely economic development. If poor health patterns are to be changed, then changes must be made in the entire socio-political system in any given community. Social, economic and political actions are required to eliminate health hazards in people's working and living environments.

5. Health services

The term health and family welfare services cover a wide spectrum of personal and community services for treatment of disease, prevention of illness and promotion of health. The purpose of health services is to improve the health status of population. For example, immunization of children can influence the incidence/prevalence of particular diseases. Provision of safe water can prevent mortality and morbidity from water-borne diseases. The care of pregnant women and children would contribute to the reduction of maternal and child morbidity and mortality. To be effective, the health services must reach the social periphery, equitably distributed, accessible at a cost the country and community can afford, and socially acceptable *(6)*. All these are ingredients of what is now termed "primary health care", which is seen as the way to better health.

Health services can also be seen as essential for social and economic development. It is well to remind ourselves that "health care does not produce good health" *(37)*. Whereas, there is a strong correlation between GNP and expectation of life at birth, there is no significant correlation between medical density and expectation of life at birth *(38)*. The most we can expect from an effective health service is good care *(37)*. The epidemiological perspective emphasizes that health services, no matter how technically elegant or cost-effective, are ultimately pertinent only if they improve health *(39)*.

6. Ageing of the population

By the year 2020, the world will have more than one billion people aged 60 and over, and more than two-thirds of them living in developing countries. Although the elderly in many countries enjoy better health than hitherto, a major concern of rapid population ageing is the increased prevalence of chronic diseases and disabilities, both being conditions that tend to accompany the ageing process and deserve special attention.

7. Gender

The 1990s have witnessed an increased concentration on women's issues. In 1993, the Global Commission on Women's Health was established. The commission drew up an agenda for action on women's health covering nutrition, reproductive health, the health consequences of violence, ageing, lifestyle related conditions and the occupational environment. It has brought about an increased awareness among policy–makers of women's health issues and encourages their inclusion in all development plans as a priority.

8. Other factors

We are witnessing the transition from post industrial age to an information age and experiencing the early days of two interconnected revolutions, in information and in communication. The development of these technologies offers tremendous opportunities in providing an easy and instant access to medical information once difficult to retrieve. It contributes to dissemination of information worldwide, serving the needs of many physicians, health professionals, biomedical scientists and researchers, the mass media and the public.

Other contributions to the health of population derive from systems outside the formal health care system, i.e., health related systems (e.g., food and agriculture, education, industry, social welfare, rural development) as well as adoption of policies in the economic and social fields that would assist in raising the standard of living. This would include employment opportunities, increased wages, prepaid medical programmes and family support systems.

In short, medicine is not the sole contributor to the health and well-being of population. The potential of intersectoral contributions to the health of communities is increasingly recognized.

ECOLOGY OF HEALTH

Ecology is a key word in present–day health philosophy. It comes from the Greek "Oikos" meaning a house. Ecology is defined as the science of mutual relationship between living organisms and their environments. Human ecology is a subset of more general science of ecology.

A full understanding of health requires that humanity be seen as part of an ecosystem. The human ecosystem includes in addition to the natural environment, all the dimensions of the man-made environment – physical, chemical, biological, psychological: in short, our culture and all its products *(40)*. Disease is embedded in the ecosystem of man. Health, according to ecological concepts, is visualized as a state of dynamic equilibrium between man and his environment.

By constantly altering his environment or ecosystem by such activities as urbanization, industrialization, deforestation, land reclamation, construction of irrigation canals and dams, man has created for himself new health problems. For example, the greatest threat to human health in India today is the ever–increasing, unplanned urbanization, growth of slums and deterioration of environment. As a result, diseases at one time thought to be primarily "rural" (e.g., filariasis) have acquired serious urban dimensions. The agents of a number of diseases, for example, malaria and chikungunya fever, which were effectively controlled have shown a recrudescence. The reasons for this must be sought in changes in the human ecology. Man's intrusion into ecological cycles of disease has resulted in zoonotic diseases such as kyasanur forest disease, rabies, yellow fever, monkeypox, lassa fever, etc. The Bhopal gas tragedy in 1984 highlights the danger of locating industries in urban areas. The nuclear disaster in Soviet Russia in April 1986 is another grim reminder of environmental pollution. Construction of irrigation systems and artificial lakes has created ecological niches favouring the breeding of mosquitoes and snails. In fact, ecological factors are at the root of the geographic distribution of disease. Therefore it has been said that good public health is basically good ecology.

Some have equated ecology with epidemiology. The main distinction between epidemiology and ecology is that while epidemiology is the study of the relationship between variations in man's environment and his state of health (or disease), ecology embraces the interrelationship of all living things. In this regard, epidemiology constitutes a special application of human ecology or that part of ecology relating to the state of human health *(41)*.

It is now being increasingly recognized that environmental factors and ecological considerations must be built into the total planning process to prevent degradation of ecosystems. Prevention of disease through ecological or environmental manipulations or interventions is much safer, cheaper and a more effective rational approach than all the other means of control. It is through environmental manipulations that

diseases such as cholera and other diarrhoeal diseases, typhoid, malaria and other vector borne diseases, and hookworm disease could be brought under control or eliminated. The greatest improvement in human health thus may be expected from an understanding and modification of the factors that favour disease occurrence in the human ecosystem. Professor Rene Dubos believes that man's capacity to adapt himself to ecological changes is not unlimited. Man can adapt himself only in so far as the mechanisms of adaptations are potentially present in his genetic code *(19)*.

RIGHT TO HEALTH

Historically, the right to health was one of the last to be proclaimed in the Constitutions of most countries of the world *(42)*. At the international level, the Universal Declaration of Human Rights established a breakthrough in 1948, by stating in Article 25: "Everyone has the right to a standard of living adequate for the health and well-being of himself and his family.....". The Preamble to the WHO Constitution also affirms that it is one of the fundamental rights of every human being to enjoy "the highest attainable standard of health". Inherent in the right to health is the right to health or medical care. Some countries have used the term "right to health protection" which is assured by a comprehensive system of social insurance that provides material security in cases of illness or accident, and free medical education, medicaments and other necessary materials and the right to be cared for by society in old age and invalidity *(42)*.

In an increasing number of societies, health is no longer accepted as a charity or the privilege of the few, but demanded as a right for all. However, when resources are limited (as in most developing countries), the governments cannot provide all the needed health services. Under these circumstances the aspirations of the people should be satisfied by giving them equal right to available health care services *(43)*.

The concept of "right to health" has generated so many questions, viz. right to medical care, right to responsibility for health, right to a healthy environment, right to food, right to procreate (artificial insemination included), the right not to procreate (family planning, sterilization, legal abortion), rights of the deceased persons (determination of death, autopsies, organ removal) and the right to die (suicide, hunger strike, discontinuation of life support measures), etc. Many of these issues have been the subject of debate. It is left to the lawyers, ethicists and physicians to formulate a general outline of what is acceptable and what is unacceptable in human society.

RESPONSIBILITY FOR HEALTH

Health is on one hand a highly personal responsibility and on the other hand a major public concern. It thus involves the joint efforts of the whole social fabric, viz. the individual, the community and the state to protect and promote health.

1. Individual responsibility

Although health is now recognized a fundamental human right, it is essentially an individual responsibility. It is not a commodity that one individual can bestow on another. No community or state programme of health services can give health. In large measure, it has to be earned and maintained by the individual himself, who must accept a broad spectrum of responsibilities, now known as "self care".

Self care in health

A recent trend in health care is self care *(44)*. It is defined as "those health-generating activities that are undertaken by the persons themselves" *(45)*. It refers to those activities individuals undertake in promoting their own health, preventing their own disease, limiting their own illness, and restoring their own health. These activities are undertaken without professional assistance, although individuals are informed by technical knowledge and skills. The generic attribute of self care is its non-professional, non-bureaucratic, non-industrial character; its natural place in social life *(46)*.

Self care activities comprise observance of simple rules of behaviour relating to diet, sleep, exercise, weight, alcohol, smoking and drugs. Others include attention to personal hygiene, cultivation of healthful habits and lifestyle, submitting oneself to selective medical examinations and screening; accepting immunization and carrying out other specific disease-prevention measures, reporting early when sick and accepting treatment, undertaking measures for the prevention of a relapse or of the spread of the disease to others. To these must be added family planning which is essentially an individual responsibility.

The shift in disease patterns from acute to chronic disease makes self care both a logical necessity and an appropriate strategy. For example, by teaching patients self care (e.g., recording one's own blood pressure, examination of urine for sugar), the burden on the official health services would be considerably reduced. In other words, health must begin with the individual.

2. Community responsibility

Health can never be adequately protected by health services without the active understanding and involvement of communities whose health is at stake. Until quite recently, throughout the world, people were neglected as a health resource; they were merely looked upon as sources of pathology or victims of pathology and consequently as a "target" for preventive and therapeutic services. This negative view of people's role in health has changed because of the realization that there are many things which the individual cannot do for himself except through united community effort. The individual and community responsibility are complementary, not antithetical. The current trend is to "demedicalize" health and involve the communities in a meaningful way. This implies a more active involvement of families and communities in health matters, viz. planning, implementation, utilization, operation and evaluation of health services. In other words, the emphasis has shifted from **health care for the people to health care by the people.** The concept of primary health care centres round people's participation in their own activities. The Village Health Guides' scheme in India, launched in 1977, is an example of community participation.

There are three ways in which a community can participate *(47)*: (i) the community can provide in the shape of facilities, manpower, logistic support, and possibly funds (ii) it also means the community can be actively involved in planning, management, and evaluation, and (iii) an equally important contribution that people can make is by joining in and using the health services. This is particularly true of preventive and protective measures. Further, no standard pattern of community participation can be recommended since there is a wide range of economic and social problems, as well as political and cultural traits among and within the communities. What is essential is flexibility of approach.

However, community involvement is not easy to obtain as extensive experience has indicated *(48)*. The traditional Indian society is cut across on rigid religion and caste lines, and appropriate role for each caste group has been a serious obstacle in securing complete community participation *(49)*.

Kerala has demonstrated that, in a democratic system with a strong political commitment to equitable socio-economic development, high levels of health can be achieved even on modest levels of income. Kerala can therefore be considered a **yardstick** for judging health status in the country *(53)*.

Studies have shown that the efforts in the health field were simultaneously reinforced by developments in other sectors. Literacy (especially female literacy) has played a key role in improving the health situation. This was probably responsible for the high rate of utilization of health facilities. Long-standing programmes directed at social welfare raised not only educational levels of the population but also developed a social infrastructure, including a transport network which provided easy access to services. An effective programme of land reform had given poor people access to land resources for food production at the household level. Kerala has demonstrated that good health at low cost is attainable by poor countries, but requires major political and social commitment *(32)*.

HEALTH DEVELOPMENT

Health development is defined as "the process of continuous progressive improvement of the health status of a population" *(54)*. Its product is rising level of human well-being, marked not only by reduction in the burden of disease, but also by the attainment of positive physical and mental health related to satisfactory economic functioning and social integration *(55)*.

The concept of **health development** as distinct from the provision of medical care is a product of recent policy thinking. It is based on the fundamental principle that governments have a responsibility for the health of their people and at the same time people should have the right as well as the duty, individually and collectively to participate in the development of their own health.

Health development contributes to and results from social and economic development. Therefore health development has been given increasing emphasis in the policies and programmes of the United Nations system. One example is that of World Bank which is providing funds for the health component of economic development programmes. The UNDP has also shown a growing interest in health development, as has the World Bank.

INDICATORS OF HEALTH

A question that is often raised is: How healthy is a given community ? Indicators are required not only to measure the health status of a community, but also to compare the health status of one country with that of another; for assessment of health care needs; for allocation of scarce resources; and for monitoring and evaluation of health services, activities, and programmes. Indicators help to measure the extent to which the objectives and targets of a programme are being attained.

As the name suggests, indicators are only an indication of a given situation or a reflection of that situation. In WHO's guidelines for health programme evaluation *(56)* they are defined as **variables** which help to measure changes. Often they are used particularly when these changes cannot be measured directly, as for example health or nutritional status *(55)*. If measured sequentially over time, they can indicate direction and speed of change and serve to compare different areas or groups of people at the same moment in time *(56)*.

There has been some confusion over terminology: **health indicator** as compared to **health index** (plural: indices or indexes). It has been suggested that in relation to health trends, the term **indicator** is to be preferred to **index**, whereas **health index** is generally considered to be an amalgamation of health indicators *(57)*.

Characteristics of indicators

Indicators have been given scientific respectability; for example **ideal** indicators

a. should be **valid**, i.e., they should actually measure what they are supposed to measure;
b. should be **reliable** and objective, i.e., the answers should be the same if measured by different people in similar circumstances;
c. should be **sensitive**, i.e., they should be sensitive to changes in the situation concerned,
d. should be **specific**, i.e., they should reflect changes only in the situation concerned,
e. should be **feasible**, i.e., they should have the ability to obtain data needed, and;
f. should be **relevant**, i.e., they should contribute to the understanding of the phenomenon of interest.

But in real life there are few indicators that comply with all these criteria. Measurement of health is far from simple. No existing definition (including the WHO definition) contains criteria for measuring health. This is because health, like happiness, cannot be defined in exact measurable terms. Its presence or absence is so largely a matter of subjective judgement. Since we have problems in defining health, we also have problems in measuring health and the question is largely unresolved. Therefore, measurements of health have been framed in terms of illness (or lack of health), the consequences of ill-health (e.g., morbidity, disability) and economic, occupational and domestic factors that promote ill-health – all the antitheses of health.

Further, health is multidimensional, and each dimension is influenced by numerous factors, some known and many unknown. This means we must measure health multidimensionally. Thus the subject of health measurement is a complicated one even for professionals. Our understanding of health, therefore, cannot be in terms of a single indicator; it must be conceived in terms of a profile, employing many indicators, which may be classified as:

1. Mortality indicators
2. Morbidity indicators
3. Disability rates
4. Nutritional status indicators
5. Health care delivery indicators
6. Utilization rates
7. Indicators of social and mental health
8. Environmental indicators
9. Socio-economic indicators
10. Health policy indicators
11. Indicators of quality of life, and
12. Other indicators.

1. Mortality indicators

(a) *Crude death rate*: This is considered a fair indicator of the comparative health of the people. It is defined as the number of deaths per 1000 population per year in a given community. It indicates the rate at which people are dying. Strictly speaking, health should not be measured by the number of deaths that occur in a community. But in many countries, the crude death rate is the only available indicator of health. When used for international comparison, the usefulness of the crude death rate is restricted because it is influenced by the age–sex composition of the population. Although not a perfect measure of health status, a decrease in death rate provides a good tool for assessing the overall

health improvement in a population. Reducing the number of deaths in the population is an obvious goal of medicine and health care, and success or failure to do so is a measure of a nation's commitment to better health.

(b) *Expectation of life* : Life expectancy at birth is "the average number of years that will be lived by those born alive into a population if the current age-specific mortality rates persist". Life expectancy at birth is highly influenced by the infant mortality rate where that is high. Life expectancy at the age of 1 excludes the influence of infant mortality, and life expectancy at the age of 5 excludes the influence of child mortality. Life expectancy at birth is used most frequently *(58)*. It is estimated for both sexes separately. An increase in the expectation of life is regarded, inferentially, as an improvement in health status.

Life expectancy is a good indicator of socio-economic development in general. As an indicator of long-term survival, it can be considered as a positive health indicator. It has been adopted as a global health indicator.

(c) *Age-specific death rates* : Death rates can be expressed for specific age groups in a population which are defined by age. An age-specific death rate is defined as total number of deaths occurring in a specific age group of the population (e.g. 20–24 years) in a defined area during a specific period per 1000 estimated total population of the same age group of the population in the same area during the same period.

(d) *Infant mortality rate* : Infant mortality rate is the ratio of deaths under 1 year of age in a given year to the total number of live births in the same year; usually expressed as a rate per 1000 live births *(57)*. It is one of the most universally accepted indicators of health status not only of infants, but also of whole population and of the socio-economic conditions under which they live. In addition, the infant mortality rate is a sensitive indicator of the availability, utilization and effectiveness of health care, particularly perinatal care.

(e) *Child mortality rate* : Another indicator related to the overall health status is the early childhood (1–4 years) mortality rate. It is defined as the number of deaths at ages 1–4 years in a given year, per 1000 children in that age group at the mid-point of the year concerned. It thus excludes infant mortality.

Apart from its correlation with inadequate MCH services, it is also related to insufficient nutrition, low coverage by immunization and adverse environmental exposure and other exogenous agents. Whereas the IMR may be more than 10 times higher in the least developed countries than in the developed countries, the child mortality rate may be as much as 25 times higher. This indicates the magnitude of the gap and the room for improvement.

(f) *Under–5 proportionate mortality rate* : It is the proportion of total deaths occurring in the under–5 age group. This rate can be used to reflect both infant and child mortality rates. In communities with poor hygiene, the proportion may exceed 60 per 1000 live births. In some European countries, the proportion is less than 2 per 1000 live births. High rate reflects high birth rates, high child mortality rates and shorter life expectancy *(27)*.

(g) *Adult mortality rate* : The adult mortality rate is defined as the probability of dying between the age of 15 and 60 years per 1000 population. The adult mortality rate offers a way to analyse health gaps between countries in the main working groups. The probability of dying in adulthood is greater for men than for women in almost all countries, but the variations between countries is very large. In Japan, less than 1 in 10 men (and 1 in 20 women) die in these productive age group, compared to almost 2–3 in 10 men (and 1–2 women) in Angola *(59)*.

(h) *Maternal (puerperal) mortality rate* : Maternal (puerperal) mortality accounts for the greatest proportion of deaths among women of reproductive age in most of the developing world. There are enormous variations in maternal mortality rate according to country's level of socio-economic status.

(i) *Disease-specific mortality rate* : Mortality rates can be computed for specific diseases. As countries begin to extricate themselves from the burden of communicable diseases, a number of other indicators such as deaths from cancer, cardiovascular diseases, accidents, diabetes, etc have emerged as measures of specific disease problems.

(j) *Proportional mortality rate* : The simplest measure of estimating the burden of a disease in the community is proportional mortality rate, i.e., the proportion of all deaths currently attributed to it. For example, coronary heart disease is the cause of 25 to 30 per cent of all deaths in most western countries. The proportional mortality rate from communicable diseases has been suggested as a useful health status indicator; it indicates the magnitude of preventable mortality.

(k) *Case fatality rate* : Case fatality rate measures the risk of persons dying from a certain disease within a given time period. Case fatality rate is calculated as number of deaths from a specific disease during a specific time period divided by number of cases of the disease during the same time period, usually expressed as per 100. The case fatality rate is used to link mortality to morbidity. One function of the case fatality rate is to measure various aspects or properties of a disease such as its pathogenicity, severity or virulence *(60)*. It can also be used in poisonings, chemical exposures or other short-term non-disease cause of death.

(l) *Years of potential life lost (YPLL)* : Years of potential life lost is based on the years of life lost through premature death. It is defined as one that occurs before the age to which a dying person could have expected to survive (before an arbitrary determined age, usually taken age 75 years). A 30 year old who dies in a road accident could theoretically have lived to an average life expectancy of 75 years of age; thus 45 years of life are lost.

Mortality indicators represent the traditional measures of health status. Even today they are probably the most often used indirect indicators of health. As infectious diseases have been brought under control, mortality rates have declined to very low levels in many countries. Consequently mortality indicators are losing their sensitivity as health indicators in developed countries. However, mortality indicators continue to be used as the starting point in health status evaluation.

2. Morbidity indicators

To describe health in terms of mortality rates only is misleading. This is because, mortality indicators do not reveal the burden of ill-health in a community, as for example mental illness and rheumatoid arthritis. Therefore, morbidity indicators are used to supplement mortality data to describe the health status of a population. Morbidity statistics have also their own drawback; they tend to overlook a large number of conditions which are subclinical or inapparent, that is, the hidden part of the iceberg of disease.

The following morbidity rates are used for assessing ill-health in the community *(61)*.

a. incidence and prevalence
b. notification rates
c. attendance rates at out-patient departments, health centres, etc.
d. admission, readmission and discharge rates
e. duration of stay in hospital, and
f. spells of sickness or absence from work or school.

3. Disability rates

Since death rates have not changed markedly in recent years, despite massive health expenditures, disability rates related to illness and injury have come into use to supplement mortality and morbidity indicators. The disability rates are based on the premise or notion that health implies a full range of daily activities. The commonly used disability rates fall into two groups: (a) Event–type indicators and (b) person–type indicators *(11,62)*.

(a) *Event–type indicators*
   i) Number of days of restricted activity
   ii) Bed disability days
   iii) Work-loss days (or school-loss days) within a specified period

(b) *Person–type indicators*
   i) *Limitation of mobility*: For example, confined to bed, confined to the house, special aid in getting around either inside or outside the house.
   ii) *Limitation of activity*: For example, limitation to perform the basic activities of daily living (ADL)–e.g., eating, washing, dressing, going to toilet, moving about, etc; limitation in major activity, e.g., ability to work at a job, ability to housework, etc.

HALE (Health–Adjusted Life Expectancy) : The name of the indicator used to measure healthy life expectancy has been changed from disability–adjusted life expectancy (DALE) to health–adjusted life expectancy (HALE). HALE is based on life expectancy at birth but includes an adjustment for *time spent in poor health*. It is most easily understood as the equivalent number of years in full health that a newborn can expect to live based on current rates of ill-health and mortality.

Quality–adjusted life years (QALY) : QALY is a measure of disease burden including both the quality and quantity of life lived. It is used in assessing the value for money of a medical intervention. The QALY is based on the number of years of life that would be added by intervention. Each year in perfect health is assigned a value of 1.0 down to a value of 0.0 for death, i.e. 1 QALY (1 year of life × 1 utility value = 1 QALY) is a year of life lived in perfect health. Half a year lived in perfect health is equivalent to 0.5 QALY (1 year × 0.5 utility value).

Disability–free life expectancy (Syn : active life expectancy) : Disability–free life expectancy (DFLE) is the average number of years an individual is expected to live free of disability if current pattern of mortality and disability continue to apply *(63)*.

Disability–adjusted life years (DALY) : DALY is a measure of overall disease burden, expressed as a number of years lost due to ill-health, disability or early death. Originally developed by Harvard University for the World Bank in 1990, the WHO subsequently adopted the method in the year 2000. The DALY is becoming increasingly common in the field of public health and health impact assessment. The Global Burden of Disease project combines the impact of premature mortality with that of disability. It captures the population impact of important fatal and non-fatal disabling conditions through a single measure. The major measure used is disability–adjusted life years (DALYs) which combines *(59)* :

- years of lost life (YLL) – calculated from the number of deaths at each age multiplied by the expected remaining years of life according to a global standard life expectancy
- years lost to disability (YLD) where the number of incident cases due to injury and illness is multiplied by the average duration of the disease and a weighting factor reflecting the severity of the disease on a scale from 0 (perfect health) to 1 (dead).

It is calculated by formula : DALY = YLL + YLD

The DALY relies on an acceptance that the most appropriate measure of the effects of the chronic illness is time. One DALY, therefore, is equal to one year of healthy life lost. Japanese life expectancy statistics are used as a standard for measuring premature death, as Japanese have the longest life expectancy.

DALY can reveal surprising things about a population's health. For example, the 1990 WHO report indicated that 5 out of 10 leading causes of disability were psychiatric conditions. Psychiatric and neurological conditions account for about 28 per cent of years lived with disability, but accounts for only 1.4 per cent of all deaths and 1.1 per cent of years of life lost. Thus they have a huge impact on population. A crucial distinction among DALY studies is the use of "social weighting", in which the value of each year of life depends on age. Commonly, years lived as a young adult are valued more highly than years spent as a young child or older adults. This weighting system reflects societie's interest in productivity and receiving a return on its investment in upbringing of the children. The effects of the interplay between life expectancy and years lost, discounting, and social weighting are complex, depending on the severity and duration of illness.

4. Nutritional status indicators

Nutritional status is a positive health indicator. Three nutritional status indicators are considered important as indicators of health status. They are *(58)* :

a. anthropometric measurements of preschool children, e.g., weight and height, mid-arm circumference;
b. heights (and sometimes weights) of children at school entry; and
c. prevalence of low birth weight (less than 2.5 kg).

5. Health care delivery indicators

The frequently used indicators of health care delivery are:

a. Doctor–population ratio
b. Doctor–nurse ratio
c. Population–bed ratio
d. Population per health/subcentre, and
e. Population per traditional birth attendant.

These indicators reflect the equity of distribution of health resources in different parts of the country, and of the provision of health care.

6. Utilization rates

In order to obtain additional information on health status, the extent of use of health services is often investigated. Utilization of services – or actual coverage – is expressed as the proportion of people in need of a service who actually receive it in a given period, usually a year *(58)*. It is argued that utilization rates give some indication of the care needed by a population, and therefore, the health status of the population. In other words, a relationship exists between utilization of health care services and health needs and status. Health care utilization is also affected by factors such as availability and accessibility of health services and the attitude of an individual towards his health and the health care system. A few examples of utilization rates are cited below:

a. proportion of infants who are "fully immunized" against the 6 EPI diseases.

b. proportion of pregnant women who receive antenatal care, or have their deliveries supervised by a trained birth attendant.
c. percentage of the population using the various methods of family planning.
d. bed–occupancy rate (i.e., average daily in–patient census/average number of beds).
e. average length of stay (i.e., days of care rendered/ discharges), and
f. bed turn-over ratio (i.e., discharges/average beds).

The above list is neither exhaustive nor all–inclusive. The list can be expanded depending upon the services provided. These indicators direct attention away from the biological aspects of disease in a population towards the discharge of social responsibility for the organization in delivery of health care services.

7. Indicators of social and mental health

As long as valid positive indicators of social and mental health are scarce, it is necessary to use indirect measures, viz. *indicators of social and mental pathology*. These include suicide, homicide, other acts of violence and other crime; road traffic accidents, juvenile delinquency; alcohol and drug abuse; smoking; consumption of tranquillizers; obesity, etc *(58)*. To these may be added family violence, battered–baby and battered–wife syndromes and neglected and abandoned youth in the neighbourhood. These social indicators provide a guide to social action for improving the health of the people.

8. Environmental indicators

Environmental indicators reflect the quality of physical and biological environment in which diseases occur and in which the people live. They include indicators relating to pollution of air and water, radiation, solid wastes, noise, exposure to toxic substances in food or drink. Among these, the most useful indicators are those measuring the proportion of population having access to safe water and sanitation facilities, as for example, percentage of households with safe water in the home or within 15 minutes' walking distance from a water standpoint or protected well; adequate sanitary facilities in the home or immediate vicinity *(58)*.

9. Socio-economic indicators

These indicators do not directly measure health. Nevertheless, they are of great importance in the interpretation of the indicators of health care. These include :

a. rate of population increase
b. per capita GNP
c. level of unemployment
d. dependency ratio
e. literacy rates, especially female literacy rates
f. family size
g. housing: the number of persons per room, and
h. per capita "calorie" availability.

10. Health policy indicators

The single most important indicator of political commitment is "allocation of adequate resources". The relevant indicators are: (i) proportion of GNP spent on health services (ii) proportion of GNP spent on health–related activities (including water supply and sanitation, housing and nutrition, community development) and (iii) proportion of total health resources devoted to primary health care.

11. Indicators of quality of life

Increasingly, mortality and morbidity data have been questioned as to whether they fully reflect the health status of a population. The previous emphasis on using increased life expectancy as an indicator of health is no longer considered adequate, especially in developed countries, and attention has shifted more towards concern about the quality of life enjoyed by individuals and communities. Quality of life is difficult to define and even more difficult to measure (see page 16). Various attempts have been made to reach one composite index from a number of health indicators. The physical quality of life index is one such index (see page 16). It consolidates three indicators, viz. infant mortality, life expectancy at age one, and literacy. Obviously more work is needed to develop indicators of quality of life.

12. Other indicators series

(a) *Social indicators* : Social indicators, as defined by the United Nations Statistical Office, have been divided into 12 categories: population; family formation, families and households; learning and educational services; earning activities; distribution of income, consumption, and accumulation; social security and welfare services; health services and nutrition; housing and its environment; public order and safety; time use; leisure and culture; social stratification and mobility *(64)*.

(b) *Basic needs indicators* : Basic needs indicators are used by ILO. Those mentioned in "Basic needs performance" *(65)* include calorie consumption; access to water; life expectancy; deaths due to disease; illiteracy, doctors and nurses per population; rooms per person; GNP per capita.

(c) *Health for All indicators* : For monitoring progress towards the goal of Health for All by 2000 AD, the WHO has listed the following four categories of indicators (Table 2).

TABLE 2
Indicators selected for monitoring progress towards "Health for All"

(1) Health policy indicators:
- political commitment to Health for All
- resource allocation
- the degree of equity of distribution of health services
- community involvement
- organizational framework and managerial process

(2) Social and economic indicators related to health:
- rate of population increase
- GNP or GDP
- income distribution
- work conditions
- adult literacy rate
- housing
- food availability

(3) Indicators for the provision of health care:
- availability
- accessibility
- utilization
- quality of care

(4) Health status indicators:
- low birth weight (percentage)
- nutritional status and psychosocial development of children
- infant mortality rate
- child mortality rate (1–4 years)
- life expectancy at birth
- maternal mortality rate
- disease specific mortality
- morbidity – incidence and prevalence
- disability prevalence

Source *(58)*

(d) *Millennium Development Goal Indicators* : The Millennium Development Goals adopted by the United Nations in the year 2000 provides an opportunity for concerted action to improve global health. The health related goals and their indicators of progress are listed in Table 3.

TABLE 3

Health-related Millennium Development Goals, and indicators

Goal: 1. Eradicate extreme poverty and hunger	
Indicator:	4. Prevalence of underweight children under five years of age
	5. Proportion of population below minimum level of dietary energy consumption
Goal: 4. Reduce child mortality	
Indicator:	13. Under-five mortality rate
	14. Infant mortality rate
	15. Proportion of 1-year-old children immunized against measles
Goal: 5. Improve maternal health	
Indicator:	16. Maternal mortality ratio
	17. Proportion of births attended by skilled health personnel
Goal: 6. Combat HIV/AIDS, malaria and other diseases	
Indicator:	18. HIV prevalence among young people aged 15 to 24 years
	19. Condom use rate of the contraceptive prevalence rate
	20. Number of children orphaned by HIV/AIDS
	21. Prevalence and death rates associated with malaria
	22. Proportion of population in malaria-risk areas using effective malaria prevention and treatment measures
	23. Prevalence and death rates associated with tuberculosis
	24. Proportion of tuberculosis cases detected and cured under Directly Observed Treatment, Short-course (DOTS)
Goal: 7. Ensure environmental sustainability	
Indicator:	29. Proportion of population using solid fuel
Indicator:	30. Proportion of population with sustainable access to an improved water source, urban and rural
Indicator:	31. Proportion of urban population with access to improved sanitation
Goal: 8. Develop a global partnership for development	
Indicator:	46. Proportion of population with access to affordable essential drugs on a sustainable basis

Source : *(66)*

The search for indicators associated with or casually related to health continues. It will be seen from the above that there is no single comprehensive indicator of a nation's health. Each available indicator reflects an aspect of health. The ideal index which combines the effect of a number of components measured independently is yet to be developed. While the search for a single global index of health status continues, the use of multiple indicators arranged in profiles or patterns should make comparisons between areas, regions and nations possible *(67)*. In the last few decades, attention has shifted from reliance on economic performance (e.g., GNP or GDP) towards other ways of measuring a society's performance and quality of life.

DEVELOPED AND DEVELOPING REGIONS

The world today is divided into developed and developing regions on the basis of some common features shared by them. The former is represented by countries such as USA and UK, and the latter by countries such as India. If one defined development as the organization of society to provide adequate housing, food, health services, education and employment for the majority of people, then many developing countries are wide of the mark. Social medicine is concerned with disparities that exist among countries. This is because socio-economic factors and health problems are interlinked. An account of these disparities is given below:

1. Social and economic characteristics

Most people in the developing countries live in rural areas and urban slums. There is a rigid hierarchy and class structure moulded by tradition and long-standing customs. The family, often a joint family, is a strong binding force. People depend mainly on agriculture and there is a lack of alternative employment opportunities. The GNP *per capita* ranges from US $ 200 to 6000 in most developing countries. The production and consumption per capita are low. They have an economic potential which is not fully realized; this refers to unemployed labour, natural resources and fertility of the soil. Science and technology are not fully applied. The level of literacy is low – it averages only 57 per cent in the least developed countries. The quality of life is poor because of the scarcity of essential goods, facilities and money. There is isolation caused by distance, poor communications and transport facilities. The environment is unfavourable predisposing to communicable diseases and malnutrition. The vast majority of people are not able to pay for medical services. There is a long tradition of free medical services provided by the State.

In the developed countries, most people (8 out of 10) are urban residents. Urban life differs from that in the villages by being more impersonal. Women are economically employed. Agriculture is second to industry. Great use is made of scientific disciplines. The standard of living and quality of life are high. The GNP per capita ranges from US $ 5000 to 40,600 in most developed countries. The adult literacy is almost universal.

2. Demographic characteristics

Population growth and changes have always been a central issue in community medicine. These changes have an impact on economic and social conditions and therefore on health and health care needs. The population of the world was 6.856 billion in the year 2010. About 93 per cent of the world population lives in developing countries.

The annual global rate of population growth is estimated to be 1.3 per cent. The advanced countries are failing to reproduce themselves, with growth rates less than 0.6 per cent, and some have already achieved zero population growth rate (e.g., Austria, Belgium, Federal Republic of Germany and the UK). The rest of the world continues to reproduce at a prodigious rate. Rates over 2.4 per cent have occurred in some African (e.g., Nigeria, Zambia, Congo) and Middle East (e.g., UAE, Libya, Saudi Arabia, Iraq) countries. In India, the current growth rate is about 1.76 per cent. These countries are now facing the population problem.

The population in developing countries is a "young" population; the proportion of persons under 15 years of age in the year 2010 was about 39 per cent in the least developed countries and 22 in other developing countries, compared to about 17 per cent in developed countries. The proportion of people over 60 years of age in developing countries is about 6 per cent, compared to 21 per cent in the developed countries. The social and economic backlashes of this age distribution are being felt in both the developing and developed countries – the former having to bear the heavy burden of providing for a population which is mainly young; and the latter having to deal with the problems of ageing.