

## **Health Geography**



# Health Geography

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**Chandralok Prakashan**  
KANPUR-208 021 (INDIA)

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First Published : 2022

ISBN : 978-93-93561-16-9

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*Published by*

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**PRINTED IN INDIA**

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Printed at Deepak Offset Press, Delhi.

# Preface

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Health geography is the application of geographical information, perspectives, and methods to the study of health, disease, and health care. Medical geography, a sub-discipline of or sister field of health geography, focuses on understanding spatial patterns of health and disease as related to the natural and social environment.

Health geography is a subdiscipline of human geography, which deals with the interaction between people and the environment. Health geography views health from a holistic perspective encompassing society and space, and it conceptualizes the role of place, location and geography in health, well-being and disease. Although health geography is closely aligned with epidemiology, its distinct primary emphasis is on spatial relations and patterns. Whereas epidemiology is predicated on the biomedical model and focuses on the biology of disease, health geography seeks to explore the social, cultural and political contexts for health within a framework of spatial organization.

Multiple public and private organizations function to improve the health and well-being of the general public. Some of these bodies function independently, others collaboratively, but all are dedicated to building and maintaining an environment that supports a healthy population. These groups may be more broadly generalized into two categories that guide various regulatory and care-oriented organizations: health promotion and health protection. While the two may sound similar, each has its own unique approach to managing the health of the larger population.

Environmental health involves evaluating and examining the effects of man-made chemicals on human health or wildlife, impacts on ecological systems and spread of illnesses or diseases. Insulation

of environmental and human health systems entails grasping the effects of human-made and environmental vulnerabilities or hazards. Increasing attention targeted on the impact of environmental health extends to public healthcare and the health of the global economy. Addressing and encompassing assessment and control of all external agents of chemical, biological or physical origin and other related factors with behavioural impact that potentially affect health is essential. The target remains on creating health-supportive environment and disease prevention programs which excludes genetic behaviour, social and cultural environment.

The challenge of low quality in health care is not unique to India. Studies from a range of developed and developing countries have demonstrated widespread problems with providers who make little effort to ensure that patients receive high-quality care, geographic variations in the quality of health care services, and high levels of medical errors.

This book is the application of geographical information, perspectives, and methods to the study of health, disease, and health care. It explores the patterns, causes, and spread of disease, environmental hazards, environmental mediators of health behaviors, and the planning and provision of health services.

—*Dr. Udhav Eknath Chavan*

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# Introduction to Health Geography

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## THE DEFINITION OF HEALTH GEOGRAPHY

Health geography (or the geography of health) effectively emerged in the 1980s as a terminology describing the encounter between geography and death, disease, and related aspects of service provision. It has since coexisted with the longer-established field of medical geography with which it shares concerns about spatial variations in its subject matter and the nature of the relationship between health and place.

In practice there is often little to distinguish work in health geography from that in medical geography and it sometimes seems that the choice of nomenclature is a matter of semantic preference or academic tribal loyalty rather than any substantive ontological difference.

Health geography is a subdiscipline of human geography, which deals with the interaction between people and the environment. Health geography views health from a holistic perspective encompassing society and space, and it conceptualizes the role of place, location and geography in health, well-being and disease. Although health geography is closely aligned with epidemiology, its distinct primary emphasis is on spatial relations and patterns. Whereas epidemiology is predicated on the biomedical model and focuses on the biology of disease, health

geography seeks to explore the social, cultural and political contexts for health within a framework of spatial organization. Traditionally, research in health geography spans 2 distinct avenues: the patterns, causes and spread of disease, and the planning and provision of health services. Research in these interlinked areas supports policy development. For example, disease epidemiology is in part related to the geography of health service provision.

### **History**

The relationship between space and health dates back to Hippocrates, who stated that “airs, waters, places” all played significant roles impacting human health and history. A classic piece of research in health geography was done in 1854 as a cholera outbreak gripped a neighborhood in London. Death tolls rang around the clock and the people feared that they were being infected by vapors coming from the ground.

John Snow predicted that if he could locate the source of the disease, it could be contained. He drew maps demonstrating the homes of people who had died of cholera and the locations of water pumps. He found that one pump, the public pump on Broad Street, was central to most of the victims. He concluded that infected water from the pump was the culprit. He instructed the authorities to remove the handle to the pump, making it unusable. As a result, the number of new cholera cases decreased.

### **Areas of study**

Health geography is considered to be divided into two distinct elements. The first of which is focused on geographies of disease and ill health, involving descriptive research quantifying disease frequencies and distributions, and analytic research concerned with finding what characteristics make an individual or population susceptible to disease.

This requires an understanding of epidemiology. The second component of health geography is the geography of health care, primarily facility location, accessibility, and utilization. This requires the use of spatial analysis and often borrows from behavioral economics.

**Geographies of disease and ill health**

Health geographers are concerned with the prevalence of different diseases along a range of spatial scales from a local to global view, and inspect the natural world, in all of its complexity, for correlations between diseases and locations. This situates health geography alongside other geographical sub-disciplines that trace human-environment relations. Health geographers use modern spatial analysis tools to map the dispersion of various diseases, as individuals spread them amongst themselves, and across wider spaces as they migrate. Health geographers also consider all types of spaces as presenting health risks, from natural disasters, to interpersonal violence, stress, and other potential dangers.

**TRENDS IN HEALTH GEOGRAPHY**

The focuses of the studies of medical geography include: the impact of human development and socio-economic activities on health, spatial relationships between healthcare services, effects of healthcare behavior on the health conditions, the impacts of neighborhood environment, especially socio-economic conditions, health and healthcare equity issues, especially medical services and healthcare for the groups with special needs.

**INDICATORS OF HEALTH**

Health can be measured through a number of different indicators. The IB Geography specification refers specifically to the need to evaluate life expectancy, infant mortality rate (IMR) and child mortality, Health-Adjusted Life Expectancy (HALE), calorie intake, access to safe water and access to health services.

**Average Life Expectancy**

Average life expectancy is a good indicator of health as it informs us generally at the national scale the length of life a person can expect to live. Of course this is impacted by extreme events in some places such as conflict but generally natural disasters and conflict are not significant enough to have any significant impact on life expectancy. Therefore life expectancy is a strong indicator of health and health services in a country. It is useful to use average

life expectancy to compare places at the national scale. However it isn't always representative of different regions or groups within a country. When used to compare countries average life expectancy hides variations that may exist within different socio-economic groups and spatial variations such as rural and urban or based on Political Geography. However, in countries where data is more readily available (and that's most) average life expectancy can be presented to compare different political regions.

### **THE DEVELOPMENT OF THE DISCIPLINE IN INDIA AND OUR MOST IMPORTANT REPRESENTATIVES**

Medical geography uses the concepts and paradigms of the discipline of geography to investigate human–environmental relationships of disease, nutrition, and medical care systems, of which maps and geographic information science (GIScience) are arguably most prominent today. Therefore, site, situation, place, location, region, and all spatial concepts may be compared to the distribution and dispersion of most diseases, nutrition as a factor in sickness and health, and the supply and demand for healthcare resources. One of the predominant concepts of geography as a science is that it examines relationships between peoples and their environments in holistic terms. In the particular subfield of medical geography, the focus is upon those interactions that bear mainly, but not exclusively, upon human health within a variety of cultural systems and a diverse biosphere.

### **Linking the human and physical worlds**

There has also been an increasing stream of work on the interactions between human societies and physical environments—long a central concern for some geographers, as illustrated by Clarence Glacken's magisterial treatment of Western interpretations of nature in *Traces on the Rhodian Shore: Nature and Culture in Western Thought from Ancient Times to the End of the Eighteenth Century* (1967). Human abuse and despoliation of the environment are important themes introduced in their modern context by a pioneering American conservationist, George Perkins Marsh, in *Man and Nature* (1864), but they were minor concerns among most

geographers until the late 20th century. One significant example of work on the interaction of human society and nature was stimulated by Gilbert White, a geography graduate of the University of Chicago. White returned to Chicago in the 1950s to lead a major research program on floodplains and their management, assessing people's views of the risks of floodplain use and evaluating the influence of flood insurance on their actions. From that foundation, White and his coworkers pioneered research into a wide range of environmental hazards and risk taking and the development of sustainable environmental management strategies, and they were also involved in government and international agency programs.

### **Emergence of Modern Geography**

Some people have trouble understanding the complete scope of the discipline of geography because, unlike most other disciplines, geography is not defined by one particular topic. Instead, geography is concerned with many different topics—people, culture, politics, settlements, plants, landforms, and much more.

What distinguishes geography is that it approaches the study of diverse topics in a particular way (that is, from a particular perspective). Geography asks spatial questions—how and why things are distributed or arranged in particular ways on Earth's surface. It looks at these different distributions and arrangements at many different scales. It also asks questions about how the interaction of different human and natural activities on Earth's surface shape the characteristics of the world in which we live.

Geography seeks to understand where things are found and why they are present in those places; how things that are located in the same or distant places influence one another over time; and why places and the people who live in them develop and change in particular ways. Raising these questions is at the heart of the "geographic perspective."

Exploration has long been an important part of geography. But exploration no longer simply means going to places that have not been visited before. It means documenting and trying to explain

the variations that exist across the surface of Earth, as well as figuring out what those variations mean for the future.

The age-old practice of mapping still plays an important role in this type of exploration, but exploration can also be done by using images from satellites or gathering information from interviews. Discoveries can come by using computers to map and analyze the relationship among things in geographic space, or from piecing together the multiple forces, near and far, that shape the way individual places develop.

Applying a geographic perspective demonstrates geography's concern not just with where things are, but with "the why of where"—a short, but useful definition of geography's central focus.

The insights that have come from geographic research show the importance of asking "the why of where" questions. Geographic studies comparing physical characteristics of continents on either side of the Atlantic Ocean, for instance, gave rise to the idea that Earth's surface is comprised of large, slowly moving plates—plate tectonics.

Studies of the geographic distribution of human settlements have shown how economic forces and modes of transport influence the location of towns and cities. For example, geographic analysis has pointed to the role of the U.S. Interstate Highway System and the rapid growth of car ownership in creating a boom in U.S. suburban growth after World War II. The geographic perspective helped show where Americans were moving, why they were moving there, and how their new living places affected their lives, their relationships with others, and their interactions with the environment.

Geographic analyses of the spread of diseases have pointed to the conditions that allow particular diseases to develop and spread. Dr. John Snow's cholera map stands out as a classic example. When cholera broke out in London, England, in 1854, Snow represented the deaths per household on a street map. Using the map, he was able to trace the source of the outbreak to a water pump on the corner of Broad Street and Cambridge Street. The geographic perspective helped identify the source of the problem

(the water from a specific pump) and allowed people to avoid the disease (avoiding water from that pump).

Investigations of the geographic impact of human activities have advanced understanding of the role of humans in transforming the surface of Earth, exposing the spatial extent of threats such as water pollution by manmade waste. For example, geographic study has shown that a large mass of tiny pieces of plastic currently floating in the Pacific Ocean is approximately the size of Texas. Satellite images and other geographic technology identified the so-called "Great Pacific Garbage Patch."

These examples of different uses of the geographic perspective help explain why geographic study and research is important as we confront many 21st century challenges, including environmental pollution, poverty, hunger, and ethnic or political conflict.

Because the study of geography is so broad, the discipline is typically divided into specialties. At the broadest level, geography is divided into physical geography, human geography, geographic techniques, and regional geography.

## **HEALTH GEOGRAPHY AND ENVIRONMENTAL AWARENESS**

Environment is fundamental for all living things. This is because of every resource necessary for them is interrelated to the environment. Unless the environment is protected, the existence of life on the planet Earth would eventually be impossible. That is why environmental issues have become so sensitive and globally important. According to Dalelo (2007:8) all people need to have a common understanding of the role played by human beings in reducing or worsens environmental deterioration.

The theoretical foundation of this study, which comes from different schools of thought, informs about the role of media regarding awareness of environmental issues, the factors promoting rapid environmental change as well as the scale of human interference in changing the physical landscape of the earth. After a discussion of the theoretical aspects and the reasons why there is a need to promote environmental awareness, this study focused

on people's awareness of environmental challenges and how they protect the environment.

Geographers argue that environmental issues today have drawn the attention of the common people as environmental degradation and pollution have assumed global dimensions and even threatening the very existence and survival of mankind (Singh 2000:3). Due to this, environmental problems and the consequences of human activities such as economic development, population growth, and land degradation, among others were given an increasingly political character.

Environmental issues have global aspects which require action at global level. Serious environmental problems result from developments taking place in developed as well as developing countries. Most advanced countries attained their prosperity at the cost of the environment. These countries concerted efforts of pursuing sustainable socio-economic development through the protection of the environment are integrated at local, regional and international levels. According to Hewitt (1990:277), discussion about global warming, deforestation, and pollution of the oceans is affecting attitudes related to economic growth and development at local, national, and international levels. Though taking effective political action to deal with these problems is as such not simple.

The concept of environmental awareness is explained as familiarity with an environmental subject with real understanding of its deeper cause and implications (UNEP 1992). This demonstrates that environmental awareness has a great effect on environmental stewardship attitudes and it has an effect on environmentally friendly behaviours. The main advantage of widespread environmental awareness is its contributions to public support for government action in environmental policy and management. The main tool for creating such awareness at macro level is by far, the media.

The role of the media to raise the community concerns and commitment for social and environmental issue is a very critical one. Awareness creation for the protection of the environment and the sustainable use of finite resources are matters that directly



concern each citizen. The media can be an instrument in breaking the silence that surrounds the environmental problems and in creating an environment that encourages discussions of how the community can participate and change their behaviour. It is truly crucial to raise public awareness of environmental issues.

### **Environment and health**

A clean environment is essential for human health and well-being. At the same time, the local environment can also be a source of stressors - for example air pollution, noise, hazardous chemicals - that negatively affect health. The health of the EU population is also adversely affected by climate change, through heatwaves, floods and changes in the distribution of vector-borne diseases. At a broader level, climate change, loss of biodiversity, and land degradation can also impact on human well-being by threatening the delivery of ecosystem services, such as access to freshwater and food production.

Human health and well-being are intimately linked to the state of the environment. Good quality natural environments provide basic needs, in terms of clean air and water, fertile land for food production, and energy and material inputs for production. Green infrastructure also serves to regulate climate and prevent flooding. Access to green and blue spaces also provides important opportunities for recreation and supports well-being.

At the same time, the environment represents an important pathway for human exposure to polluted air, noise and hazardous chemicals. In their report on preventing disease through healthy environments, the World Health Organization (WHO) estimates that environmental stressors are responsible for 12–18 % of all deaths in the 53 countries of the WHO Europe Region. Improving the quality of the environment in key areas such as air, water and noise can prevent disease and improve human health.

Air pollution is the single largest environmental health risk in Europe, and is associated with heart disease, stroke, lung disease and lung cancer. Exposure to air pollution is estimated to result in over 400 000 premature deaths in the EU each year. Noise

exposure from transport sources and industry can lead to annoyance, sleep disturbance and related increases in the risk of hypertension and cardiovascular disease.

Exposure to hazardous chemicals is also a key concern. People can be exposed to a wide range of chemicals in their daily lives, via polluted air and water, consumer products and diet. The properties of certain hazardous chemicals cause them to persist in the environment and bioaccumulate in the food chain, which means there will be a considerable time lag before reductions in emissions translate into reduced exposure.

In addition, the volume and range of chemicals in use today and the ongoing growth in chemical production suggests that human and environmental exposure will continue to increase. This raises concerns about the health effects of exposure to mixtures of chemicals over our lifetime, in particular during vulnerable life stages, such as early childhood, pregnancy and old age.

The impacts of climate change also pose immediate threats to health, in terms of heat waves and shifts in the patterns of infectious diseases and allergens.

In general, bathing water quality is of a high standard across the EU, with the quality of bathing waters consistently improving over time as a result of investment in the sewerage system, better waste water treatment and the reduction of pollution from farms.

A growing body of evidence suggests that environmental risks are not evenly distributed across society, but rather disproportionally affect socially disadvantaged and vulnerable population groups.

An individual's socioeconomic status influences their exposure to environmental stressors, since poorer people are more likely to live in degraded environments. Socially disadvantaged people may be more sensitive to the impacts of environmental stressors due to pre-existing health conditions, poor nutritional status and specific behaviours, such as smoking or inactivity. They may also face constraints in adapting to and avoiding environmental risks.

***Policies***

Recognising the intrinsic link between the state of the environment and quality of life, priority objective 3 of the Seventh Environment Action Programme (7th EAP) aims 'to safeguard the Union's citizens from environment-related pressures and risks to health and well-being' (EU, 2013). The profound dependency of human society on supporting ecosystems lies at the very core of the 7th EAP vision that 'in 2050 we live well, within the planet's ecological limits'.

A broad range of policies are in place at EU level to address environmental impacts on health. Some examples from the main environmental policy areas include:

- The Clean Air Policy Package for Europe;
- The EU climate change adaptation strategy;
- The Environmental Noise Directive; and
- The Regulation concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

The European Environment and Health Process, led by WHO Europe, aims to bring together the environment and health sectors, and promote joint solutions, in particular to address the environment-related health goals and targets of the 2030 Sustainable Development Agenda.

In the Ostrava Declaration of 2017, ministers and representatives of countries in the WHO European Region set out an intersectoral and inclusive approach towards improving environmental health.

***EEA activities on environment and health***

The EEA is working with partners at national and international level to build the knowledge base on the linkages between the environment, health and well-being. This includes work to explore how the environment contributes to human well-being, as well as work on exposure to and the health impacts of specific environmental stressors including air pollution, noise, chemicals and climate change. Ultimately, health outcomes result from the

combination of exposures to environmental stressors over time, implying that assessments of environmental health should take an integrated approach.

The EEA is also developing a new line of work to explore how social and demographic factors influence the relationship between the environment and health. This includes assessing how an individual's social status and age can affect both their exposure to environmental stressors and the resulting impacts on health.

Well-known environmental stressors that affect human health are subject to regulatory control in Europe, with efforts underway to reduce exposure. However, there are also emerging issues for which environmental pathways and effects on health remain poorly understood. These include issues such as anti-microbial resistance, or changes in human exposure to chemicals in products as we shift towards a circular economy and increase recycling. The EEA engages with international networks of experts to identify emerging environmental risks, including the European Commission, the WHO and the European Food Safety Authority.

In terms of thematic work, the EEA delivers a range of assessments and indicators on air pollution, noise, chemicals and climate change adaption.

The EEA is a partner in the HBM4EU initiative. The main aim of the initiative is to coordinate and advance human biomonitoring in Europe. HBM4EU will provide better evidence of the actual exposure of citizens to chemicals and the possible health effects to support policy making.

The EEA also contributes to the European Commission's Information Platform for Chemical Monitoring (IPCHEM), which documents occurrence of chemicals and chemical mixtures, in relation to humans and the environment.

## Health Geography: Terms and Definitions

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### BASIC DEFINITIONS AND TERMS

An important “new” area of health research that is a hybrid between geography and medicine dealing with the geographic aspects of health and healthcare. Medical geography studies the effects of locale and climate upon health. It aims to improve the understanding of the various factors which affect the health of populations and hence individuals. It is also called health geographics.

The idea that place and location may influence health is not exactly new. It is an old idea and a fertile one. Since Hippocrates (circa 3rd century BC), it has been known that certain diseases such as malaria occur in some places and not others (and for good reason). Malaria is not a disease of mountain tops. It lurks in lowlands where mosquitos breed and sting, to convey the parasitic agent of the disease — plasmodium.

A classic piece of research in medical geography was in done in 1854 as cholera gripped London. Death tolls rang around the clock from church towers. People feared they were being infected by vapors coming from the ground. A physician by the name of John Snow thought that, if he could locate the source of the disease, it could be contained. He drew maps showing the homes of people who had died of cholera and the locations of water

pumps. He found that one pump, the public pump on Broad Street, was central to most of the victims. He figured that infected water from the pump was the culprit. He instructed the authorities to remove the handle to the pump, making it unusable. The number of new cholera cases plummeted. The Broad Street pump was the source of cholera.

In the early 20th century a couple of dentists in Colorado noticed that children living in areas with high levels of naturally-occurring fluoride in groundwater had fewer dental caries. Their discovery of the value of fluoride came from the application of medical geography (which, since this is dental geography, might be better called health geography).

Medical geography and medicine are disciplines that are closely related. Medical geography is concerned with population health issues and spatial variation in the causes, distribution, prevention and treatment of diseases. While other health professions are particularly about the health challenge to improve the development and longevity of human life. Medical geography is interested in all of those but relating the situations with spatial processes.

Health and diseases issues in medical geography could affect both plants and animals as points of deliberation; however, the primary interest is the human population. In the event where the spread of an epidemic or diseases affect the sources of human livelihood with consequential transmission of certain diseases that affect man; it is nevertheless studied therefore formed from other disciplines between geography and medicine.

### **Medical Geography Definition**

Medical geography is a branch of geography that helps us understand the problems of diseases in the environment, the spread of diseases, the sources of diseases, the causes and area of diseases spread and how these diseases relate to the environment. Medical geography is also interested in the factors and origin of these diseases since geography is essentially interested in spatial interaction is also called health geography. Medical geography is also interested in man and his environment and the concept why

man and his environment as the matter of life and death. Medical geography is interested in diseases in terms of environmental factors that help in the spread of these diseases from one geographical region to another.

***Who is a Medical Geographer?***

A medical geographer is someone who is interested in the problems of human adjustment to the environment, he is equally interested in the evolution of the physical economic, the human elements of the geographical environment that affects-

- The distribution of spatial and seasonal incidences of epidemic and endemic
- The morbidity (spread of diseases) and the mortality of the host (man) and his specific natural environment

**Scope of Medical Geography**

Medical geography is an area of medical research that incorporates geographical techniques to explain health and diseases. The discipline also studies the impacts of climate on health and situation. It provides an understanding of health problems and improves the health of the people based on geographic factors. For instance, certain diseases situation are peculiar with certain geographical locations e.g the rain forest environment which is swampy will have diseases type that are not found in the savannah environment. Water logged areas are prone to malaria as opposed to high land or relatively dry areas that consumes water. For instance, research has shown that consumers of water with high chloride content have few cavities compared to children who do not grow in such areas.

Another area of medical geography is the general condition of the optimum development of man on the earth surface as a basis for general conditions of diseases coverage. One important person in medical geography J. M May (1950) who described medical geography as a geography of disease which is concerned essentially with the investigation of the relationship between the diseases and environmental factors.

### **History of Medical Geography**

The history of medical geography began since the time of the Greek doctor, Hippocrates (5th-4th centuries BCE), during this period, people began to study the effect of location on human health. For instance, early medicine studied the differences in diseases experienced by people living at high versus low elevation. It was easily understood that those living in lowlands areas near waterways would be more prone to malaria than those at higher elevations or in drier areas which have low humidity. Though the reasons for these variations were not fully understood at the time, the study of this spatial distribution of disease is the beginnings of medical geography.

This field of geography did not gain recognition not until the mid-1800s though when cholera gripped London. As high number of people became ill, they believed they were becoming infected by vapours escaping the ground. A physician in London by the name of John Snow thought that, if he could locate the source of the toxins infecting the population they and cholera could be contained.

As part of his study, Snow drew maps showing the homes of people who had died of cholera and the locations of water pumps throughout London. After examining these locations, he found a cluster of unusually high deaths near a water pump on Broad Street. He then concluded that the water coming from this pump was the reason people were becoming sick and he seek for permission from the authorities to remove the handle of the pump as to stop people from drinking the same water. After he removed the handle of the pump, the number of cholera deaths dramatically reduced.

Snows use of mapping to find the source of disease is the earliest and most famous example of medical geography. Since after he conducted his research, geographic techniques have found their place in a number of other medical applications.

### ***Areas of Medical Geography***

- Geography of health



- Geography of hunger
- Geography of death

Some other studies are interested in incidences of spread of other diseases such as incidence of malaria, cholera, environmental sanitation, natural hazard (drought, and famine), and distribution of medical facilities etc.

### **Importance of Medical Geography**

We may identify the need for medical geography in a community with low standard of living where the environment dominantly influences the behaviour of people or where the environment favours the spread of diseases type for example in Niger Delta , they have the spread of spillage which has led to the pollution of the environment. This also has taken parts of agricultural farmland that would have been used for farming activities and furthermore, it has led to the destruction of aquatic animals and plants. These are the reasons why we are interested in medical geography.

### ***Ecology and Diseases***

Empirical evidence has shown the close association between environmental condition and various kinds of diseases for example, our mapping techniques have tried to show the nature of these association, while our behavioural approach has tried to identify the causal correlation between the environment (physical environment) that comes into play in the ecology of diseases.

### **DEMOGRAPHIC INDICATORS RELEVANT TO HEALTH GEOGRAPHY**

Geographical inequalities have become a major issue which guides policy development in Europe. The inhomogeneity of the environment on the territory, does not guarantee an equal access to an environment of quality. In the same way, unequal distribution of people's exposure to – and potentially of disease resulting from – environmental conditions constitutes an important public health concern in Europe.

Reducing health inequalities involves the characterization and the identification of how factors accumulate and interact in an area. Certain socioeconomic groups bear a disproportionate burden of environmental externalities, and vulnerable to the health effects resulting from this exposition. Previous studies have demonstrated that population with a low socioeconomic status tends to be more highly exposed to air pollutants and toxicants, due especially to their residential proximity to pollution sources (e.g. high-traffic roads, industrial facilities and waste disposal sites). Conversely, few have considered to wholesome environments may be related to urban socioeconomic inequalities and have shown that access to green spaces may have a beneficial effect on health.

Infant and neonatal mortality are highly sensitive measures which reflect economic development, general living conditions, social well-being and rates of illness of whole populations. Moreover, they are recognized by the World Health Organization (WHO) as indicators of the health status of a population and of the effectiveness of the health care system. Skilled assistance at delivery and access to emergency obstetric care are the most effective interventions to prevent these early and intra-partum related deaths. This requires both the availability of such services as well as the will and the possibility for pregnant women to seek this care at delivery. Recent research has considered that accessibility to health care facilities is known to influence health services usage but the quality of life depends on the adequacy of their position in the territory. Most of these neonatal deaths occur during the first day of life and complications related to delivery care make up a large proportion of the overall neonatal mortality. Contextual factors, such as social and environmental exposures, are well-documented to be associated with adverse birth outcomes. Children's exposure to air pollution is therefore of primary concern, especially in reference to the life course approach which state that health problems during childhood have repercussions on health at later stages of life. They are particularly sensitive to environmental factors such as teratogens agents, and early exposure to environmental factors can lead to diseases or subsequent severe functional deficits.

Previous studies demonstrated that the adequate location of healthcare facilities deserve careful and detailed future analysis. Geographical factors such as distance between home and healthcare facilities are part of the first and the second delay and suggested an influence on the choice of delivery place as well as being related to neonatal mortality risks. Some studies demonstrated that the usage of health services decreases with increasing distance between health facilities and families' homes. This also holds true in the case of accidental out-of-hospital births. In France, distance to the closest maternity unit was found to aggravate the risks of out-of-hospital birth.

Several factors hinder access to the health care services needed to avert maternal and newborn deaths and morbidity. These include perception of the mothers as cultural norms, attention to the needs of women in planning and delivering health services, previous experiences in the hospital, and individual factors or health behaviors of the mother as maternal age (teenage mothers and mothers aged 40 and over), multiple births, smoking habits, obesity, that could affect health outcomes.

Moreover, the health status of a given population is a result of complex interactions between the social and physical characteristics of their areas of residence (e.g. neighborhood socioeconomic status), environmental exposure factors and those that relate to the characteristics of the health care system and care practices. To our knowledge, no previous studies explored such a large variety of field to characterize neighborhood areas.

At the small area level, we view to identify the census blocks which cumulate environmental inequalities where public authorities should design relevant preventive actions in priority. In our context, we aim to identify through geographic indicators of healthcare, environment and socioeconomic factors, local territorial inequalities. The two majors objectives were : i) Identification and characterization of socioeconomic, health accessibility and exposure factors in order to explain how they accumulate and interact in an area. ii) Investigation the role of these three fields on environmental health inequalities related to infant and neonatal mortality.

### **Attributes To Consider In Selecting Secondary Data Sources**

If the secondary sources of the data required to develop the indicators to be monitored, the characteristics of the data must be taken into consideration prior to their selection. The relevant attributes for selecting secondary data sources to generate population-based health indicators are described below. However, these attributes can and should be evaluated in the context of the purpose for which the data will be used. In addition, the selection of secondary source data should also consider the advantages and disadvantages outlined in section 3.1. The attributes are:

- **POPULATION REPRESENTATIVENESS:** Representativeness is an attribute that involves the absence of selection bias with respect to the population that the indicator is intended to represent. Non-representative samples (such as convenience samples or samples based on sentinel units), samples with high rates of non-response, or samples that reflect underreporting in information systems, are examples of factors that can compromise the representativeness of a data source. For example, a country's live birth information system is a universal system, because it is supposed to include all children born alive in all types of facilities or birthing sites. However, it is known that births in conditions of greater vulnerability (poorer regions, rural areas, areas with lack of housing, indigenous ethnicity, among other factors) might not be reported to the system. In such a case, there is a bias in the representativeness of those population groups. Similarly, research on victims of violence based on sentinel unit samples (reference health services serving such victims), might not be representative of the population. One reason is that this type of sampling systematically excludes victims with less severe injuries or with fatal injuries but were not treated in a health facility.
- **PERIODICITY:** Data can be compiled continuously in systems such as civil registries, cancer registries, and surveillance systems for reportable diseases. Data can also

be compiled periodically, which is to say at regular intervals (for example, 10-year population census, triennial survey of schoolchildren), or without predefined periodicity; and at a particular point in time (for example, health surveys on specific subjects, academic research projects, etc.). Although specific health-related studies are recognized as useful sources of important information for developing specific indicators, their usefulness for monitoring long-term indicators is limited. Nevertheless, a combination of various specific research studies can serve to indicate trends, even if the studies do not provide for ideal methodological comparability. One example is research on the prevalence of smoking conducted with different methodologies and target populations. Such research can, nevertheless, provide the general direction of a trend, with the caveat that the relevant limitations must be taken into account.

- **VALIDITY:** This refers to the ability of the source to measure what is intended to be measured (absence of distortions, bias, or systematic errors). The most relevant biases are those related to selection of the study population and the quality of the information compiled. The data source should include the variables needed to develop the indicator. An example is a live birth information system that includes data on congenital malformations (including microcephaly). In general, observations at birth without supplementary examination and monitoring of the children tend to underestimate the prevalence of congenital malformation. Although the system may be quite valid as a database for a series of other indicators, it is not valid to estimate the prevalence of congenital malformations in children.
- **TIMELINESS:** The timeliness of the source involves the availability and reliability of the data at the time it is needed to construct the indicators. Thus, timely produced indicators provide better opportunities for making health-related decisions.

- **STRATIFICATION:** Many health-related problems require indicators that are stratified according to population subgroups or by areas of particular interest. Multiple analytical interpretations can be derived from the level of disaggregation available in the selected data source. These considerations can significantly expand or limit the use of the indicator for decision-making.
- **SUSTAINABILITY:** This attribute represents the source's potential to remain relevant and be of the quality needed to generate information over time. This depends not only on the periodicity of the data collection, but on the availability of the financial resources needed to sustain that particular source of data; the presence of a legal framework; political will, among other factors. Surveys conducted by telephone tend to be more sustainable because they require fewer resources. However, telephone surveys have limitations not found in surveys based on personal interviews and biometrical measurements.
- **PRECISION:** Some well-designed probabilistic samples that ensure representativeness have some degree of imprecision—a factor to be considered in any sample-based indicator. Imprecision may arise, for example, when calculating confidence intervals that inform the user (usually with 95% confidence) of the plausible value of an indicator as applied to the population from which the sample was taken. Indicators developed from census sources, such as, population censuses, universal data sources, and vital statistics information systems, etc., are free of imprecision.
- **ACCESS TO DATA:** This refers to ensuring the availability of data to the public through national data repositories and other means.

### ***Main Data Sources***

The main data sources include demographic censuses, vital statistics information systems, disease reporting systems, cancer registries, population-based research, and other sample-based research—which may be local (subnational) and/or periodic

(regular)—and the various information systems created by the health and other sectors for administrative purposes.

Below is a description of the most frequently used data sources for the development of health indicators:

### ***Demographic Censuses***

In most countries, the demographic census is the most commonly used data source on the characteristics of a population. A census is of paramount importance for preparing indicators and planning health interventions. Other demographic data sources are household censuses, civil registries, and national estimates for variables of interest. Demographic data are necessary for calculating many health-related indicators.

The data in a national census include: (a) total population, by sex, age, and ethnic origin; (b) increase in population; (c) rural and urban distribution of the population; and (d) dependency ratio. In addition, demographic censuses become secondary data sources when used to establish the denominators of many health indicators (rates, proportions, ratios): mortality; incidence and prevalence of diseases, accidents and violent acts; prevalence of risk factors for accidents and violence, as well as sequelae of these events; and ratio of hospital beds to population.

The growing need for information has made censuses an essential tool for countries' information systems. They serve a political, administrative, technical, and scientific purpose. Such data are compiled for the entire population, through personal interviews. In most countries, censuses represent periodic data that are collected every ten years, with publication of the information they yield approximately two years later.

*The strengths of censuses are: (1) a high degree of representativeness since they are a complete (or nearly complete) record of the total population in the country; (2) periodicity—even though the frequency of the data collection is every ten years, the time-sensitive information is useful, especially as a point of reference; (3) high sustainability since the census is the task of a governmental agency that guarantees the necessary resources and legal framework; (4) knowledge of the distribution of the*

*population, based on major characteristics; and (5) inclusion of health-related questions.*

One limitation in the use of census data is the possibility of inaccuracies in population estimates for the inter-censal years. These estimates tend to lose accuracy the further they are from the year of the census. In addition, the calculations are subject to changes as new demographic information is generated. There are various methods for making these estimates, each based on its own assumptions, but all include the basic demographic factors of fertility, mortality, and migration.

With major changes in the factors affecting a country's demographic structure, existing methodologies can become problematic, particularly with respect to population projections. There is the difficulty, for example, of making adequate population projections based on the 10-year demographic censuses given the steep decline in fertility rates that occurred between 1980 and 2010. Population migrations resulting from conflicts or economic factors can also affect population projections. In addition, these factors can affect estimates of health indicators since population data from demographic censuses and the corresponding projections are used as the denominator. For these reasons, if indicators are to be monitored over time, they should be recalculated retrospectively as new population projections are made.

### ***Health Information Systems***

National health information systems provide data for health-related events; these systems also provide some census-related data. National health information systems can have sub-systems that address specific health events to include mortality, births, notifiable diseases, cancer and other disease registries.

- Mortality information systems: All of the countries in the Region of the Americas are required to report all deaths. In some countries, this requires the completion a form known as the "declaration of death," followed by registration of the event in the civil registry system where a death certificate (a legal document), is issued. WHO has



established an international form of medical certificate of cause of death. It contains a minimum set of variables that should be included in a death certificate. These include the underlying, intermediate, and immediate causes of death. Most countries use the International Classification of Diseases (ICD) to code the causes of death. This permits comparisons between countries and at different points in time. In some countries, especially in remote areas, the reporting of deaths is incomplete, thereby compromising the representativeness of mortality statistics. The proportion of under-reporting of deaths and the proportion of deaths due to ill-defined causes are indicators of the quality of mortality statistics.

- Birth registration systems: These are a source for census data and for the collection of vital statistics. In all of the countries in the Region of the Americas, it is compulsory for every live birth to be reported. In most of these countries, births occur in health facilities where a form known as the “declaration of live birth,” is issued. Subsequently, the birth must be recorded in the civil registry where a birth certificate, a legal document, is issued. Declarations of births generate data for formulating indicators that are highly useful in monitoring maternal and child health during the prenatal, delivery, and perinatal periods, while also providing information on a population’s fertility profile. Standardizing definitions, forms, and variables of interest facilitate comparisons between countries and over time. The main limitation in working with birth indicators is the fact that coverage may be incomplete, particularly in remote areas within certain countries thereby compromising the representativeness of the resulting statistics. The proportion of unregistered births and of incomplete information on important variables are indicators of the quality of birth registration.

*These two systems are sources of data to develop indicators. Information systems that include vital statistics, especially on mortality and births, have many strengths to include: (1) a high level of sustainability*

*since all countries have legislation mandating the collection of vital statistics; (2) continuous periodicity as data are prepared continually, as occurrences are recorded; and (3) a high level of representativeness in nearly all of the Region (with specific problems in some areas, due to underreporting).*

- Public health surveillance systems: According to WHO, “public health surveillance is the continuous, systematic collection, analysis, and interpretation of health-related data needed for the planning, implementation, and evaluation of public health practice.”. These systems are useful sources of data for developing morbidity indicators regarding the prevention and control of communicable diseases, noncommunicable diseases, accidents, and violence. Surveillance systems for communicable diseases play a key role in providing early warning of possible threats to public health and make it possible to monitor measures and programs for prevention and control. Effective national surveillance and response systems are therefore essential for national, regional, and global health security.

Most of the Region’s countries have national surveillance systems established by their ministries of health. These differ, however, from country to country with regard to the number of diseases under surveillance, the type of information compiled, the use of electronic or hardcopy records, and the systems’ coverage. Surveillance of noncommunicable diseases can be conducted by health care services (with information from health institutions) or using population-based health surveys. Additionally, surveillance can occur through disease-specific programs such as for tuberculosis and vaccine-preventable diseases.

In some countries, the surveillance of certain diseases may not be integrated into the national surveillance system. Notably, surveillance case definitions can change over time in response to changes in the characteristics of an epidemic, as in the case of HIV/AIDS and H1N1. Another surveillance tool is the International Health Regulations 2005 (IHR) which calls for the monitoring of

diseases that have the potential to cross borders and threaten people worldwide.

In recent years, surveillance systems have been used to monitor a broad range of health conditions, risk factors, and other public health issues. Some countries have implemented surveillance registries for noncommunicable diseases (cervical cancer, acute myocardial infarction, violence, diabetes, etc.) or for health problems caused by toxic substances in the environment. These registries compile information on all cases of these diseases through the health care network or through sentinel surveillance units. Such systems are a source of data on morbidity indicators that are useful in disease prevention and control efforts.

*Notable advantages of using surveillance systems as sources for developing indicators include: a) representativeness although there can be variations based on the characteristics of the country's system; b) a high level of sustainability for monitoring the diseases that are subject to regulation and/or legislation; and c) high periodicity as data are compiled continuously.*

*It should be noted that since the actual frequency and distribution of a population's health condition is usually estimated, it is impossible to measure precisely its representativeness.*

The collection, analysis and interpretation of surveillance data and indicators on immunization were essential in formulating strategies to control and eliminate vaccine-preventable diseases in the Region. Notably, PAHO is the first WHO region certified as polio-free and the first to have interrupted the endemic transmission of measles and rubella.

- Population-based cancer registries: These are the gold standard for providing information on this disease. Cancer registries compile, classify, analyze and report information on all cancers occurring in a geographically defined population. The information is collected from a multiplicity of sources, including hospitals, clinical analysis laboratories, and departments of vital statistics. Routine calculation of rates (per 100,000 inhabitants) produced by population-based cancer registries provides information that can assist

public health officials to better understand the disease, its treatment, and to evaluate cancer prevention and control programs. This information provides a solid basis for planning and implementation of programs to reduce the cancer burden as well as provide input for research.

### **EXPRESSIONS TO DEPICT HEALTH STATUSES**

Looking for some words of wisdom when it comes to health? Search no further than this list of inspirational health quotes! Every now and then, it's good to have a reminder of how important our health is. As the phrase goes, "If you have good health, you have everything." Many people don't appreciate their health until they aren't well. By then, the poor eating, missed sleep, and lack of exercise catches up and then you can't do much of anything until you recover. Sometimes a reminder of how important health is can be helpful in motivating individuals to healthier behaviors.

### **Health Status**

Health status is a multidimensional concept, requiring multiple indicators and multiple methodologies for adequate measurement. Several different indicators of health status are usually included in health surveys, including single summarizing measures; questions relating to disease incidence and prevalence; and questions relating to functioning (physical, cognitive, emotional, and social) or disability (Stewart and Ware, 1992). Health status measures also vary depending on whether they are based on objective information obtained from standardized examinations or medical records or from information obtained from the individual or a proxy. To be most effective, individual health surveys should capture a variety of aspects of health status so as to provide a more comprehensive and complete assessment of health status than would be possible from any single strategy. Measures of health status should also be constructed to be useful in epidemiologic analyses of risk factors as well as for monitoring trends.

There is often interest in using a single question to measure health status in health surveys, as well as in surveys of other areas,

such as employment, income, or education. The subject's self-assessment of his/her health status as excellent, very good, good, fair, or poor is a popular summary indicator of health status. This measure has been shown to be highly correlated with other measures of health status and is predictive of mortality and admission to long-term-care facilities (Idler and Angel, 1990). However, this measure can be problematic when used to monitor change over time. The means by which individuals evaluate various aspects of health have been shown to be affected by contextual parameters. Implicit in self-perceived health status is the individual's evaluation of his/her health status against some unstated standard. Societal norms act to define the standard but the norms and the standards change in response to a variety of conditions.

Although "health" is a positive concept, it is often measured by the presence of specific conditions, such as arthritis and diabetes. As opposed to acute, infectious diseases, these are chronic conditions that reflect the type of health concerns that are most prevalent in Canada and other developed countries with aging populations. Longevity allows more time for chronic conditions and their consequences to develop and progress.

Symptoms and other outcomes of disease are also indicators of population health. Chronic pain is useful as it reflects both comorbidity and disease severity. The likelihood of experiencing chronic pain increases with age, and it can have a major impact on quality of life. Like chronic pain the indicator, participation and activity limitation is not disease specific; it provides evidence of how disease processes interfere with life.

Risk factors, rather than outcomes of disease are useful indicators of population health status. Being overweight or obese, for example, is a risk factor for many conditions including Type 2 diabetes, cardiovascular disease, high blood pressure, osteoarthritis, and some cancers, and in itself may limit activities and lower perceptions of health.

Based on the selected health indicators, Canadians are generally healthy, and from 2003 through 2008, the health status of the

population remained quite stable. Nonetheless, there are enduring differences between the health of men and women. Women are generally less likely than men to be overweight or obese, or to have diabetes. For all other indicators, with the exception of self-perceived health on which ratings are similar, men tend to rate their health more positively than women do. The paradox is that despite reporting more favourably on most health indicators, men are more likely than women to die at earlier ages.

The health status of individuals, and the population as a whole, is the end result of many factors. Genetics aside (for which we have no indicator) our health is a direct consequence of behaviours such as diet, alcohol consumption, smoking, and exercise. Characteristics of the environment in which we live and work also influence our health – access to affordable housing, education, and employment for example as well as exposures to toxins such as second-hand smoke. In addition, the health of Canadians is inexorably tied to our country's demographic composition. As the proportion of seniors in the population increases, so too does the prevalence of many chronic conditions. While these place a burden on individuals, families, and the health care system, they are often a consequence of longevity which is itself a positive indicator of the health status of Canadians.

## **EXPRESSIONS IN CONNECTION WITH HEALTH PROTECTION AND HEALTH DEVELOPMENT**

### **Evolution of health promotion: a stand-alone concept or building on primary health care?**

The origin and evolution of health promotion is complex, and no single driver is responsible. The predominant belief (and understanding) revolves mostly around the fact that health promotion as a public health component was introduced in 1986 by the World Health Organization (WHO) in Ottawa, paving the way for the subsequent health promotion movement. However, health promotion, as a conceptual framework, stimulating a shift in thinking began around 1978 when “primary health care” was adopted at the Alma-Ata conference as the principal mechanism

for health care delivery. The Alma-Ata Declaration underlined the WHO strategy of “Health for all by the year 2000” (1977). It crucially recognized that health improvements would not occur just by developing more health services or by imposing public health solutions and heralded a shift in power from the providers of health services to the consumers of those services and the wider community. The primary health care initiative became the driving force for comprehensive health development over the following 2 decades, and provided the right environment for the concept of health promotion to develop and grow.

During the early 1980s, the term “health promotion” was increasingly used by a new wave of public health activists who were dissatisfied with the rather traditional and top-down approaches of “health education” and “disease prevention”. This, however, generated a debate among the global public health community about the various theories and concepts of prevention, education and promotion. Whereas the term “health protection” existed long before that, and was considered to be consistent with the disease perspective and focused attention on prevention of disease risk factors and diseases, it has since been reinforced through the primary health care and health promotion approaches.

The debate prompted WHO to call a special meeting in late 1984 in Copenhagen to provide some clarity and direction. This led to the first substantive document on health promotion. Two years later the first conference on “health promotion” in Ottawa defined the term as “the process of enabling people to increase control over, and to improve, their health” in the Ottawa Charter, which is still considered the most valid principle of furthering health promotion in the 21st century. The definition has its roots in earlier initiatives such as the Alma-Ata Declaration, which introduced political action, social understanding, and economic policy to the concept of health promotion. The Ottawa Charter further legitimized health promotion as it emphasized the need for intersectoral collaboration and equity in health. The call for action for health promotion referred to 5 strategies: building healthy policy, creating supportive environments, strengthening

community action, developing personal skills, and reorienting health services. The Ottawa conference is often regarded as a milestone in the field of health promotion because a vision and a strategy to advocate health promotion were developed and effectively brought to the attention of the public.

In the ensuing 2 decades, the key achievement of Ottawa 1986 was to legitimize the vision of health promotion by clarifying the key concepts, highlighting the conditions and resources required for health, and identifying key actions and basic strategies to pursue the WHO policy of “health for all”. Importantly, the Charter that emerged also identified the prerequisites for health, including peace, a stable ecosystem, social justice and equity, and resources such as education, food and income. It highlighted the role of organizations, systems and communities as well as individual behaviours and capacities, in creating choices and opportunities for better health.

Since the first conference in Ottawa, WHO has been instrumental in organizing subsequent global conferences on health promotion in partnership with national governments and associations. These mostly focused on each of Ottawa’s 5 health promotion strategies. The Second International Conference on Health Promotion in Adelaide, Australia in 1988 explored in greater depth “building healthy policy”. The focus of the Third International Conference on Health Promotion in Sundsvall, Sweden, in 1991 was on “creating supportive environments”. This particular conference was the first where the notion was put across how environments (physical, social, economic, or political) can be made more supportive of health. The Fourth International Conference on Health Promotion held in Jakarta, Indonesia, in 1997 reviewed the impact of the Ottawa Charter and engaged new players to meet global challenges. The evidence presented showed that health promotion strategies can contribute to improvement in health and the prevention of diseases in developing and developed countries alike. Five priorities were identified in the Jakarta Declaration on Health Promotion into the 21st Century: promote social responsibility for health, increase investments for



health development, consolidate and expand partnerships for health, increase community capacity and empower the individual and secure an infrastructure for health promotion. These were confirmed in May 1998 through the World Health Assembly Resolution on Health Promotion (WHA 51.12).

Despite the evolution of health promotion over the decades and the progress being made through these successive conferences as well as through the parallel initiatives WHO was taking, 2 important challenges remained. The first was to demonstrate, and communicate more widely to developing countries, that health promotion policies and practices can make a difference to health and quality of life. The second was even more important: that action for health promotion can achieve greater equity in health and can close the health gap between population groups. That is why the Fifth Global Conference on Health Promotion in Mexico in 2000 primarily focused on health inequalities both within and between countries. This conference resulted in the Mexico Ministerial Statement for the Promotion of Health: from ideas to action, which affirmed the contribution of health promotion strategies in sustaining local, national and international actions in health.

At the dawn of the new millennium, it was increasingly realized that the global public health landscape was changing dramatically and that more understanding (and action) was required to address the determinants of health if the health of the population was to be promoted. Unforeseen opportunities and challenges surfaced, such as the negative effects of climate change on population, geopolitical changes, debt in developing countries, and of course globalization of people, money, products and services, which had very important implications on wider public health as well as the way health promotion should position itself.

It was in this context that the Sixth Global Conference on Health Promotion in Bangkok in 2005 identified actions, commitments and pledges required to address the determinants of health in a globalized world through health promotion. The conference was structured around 4 themes: the new context,

healthfriendly globalization, partners, and sustainability, and resulted in the second health promotion charter, which identified 4 key commitments to promote health (central to the global development agenda; a core responsibility for the whole of the government; a key focus of communities and civil society; and a requirement for good corporate practice) and 5 key action areas (advocate for health based on human rights and solidarity; invest in sustainable policies, actions and infrastructure to address the determinants of health; build capacity for policy development, leadership, health promotion practice, knowledge transfer and research, and health literacy; regulate and legislate to ensure a high level of protection from harm and enable equal opportunity for health and well-being for all people; and partner and build alliances with public, private, nongovernmental and international organizations and civil society to create sustainable actions). The 4 key commitments and the 5 key action areas build on the previous key action areas put forward by the Ottawa Charter and articulate a renewed vision on health promotion, tackling the inequities and inequalities in health through addressing the determinants of health.

However, some of the terms commonly used in the public health community, e.g. disease prevention, health education, wellness, quality of life, and health promotion, have at times led to confusion in their understanding. It is therefore, important that the concepts of health promotion, prevention and protection are discussed so as to effectively understand the difference between these public health disciplines.

### **Health Promotion vs Health Protection**

Multiple public and private organizations function to improve the health and well-being of the general public. Some of these bodies function independently, others collaboratively, but all are dedicated to building and maintaining an environment that supports a healthy population.

These groups may be more broadly generalized into two categories that guide various regulatory and care-oriented organizations: health promotion and health protection. While the

two may sound similar, each has its own unique approach to managing the health of the larger population.

***Health Promotion***

Health promotion addresses large scale public health concerns, beginning with the well-being of each individual. Health promotion activities are those which seek to modify the behavior of individuals by improving the choices that affect society at large. The goal is to decrease the risk of illness or disease and improve overall health.

Many of the initiatives that fall under the umbrella of health promotion are educational in nature. These educational initiatives address the individual's knowledge of specific risk topics such as: nutrition, physical fitness, sexual practices, drugs and alcohol, tobacco, mental health, family planning, and multiple forms of abuse. In the many instances within the United States, health promotion initiatives can become a part of a larger public policy.

A popular example of successful health promotion is the warning label that now exists on cigarettes. Historically, cigarettes were considered socially acceptable, and commonly sold without any warning about the risk to the health of the user. However, health experts noted the increased incidence of disease and began to educate the public on the risks of smoking and tobacco use. Eventually, these health promotion activities led to a change in public policy, which now requires the manufactures to add a warning label directly to the package. Health promotion experts hope that by educating people about the danger of certain elective behaviors, they will gradually curb their behavior and make healthier choices.

***Health Protection***

Health protection is concerned with preventing the spread of communicable diseases by establishing minimum standards, often in the form of regulations. Health protection is often managed by the public sector. In the United States, the responsibility of establishing and maintaining health protection standards is entrusted to government agencies like the Food and Drug

Administration, Environmental Protection Agency, and Department of Health and Human Services.

Another example of the standards set for health protection includes the standardized response and reporting procedures, occupational safety standards, and certain guidelines for optimizing worker rehabilitation following injury. The Occupational Safety and Health Administration regulates many of these workplace administrative duties in the U.S. As a leading provider of occupational medicine, Concentra works closely with these agencies to assist employer efforts to follow the proper employee health and safety regulations. Concentra also partners with employers to offer ambulatory medical care to their employees such as pre-employment testing, primary care, and urgent care for ill or injured workers.

A good example of health protection is the regular testing of soil where farmers grow produce or raise items for consumption. By ensuring that food supply will not be contaminated with agents of disease, the FDA is able to prevent people from eating tainted food and becoming sick.

### **Health development**

The process of constant, progressive enhancement of the health status of a population.

The notion of development as a managed process has been derived from work in the field of economic and social development studies, and is now being applied to health systems.

Ensuring the health and well-being of all is essential to poverty eradication efforts and achieving sustainable development, contributing to economic growth and prosperous communities. Health is also an inalienable human right according to the Universal Declaration of Human Rights, as good health allows people to reach their full potential, children to be better able to learn, workers to be more productive and parents to care for their children better.

It is also a key indicator of a country's progress: a nation with a healthy population is more likely to experience sustained growth. Good health is also essential for the stability of entire regions, as

pandemics, which transcend borders, can have severe social and economic impacts on families and communities, and can put increased pressure on health systems.

Although global health has improved significantly in recent decades, this benefit has not been shared evenly within and among nations. Several hundred million people across the globe continue to go without basic health services, especially in rural areas and in the most impoverished communities. More than six million children die each year and nearly 300,000 women die in pregnancy or childbirth, many from preventable causes.

For Canada, health has been a long-standing focus of Canada's development efforts and remains a top priority. Through our engagement in international forums and in advancing critical development issues, Canada is recognized as a leader in global health.

Canada's efforts are multifaceted, but they all strive to support efforts to address immediate health challenges while building the capacity necessary to sustain and achieve long-term results.

Working with developing countries and development partners, Canada is helping to strengthen health systems to ensure that critical services, medicines, and interventions reach the most vulnerable and the hardest to reach, particularly women and children. Our approach also includes training front-line community health workers and other key personnel, such as midwives.

Partnerships are a key component of Canada's approach. Working collaboratively with international organizations and Canadian civil society, life-saving vaccinations, nutritional supplements, and other medicines and commodities can be delivered more effectively and efficiently, thus providing communities with the means to prevent and treat leading diseases and illnesses. These include HIV/AIDS, tuberculosis, malaria, diarrhea, pneumonia, malnutrition and undernutrition, and other primary causes of mortality and morbidity.

## **The Specific Health Geographic Characteristics of the Developing World**

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Developing countries will be hardest hit by the COVID-19 pandemic. They are facing an unprecedented health and economic crisis, with potentially extreme economic, social and sustainable development consequences that may reverse decades of development progress and further jeopardise efforts to achieve the 2030 Agenda for Sustainable Development.

- A significant increase in infections could rapidly overwhelm already weak health systems.
- In many developing countries, the pandemic comes in addition to pre-existing food or security crises.
- Socio-economic impacts are already being felt and will have long-lasting consequences, possibly reversing decades of progress in poverty eradication: exports in developing Asia are falling, growth in Africa could be halved, and an extra 30 million people in Latin America could fall into poverty.
- Containment measures in developing countries will further affect businesses and households, and could disrupt supply chains, engender a food security crisis, and result in increased incidence of gender based violence.

The crisis will aggravate existing development challenges,

and while governments have started to respond, their capacity is tightly constrained.

- Many developing countries have been grappling with structural vulnerabilities such as persistent social and economic inequalities, conflict and forced displacement, declining trust in government, the impacts of climate change, and environmental fragility.
- Crucially, many lack the resources to scale-up health interventions and the fiscal space to implement support measures and minimise disruptions the way OECD countries are currently doing. Moreover, containment measures may be difficult to implement and have ripple effects in contexts of widespread informality and a lack of safety nets for the majority of households. They may have disproportionate impacts for poor people and socially marginalised and excluded groups.
- Developing countries urgently need support from the international community. They are entering this crisis with lower fiscal buffers than they had in 2008-09. Twice as many countries have approached the IMF for short-term emergency assistance as in the immediate aftermath of the 2008 global financial crisis.

OECD governments and the broader international community need to unlock ambitious support to developing countries, to prevent the loss of lives, contain the risk of aftershocks, and invest in their sustainable recovery.

- The international response to COVID-19 should be unprecedented in terms of resources mobilised, scope and ambition. It must preserve hard-won gains in poverty reduction, social inclusion and democratic governance, and enable a sustainable economic recovery. It should lead to a new development model that is conducive to resilience and sustainability.
- Immediate support to the healthcare sector, its workers, and social infrastructure should go hand-in-hand with

efforts to strengthen health systems and expand social protection and health coverage. Support for the economic recovery is crucial too, as governments need to deploy income-support and stimulus measures to protect jobs and firms.

- Official development assistance, should, to every extent possible, be protected and stepped up, while expanding support to global public goods.
- The scope for co-ordinated and equitable debt management efforts and concessional resources should be explored, building on the debt service payment standstill agreed by the G20 Finance Ministers on April 15.
- In addition, a global investment effort for a green and global sustainable recovery is needed, with developed and developing countries coming together in its design.
- A supportive multilateral system is crucial to keep governments accountable and refrain from measures that disrupt flows of goods and services; to foster innovative and coherent responses; and to increase co-ordination in contexts of multiple crises, such as in the Sahel.
- In addressing the immediate impacts of the COVID-19, the role of women in combatting the pandemic needs to be recognised, as well as the increased risk of gender based violence, including sexual exploitation, abuse and harassment (SEAH).
- Particular attention needs to be placed upfront on ensuring respect for policy coherence. Policies in OECD countries need to be designed in a way that avoids negative externalities on developing countries.

### **Quality of Care in Developing Countries**

The process of providing care in developing countries is often poor and varies widely. A large body of evidence from industrial countries consistently shows variations in process, and these findings have transformed how quality of care is perceived (McGlynn and others 2003). A 2002 study found that physicians



complied with evidence-based guidelines for at least 80 percent of patients in only 8 of 306 U.S. hospital regions (Wennberg, Fisher, and Skinner 2002). It is important to note that these variations appear to be independent of access to care or cost of care: Neither greater supply nor higher spending resulted in better care or better survival. Studies from developing countries show similar results. For example, care in tertiary and teaching hospitals and care provided by specialists may be better than care for the same cases in primary care facilities and by generalists.

One explanation for variation and low-quality care in the developing world is lack of resources. Limited data indicate, however, that high-quality care can be provided even in environments with severely constrained resources. A study in Jamaica, which used a cross-sectional analysis of government-run primary care clinics, showed that better process alone was linked to significantly greater birthweight (Peabody, Gertler, and Liebowitz 1998). A study in Indonesia attributed 60 percent of all perinatal deaths to poor process and only 37 percent to economic constraints (Supratikto and others 2002).

Cross-system or cross-national comparisons provide the best examples of the great variation in clinical practice in developing countries. In one seven-country study, researchers directly observing clinical practice found that 75 percent of cases were not adequately diagnosed, treated, or monitored and that inappropriate treatment with antibiotics, fluids, feeding, or oxygen occurred in 61 percent of cases (Nolan and others 2001). Another study compared providers' knowledge and practice in California and FYR Macedonia, using vignettes to adjust for case-mix severity. Although the quality of the overall or aggregate process was lower in FYR Macedonia, a poor country, the top 5 percent of Macedonian doctors performed as well as or better than the average Californian doctor (Peabody, Tozija, and others 2004).

In a study commissioned for this chapter, an international team measured quality in five developing countries (China, El Salvador, India, Mexico, and the Philippines), using the same clinical vignettes at each site. The team evaluated the process for

common diseases according to international, evidence-based criteria. Quality varied only slightly among countries. The within-country range of quality of doctors was 10 times as great as the between-country range. Such wide variation strongly suggests that efforts to improve health status must involve policies that change the quality of clinical care.

### **DEMOGRAPHIC AND SOCIAL-ECONOMIC FEATURES**

Demographic, social, economic and geographic factors are associated with increased short-term mortality after cardiac arrest. We sought to determine if these factors are additionally associated with long-term outcome differences using a detailed clinical database linked to state-wide administrative data.

Although overall survival after sudden cardiac arrest has improved over time, not all groups have experienced improved outcomes, with notable quality gaps associated with patient sex, race, socioeconomic status and rural residence. It is not clear to what extent these effects arise from health system elements, underlying biological differences, geographic access to healthcare or an intersection of multiple factors. Health system factors are an important potentially modifiable aspect of cardiac arrest care and can serve as quality improvement targets. There is recent evidence that inpatient cardiac arrest clinical guidelines are applied variably across hospitals, and that women receive fewer guideline-recommended treatments in the prehospital setting. Patients living in rural and lower income areas face other potential challenges, such as lower rates of bystander-initiated cardiopulmonary arrest, longer transit times to the hospital less access to automated external defibrillators and poorer access to specialist care. Recognizing these continued threats, the National Academy of Medicine emphasized sex, race, socioeconomic, and rural health disparities as priorities for cardiac arrest research.

Using a highly detailed clinical registry with long-term outcome data in cohort of cardiac arrest survivors, our study sought to determine if there are persistent long-term outcome differences based on sex, race, income status, or health care access.

We hypothesized that male sex, black race, lower income status, residence in a rural area, residence in an area with a shortage of primary care providers, and residence at greater distance to the nearest hospital would be associated with shorter duration of survival after hospital discharge.

### **Patient cohort, outpatient procedures and outcomes**

We included adult patients resuscitated from in-hospital cardiac arrest or out-of-hospital cardiac arrest treated at one of five hospitals in Pennsylvania between 2005 and 2013. We included both in-patient and out-of-hospital cardiac arrest events as it was our objective to describe and better understand the long-term outcomes for these patients as a whole. Although the precipitating etiologies are frequently different for in-patient and out-of-hospital cardiac arrest, the post-hospital needs for these patients are probably similar. In order to address both of these concerns (i.e., differing etiologies and yet similar long-term management strategy) we planned *a priori* to control for arrest location in our multivariable model.

We identified patients from a detailed clinical registry maintained at the University of Pittsburgh. We obtained demographics (age, sex, race), arrest characteristics (location, presenting rhythm, and post-arrest illness severity modeled using Pittsburgh Cardiac Arrest Category), hospital interventions (cardiac catheterization and implanted cardioverter-defibrillator (ICD) insertion), and functional status at hospital discharge (Cerebral Performance Category (CPC)) from this registry. We excluded patients who died before discharge, those who arrested secondary to trauma or neurologic catastrophe and sparsely represented demographic groups (defined as racial designations in fewer than 5% of the total cohort).

We linked registry records to data from the Pennsylvania Health Cost Containment Council (PHC-4) using social security number, date of birth, name, and sex. PHC4 is an independent state agency that collects information on inpatient hospitalizations, outpatient care and ambulatory surgery procedures. We performed

this linkage, in addition to index hospitalization data collection, to identify cardiac catheterizations or ICD insertions that took place within six months after index hospitalization in the outpatient setting, as in some clinical contexts it may be medically appropriate to delay these procedures to await physiological or myocardial recovery.

We used three measures to evaluate patient health care access: patient residence in a rural area (a measure of health care *availability*), patient residence in an area with barriers to care or a scarcity of primary care providers (a separate measure of health care *availability*), and estimated drive time from patient residence to the nearest acute care hospital (a measure of health care *accessibility*). Availability and accessibility are complementary measures of health care access, with availability representing the relationship between volume of services and volume of patients, and accessibility representing the relationship between the location of services and the location of patients. For our first measure of health care availability, we classified patients as living in a rural area if the geometric centroid of their home ZIP code was located in an area designated as rural by the United States Census Bureau. We evaluated this exposure as rural health studies are a research priority outlined by the National Academy of Medicine. We additionally evaluated a second measure of availability using Medically Underserved Area or Population (MUA/P) designations. We obtained these locations from the Department of Health and Human Service's Health Resource & Services Administration (HRSA). HRSA develops criteria for geographic shortages of primary care providers, in addition to dental and mental health. These regions are not limited to urban or rural areas, and can span single or contiguous groups of counties. Medically Underserved Populations include groups who face economic, cultural or linguistic barriers to care. We designated a patient's home address as being an MUA/P if the geometric center of the ZIP code was contained within one of the HRSA MUA/P regions. We evaluated this second measure of availability, as these regions are potential targets for post-acute care investment. For our measure of accessibility, we used patient drive time to the nearest acute care

hospital, rather than from arrest location or drive time to the actual treating hospital. We estimated the drive time to the closest short-term acute care hospital using the geometric center of each patient's home ZIP code and hospital street addresses reported in the 2013 Centers for Medicare and Medicaid Healthcare Cost Report Information System national database using ArcGIS Desktop 10.4 (Redlands, CA). We evaluated total drive time as a continuous variable using fractionated polynomial analysis with STATA command `mfp` to identify possible nonlinear functional forms and to determine if there were natural time breakpoints associated with increased mortality.

We determined post-discharge survival by querying the National Death Index (NDI). The NDI is a comprehensive database of vital status obtained from state death records that has been used extensively to determine long-term mortality. We linked registry records NDI data as previously described. The follow-up period extended to December 31 2014, providing two to nine years of follow-up.

### ***Statistical analysis***

We summarized patient demographics, arrest characteristics, hospital treatments, and long-term outcomes using descriptive statistics. We performed unadjusted Cox proportional hazard regression to test the associations between long-term outcome and race, sex, estimated median income (defined as household income less than \$30,000, \$30,000 to \$60,000 and more than \$60,000), extended drive time to the nearest hospital (defined as more than 20 minutes), arrest characteristics (location, presenting rhythm and post-arrest illness severity), invasive cardiac procedures (cardiac catheterization and ICD insertion), and functional status at hospital discharge. We created median income and Charlson Comorbidity thresholds using natural breakpoints from lowess plots with mortality.

We performed cross tabulations and evaluated correlations between our three measures of geographic access. We performed these steps as we expected they could represent at least partially overlapping exposures.

We evaluated interactions within demographic characteristics and between demographic characteristics and invasive procedures, to determine if there were nuanced relationships between health disparity risk factors and long-term outcome such that subgroups of patients benefited more than others. We then created a multivariable Cox model to evaluate the association between long-term survival and demographic factors and measures of health care access, controlling for all other covariates. We evaluated each geographic access measure separately in the multivariable model, and collectively. We included interactions that were significant below the  $\alpha < 0.05$  level in the final multivariable model. We performed a sensitivity analyses using additional drive times of 10, 15, 25 and 35 minutes, to evaluate if the relationship had a clear threshold. We performed standard regression diagnostics on all models, including checks for variable collinearity. We controlled for center clustering effects in all models.

## **HEALTH AND LIFE PROSPECTS**

### **Social and Economic Factors**

Social and economic factors, such as income, education, employment, community safety, and social supports can significantly affect how well and how long we live. These factors affect our ability to make healthy choices, afford medical care and housing, manage stress, and more.

The social and economic opportunities we have, such as good schools, stable jobs, and strong social networks are foundational to achieving long and healthy lives. For example, employment provides income that shapes choices about housing, education, child care, food, medical care, and more. In contrast, unemployment limits these choices and the ability to accumulate savings and assets that can help cushion in times of economic distress.

Social and economic factors are not commonly considered when it comes to health, yet strategies to improve these factors can have an even greater impact on health over time than those traditionally associated with health improvement, such as strategies to improve health behaviors.

Across the nation, there are meaningful differences in social and economic opportunities for residents in communities that have been cut off from investments or have experienced discrimination. These gaps disproportionately affect people of color – especially children and youth.

### **How do disparities in geographical access to health care affect health and well-being?**

The locations, number, and quality of health care providers differ from place to place, and services may not be available in places where they are most needed. Access to health care is not simply a matter of measuring distance to health facilities; access is affected by socioeconomic status, cultural and social norms, and transportation networks.

In a study of access to government health services in Kenya, for example, Noor et al. (2006) show that a transportation model adjusted for actual use patterns and competition between health facilities provided a much better indicator of access to health care than did a model focused solely on distance. Their example illustrates that understanding the locational circumstances that create inequalities in access to health care is a critical piece of the health picture.

Studies analyzing geographical inequalities in health care access should build on increasingly detailed work on this topic. For example, Luo and Wang (2003) have developed an index of spatial accessibility as a way of analyzing the local supply of primary health services in relation to local demand. Their method was used to analyze spatial access to primary care in Illinois and its relationship to late-stage cancer (Wang et al., 2008). Not surprisingly, in Illinois, as in much of the United States, rural areas are characterized by lower levels of spatial access to primary care than urban areas. But why are some rural communities much more disadvantaged than others? Geographical scientists such as Cutchin (1997) have taken up this question, looking at the specific attributes of rural places that tend to attract primary-care physicians and encourage them to stay. Additional work in this vein can

provide policy makers and community planners with much needed insight into ways of addressing the problem of rural health care access.

Another example of the promise of spatially explicit studies of health care access comes from ongoing research on whether cancer patients living in communities with poor access to primary health care have a higher-than-average risk of late-stage diagnosis (cancer diagnosed after it has spread to distant tissues or organs). The researchers conducting the study undertook multilevel analyses of the associations between late-stage risk, individual demographic variables, and contextual variables, describing socioeconomic characteristics of places and their spatial access to primary care (McLafferty and Wang, 2009). Their research showed that, in Chicago, the high risk of late diagnosis among cancer patients largely reflects the high concentration of vulnerable people living in economically disadvantaged neighborhoods. Outside Chicago, poor spatial access to primary care significantly heightens the risk of late diagnosis among breast and colorectal patients, supporting the findings of geographical scientists in other contexts (Rushton et al., 2004). McLafferty and Wang also identify poor health outcomes in a dense urban setting where spatial access to care is quite high, according to GIS-based measures.

These findings highlight the need for research investigating the connections between population vulnerability, place vulnerability, and access to health care. Among the most important topics to investigate are effects of time-space constraints on the use of primary health care by low-income urban residents and geographical variations in the quality of health care. There is also much to be gained from comparative analyses of the spatial dimensions of health care access in different parts of the world and for different types of health challenges (e.g., heart disease, HIV/AIDS, vector-borne diseases).

## **ENVIRONMENTAL CHALLENGES**

A healthy population is essential for economic development. The poorest people on the planet tend to suffer most from the



health effects from exposures to environmental hazards like air pollution and impure water. In turn, disease and disability related to polluted environments slows and blocks economic development. In addition to its toll on human suffering, illness carries a significant financial burden in the form of healthcare expenditures and lost productivity. For example, unhealthy children often cannot attend or perform well in school, and unhealthy adults cannot work or care for their families.

### **Economic development affect environmental health**

Economic development has led to tremendous improvements in people's well-being, but often at the expense of the environment. Industrialization has contributed to pollution of air and water, changing dietary patterns, and shifting patterns of transportation and land use. Exposures to air and water pollutants directly increase disease. Similarly, dietary changes and decreased levels of physical activity, resulting from transportation and other work and lifestyle changes, are contributing to global epidemics of obesity, diabetes, and associated diseases. Globalization and the large geographic scale over which rapid industrialization is occurring make these environmental health problems global health problems.

### ***What is sustainable development?***

Sustainable development is frequently defined as development that meets the needs of present generations without compromising the ability of future generations to meet their own needs. As evidence of the harm to health and well-being from widespread environmental degradation and global climate change grows, communities and governments are placing greater emphasis on assuring that economic development is achieved in a sustainable way.

### ***How can environmental health be integrated into sustainable development?***

Protecting and creating healthy environments is a critical component of sustainable development. Environmental health can be integrated into sustainable development by:

- Improving environmental quality for the poorest populations with the greatest burden of environmental diseases, by reducing exposures to air pollution in homes and villages from biomass burning, and providing clean water and sanitation
- Identifying efforts to address environmental problems that can also provide health benefits. For example, creating environments that encourage biking and walking for transportation reduces greenhouse gas and toxic air pollution emissions (environmental benefit) and increases physical activity (health benefit).
- Recognizing that some policies, practices, and technologies designed to promote sustainability and economic development may have unintended adverse environmental health effects, and attempting to prevent or mitigate these before they are implemented.

### **Key Environmental Challenges: Causes And Impact**

The key environmental challenges that the country faces relate to the nexus of environmental degradation with poverty in its many dimensions, and economic growth. These challenges are intrinsically connected with the state of environmental resources, such as land, water, air and their flora and fauna. The proximate drivers of environmental degradation are population growth, inappropriate technology and consumption choices, and poverty, leading to changes in relations between people, ecosystems and development activities such as intensive agriculture, polluting industry and unplanned urbanisation.

However, these environmental challenges give rise to environmental degradation only through deeper causal linkages, in particular, institutional failures, resulting in lack of clarity or enforcement of rights of access and use of environmental resources, policies which provide disincentives for environmental conservation (and which may have origins in the fiscal regime), market failures (which may be linked to shortcomings in the regulatory regimes), and governance constraints. Environmental degradation is a major causal factor in enhancing and perpetuating

poverty, particularly among the rural poor, when such degradation impacts soil fertility, quantity and quality of water, air quality, forests, wildlife and fisheries. The dependence of the rural poor, in particular, tribal societies, on their natural resources, especially biodiversity, is self-evident.

Women in particular face greater adverse impacts of degradation of natural resources, being directly responsible for their collection and use, but rarely for their management. The commitment of time and effort in the collection of these resources has a direct impact on the capacity of rural women to devote time to raising and educating children, enhancing their earning skills, or participating in gainful livelihoods.

The poor are also more vulnerable to loss of resilience in ecosystems. Large reductions in resilience may mean that the ecosystems, on which livelihoods are based, break down, causing distress. The loss of the environmental resource base can result in certain groups of people being made destitute, even if overall, the economy shows strong growth. Further, urban environmental challenges and degradation, through lack of (or inappropriate) waste treatment and sanitation, industry and transport related pollution, adversely impacts air, water, and soil quality, and differentially impacts the health of the urban poor.

This, in turn, affects their capability to seek and retain employment, attend school and enhances gender inequalities, all of which perpetuate poverty. Poverty itself can accentuate environmental degradation, given that institutional failures persist. For the poor, several environmental resources are complementary in production and consumption on other commodities (e.g. water in relation to agricultural production, fuel wood in relation to consumption of food), while a number of environmental resources are a source of income or food (e.g. fisheries, non-timber forest produce). This is frequently a source of cumulative causation, where poverty, gender inequalities, and environmental degradation mutually reinforce each other.

Poverty and environmental degradation are also reinforced by, and linked to population growth, which in turn, depends on

a complex interaction of diverse causal factors and stages of development. Stabilisation of population is a necessary condition for sustainable development. Economic growth, in its turn, bears a dichotomous relationship to environmental degradation. On the one hand, growth may result in “excessive” environmental degradation through the use of natural resources and generation of pollution aggravated by institutional failures.

If impacts on the environmental resource base are neglected, an incorrect picture is obtained from conventional monetary estimates of national income. On the other hand, economic growth permits improvement in environmental quality by making available the necessary resources for environmental investments and generating societal pressures for improved environmental behaviour, and institutional and policy change. Unsustainable consumption patterns, particularly in industrialised countries also have serious adverse impacts on the environment, both local and global. The global impacts are largely manifest in developing countries and further, accentuate poverty.

It is increasingly evident that poor environmental quality has adversely affected human health. Environmental factors are estimated as being responsible in some cases for nearly 20 percent of the burden of disease in India, and a number of environment-health factors are closely linked with dimensions of poverty (e.g. malnutrition, lack of access to clean energy and water). It has been shown that interventions such as reducing indoor air pollution, protecting sources of safe drinking water, protecting soil from contamination, improved sanitation measures, and better public health governance, offer tremendous opportunities for reducing the incidence of a number of critical health problems.

It is also evident that these environmental protection measures would be difficult to accomplish without extensive awareness raising, and education, on good practices with respect to public and private behaviour. Institutional failures, referring to unclear or insufficiently enforced rights of access to and use of, environmental resources, result in environmental degradation because third parties primarily experience impacts of such degradation, without cost to the persons responsible for the

damage. Such rights, both community based and individual, are critical institutions mediating the relationships between humans and the use of the environment. Traditionally, village commons water sources, grazing grounds, local forests, fisheries, etc., have been protected by local communities from overexploitation through various norms, which may include penalties for disallowed behaviour.

These norms, may, however, be degraded through the very process of development, including urbanization, and population growth resulting from sharp reduction in mortality and also through state actions which may create conditions for strengthening of individual over communitarian rights, and in doing so allow market forces to press for change that has adverse environmental implications. If such access to the community resources under weakened norms continues, the resources would be degraded, and the livelihoods of the community would suffer. Policy failures can emerge from various sources, including the use of fiscal instruments, such as explicit and implicit subsidies for the use of various resources, which provide incentives for excessive use of natural resources. Inappropriate policy can also lead to changes in commonly managed systems, with adverse environmental outcomes.

Another major set of challenges arises from emerging global environmental challenges such as climate change, stratospheric ozone depletion, and biodiversity loss. The key is to operationalize the principle of common but differentiated responsibility of countries in relation to these problems. Multilateral regimes and programmes responding to these global environmental issues must not adversely impact the development opportunities of developing countries. Further, the sharing of global natural resources must proceed only on the basis of equal sharing per-capita across all countries.

## **Major environmental health problems**

### ***Environmental Health***

Environmental health involves evaluating and examining the

effects of man-made chemicals on human health or wildlife, impacts on ecological systems and spread of illnesses or diseases. Insulation of environmental and human health systems entails grasping the effects of human-made and environmental vulnerabilities or hazards. Increasing attention targeted on the impact of environmental health extends to public healthcare and the health of the global economy. Addressing and encompassing assessment and control of all external agents of chemical, biological or physical origin and other related factors with behavioural impact that potentially affect health is essential. The target remains on creating health-supportive environment and disease prevention programs which excludes genetic behaviour, social and cultural environment.

### ***Major Health Problems***

All types of pollution and environmental concerns are interlinked to influence one another, hence need to be tackled all together. Various stakeholders along with the community have to work together to reduce the environmental impact on public health.

- 1) Climate change: is caused by greenhouse gases that trap heat from the sun and warms the surface of the earth; increase in oceanic temperatures that affects marine habitat and ecosystems; rise in global sea levels that accounts for shrinking land, mass floods and freak weather incidents across the world.
- 2) Pollution: is one of the primary causes for environmental concerns related to climatic change and biodiversity. All types of water, air, soil, radioactive, noise, light and thermal pollution affect the environment. Polluting and degrading air, soil and water quality along with global warming and climatic change has detrimental effects on public health. Water and air pollution is a huge concern causing financial strain and danger to human and marine life. Implementation of laws and strict regulation along with educating people on the causes and effects of pollution can avoid damage to valuable resources.
- 3) Deforestation: involves destroying plants and trees which provide oxygen, food, water and medicine to the public.

Natural wildfires, illegal logging, agricultural practices and harvesting of mass amount of timber for commercial use are decreasing forests, reducing oxygen supply and increasing greenhouse gas emissions at an alarming rate. Biodiversity includes essentially most complex and vital feature of ecosystem that makes up the environment which is in danger with the increase in global warming, pollution and deforestation.

- 4) Disease: mitigation and control is one main aspect affecting environmental health making radio logical, occupational and industrial hygiene; safe drinking water; control of vector-borne, communicable and non-communicable diseases necessary.
- 5) Hazardous waste: management, hazardous material management, waste disposal systems, contaminated site remediation, prevention of leakage of underground storage tanks, emergency responses and prevention of release of hazardous materials into the environment has become essential. Improving waste management systems can prevent the possibility of polluting natural resources or triggering the spread of illnesses. Global industrialization is revolutionizing public living standards that require proper hygiene and handling of waste items. The techniques and materials related to industrial progress are often linked to infectious diseases.

Education programs have been initiated to create awareness and disseminate information on public health hygiene; effects of climatic change, pollution, deforestation and other environmental concerns.

# 4

## Health Care Challenges in the Developed World

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Health care is defined as the field concerned with the restoration of human life which is holistic include body and mind of the individual, the medical dictionary define health care as “The prevention, treatment and management of illness and the preservation of mental and physical well-being through service offered by the medial and allied health professions” Developing nation are nations which are considered to be industrialized and developing countries are countries considered to be underdeveloped or third world countries whose citizen depend solely on agricultural work and trying to improve the social and economic life of its citizens and these countries lack healthcare infrastructures to address the health needs of their people.

A country can be considered either developed or developing based on the basis of many other indicators such as “economics, per capita income, industrialization, literacy rate, living standard.” According to Kofi Annan “a developed country is one that allows all its citizens to enjoy a free and healthy life in a safe environment”. Differencebetwween.info has outlined several generalized characteristics between developed and developing nations, for the developing nation this includes high level of industrial development, post-industrial economics, high education level, better infrastructures, good health care, high human development index (HDI) increased life expectancy. While



developing countries have the following characteristics lower education rate, high levels of birth rates, death rates and high infant mortality rates, poor infrastructure, weak governments and poor access to health care.

### **Differences between healthcare in developing and developed nations**

Health care differ from developing and developing nations and this mostly depends on the economic and political stability of each nations, that is why even in countries called developed or developing may be different form nations. WHO has identified indicators that used to measure the discrepancies in health such as “health of the population, fair financial contributions, and responsiveness of the system, preventable deaths, and affordability?” (Boundless.com).

### ***Challenges faced by developing nations to provide adequate healthcare to its people***

Developing countries face many challenges as they provide healthcare service this includes cost, social, cultural, political and economic conditions.

- Cost and quality outcome of services developing countries struggle on how to balance between service offered and the quality of services offered to its population, reducing health care cost and improving quality of outcomes is a challenge. Many developing nations although has healthcare budget allocated for healthcare but the quality of the service offered may be affected because the budgets many not be enough to caterer for the current shift of diseases from infectious to chronic disease.
- Human resource many developing countries face shortage of medical personnel such as doctors and other health care professionals, the available few human resources lack adequate training, poor motivation that has resulted into brain drain and the resources of doctors to patients in most developing countries is

- Aging population. Developing countries aging population in coming decades is anticipated to increase more especially the age group 65 years and above to 690 million by 2030 (Toshiko Kaneda)
- Access to health care in developing countries has been identified as a challenges this can include dimension such as the availability of service, affordability and acceptability. Many communities in developing countries many have constrains in accessing service this can be linked to distance from the community to the health facility, lack of money for transport and to pay for paying the service, attitude of health workers affected people's access of the service.
- According to China Watch developing countries public health sector is faced by four major challenges "the transformation of epidemiology, the HIV/AIDS epidemic, the emergence of new diseases, and high sanitation imbalances among countries" These challenges expose people in developing countries into poverty as the cost of treatment associated with this conditions is high and most people who may be infected are the bread winners as they become sick productivity is reduced and the work force in the community is affected.
- Rise in chronic diseases the rates of chronic disease continue to increase this pose a great danger to the inadequate health care systems in most developing countries with limited finance, human resource and infrastructure to deal with this shift of disease burden.
- Inequality in health care health care in developing countries can be seen on different levels of "social stratification including socioeconomic, political, ethnic, and cultural"(Dr Christopher October 2009)
- Infrastructure
- Resources many developing countries have limited resources to fund the health care system, more than 50% of Africa population lack access to health care (Dan. November 2 2006). Most funding for health in developing

countries is out-of-pocket for example in Kenya 52% of health care financial is out-of-pocket (Dan 2006).

- Perception of health care in most developing countries staff working in the health care facilities are unhappy due to poor motivation and many clients who seek care may view some health care providers as unqualified, these results in poor service provision and affects patients access to health care (Lowell et al June 2010).

### **The Challenges of Health Care Delivery in Developing Countries**

The challenges of healthcare delivery in a developing country such as Nigeria with its diverse ethnic and cultural groups pose is huge. Poverty, ignorance, lack of resources and health facilities and bad leadership acting in concert produce a wide spectrum of disease on one hand. On the other hand, are the sheer determinations and will of the people to survive in the face of man-made problems, strong family and community support. Furthermore, support by religious groups plays their part in giving the people hope. Overworked and overwhelmed medical personnel depend on their ingenuity and acumen to improvise in order to save lives. In the developed world, such improvisation would probably end in litigation.

Apart from infectious diseases which are largely preventable, injuries from ethnic and religious strife in some areas have direct impact on the most productive age groups which further stretches the limited resources available. Road traffic injuries are a major but neglected public health challenge and requires concerted efforts for effective and sustainable prevention

There is the issue of emigration of highly trained personnel (the so-called brain drain) that further compounds the problem of healthcare delivery in Africa.

In order to tackle healthcare delivery head-on, governments must demonstrate the will to carry the people with them.

Legislation and persuasion are useful tools that can be utilised while being sensitive at every point to the culture and religious

beliefs of those involved. Religious and traditional rulers in Nigeria wield a great deal of influence in their domain. It is, therefore, imperative to solicit their support in programmes aimed at improving the lot of the people. The recent recommendations of the global polio eradication initiative for example is a step in the right direction. Improving the level of literacy is also vital in the fight against diseases.

The services of organisations like the British Council are immensely useful in the area of education and research. We were beneficiaries of the library outreach programme of British Council early on in our careers, which allowed us access to books and journals.

Collaboration with health institutions in other continents can facilitate training and research. The provision of grants to enable willing highly trained emigrants to go back to their 'root' for brief periods may help to improve things. Such programs can be in partnership with local and regional postgraduate medical colleges..

Good governance, accountability and transparency on the part of governments and their officials will encourage not only development aid but also create conducive atmosphere for investment and job creation. This should in turn translate to availability of resources for the provision of basic amenities. A wholesome and proactive approach is required to help turn things around.

#### **DEMOGRAPHIC AND SOCIAL-ECONOMIC CHARACTERISTIC**

For nations to improve the health of their populations, some have cogently argued, they need to move beyond clinical interventions with high-risk groups. This concept was best articulated by Rose (1992), who noted that "medical thinking has been largely concerned with the needs of sick individuals." Although this reflects an important mission for medicine and health care, it is a limited one that does little to prevent people from becoming sick in the first place, and it typically has disregarded issues related to disparities in access to and quality

of preventive and treatment services. Personal health care is only one, and perhaps the least powerful, of several types of determinants of health, among which are also included genetic, behavioral, social, and environmental factors (IOM, 2000; McGinnis et al., 2002). To modify these, the nation and the intersectoral public health system must identify and exploit the full potential of new options and strategies for health policy and action.

Three realities are central to the development of effective population-based prevention strategies. First, disease risk is currently conceived of as a continuum rather than a dichotomy. There is no clear division between risk for disease and no risk for disease with regard to levels of blood pressure, cholesterol, alcohol consumption, tobacco consumption, physical activity, diet and weight, lead exposure, and other risk factors. In fact, recommended cutoff points for management or treatment of many of these risk factors have changed dramatically and in a downward direction over time (e.g., guidelines for control of “hypertension” and cholesterol), in acknowledgment of the increased risk associated with common moderately elevated levels of a given risk factor. This continuum of risk is also apparent for many social and environmental conditions as well (e.g., socioeconomic status, social isolation, work stress, and environmental exposures). Any population model of prevention should be built on the recognition that there are degrees of risk rather than just two extremes of exposure (i.e., risk and no risk).

The second reality is that most often only a small percentage of any population is at the extremes of high or low risk. The majority of people fall in the middle of the distribution of risk. Rose (1981, 1992) observed that exposure of a large number of people to a small risk can yield a more absolute number of cases of a condition than exposure of a small number of people to a high risk. This relationship argues for the development of strategies that focus on the modification of risk for the entire population rather than for specific high-risk individuals. Rose (1981) termed the preventive approach the “prevention paradox” because it brings large benefits to the community but offers little to each participating

individual. In other words, such strategies would move the entire distribution of risk to lower levels to achieve maximal population gains.

The third reality, provided by Rose's (1992) population perspective, is that an individual's risk of illness cannot be considered in isolation from the disease risk for the population to which he or she belongs. Thus, someone in the United States is more likely to die prematurely from a heart attack than someone living in Japan, because the population distribution of high cholesterol in the United States as a whole is higher than the distribution in Japan (i.e., on a graph of the distribution of cholesterol levels in a population, the U.S. mean is shifted to the right of the Japanese mean). Applying the population perspective to a health measure means asking why a population has the existing distribution of a particular risk, in addition to asking why a particular individual got sick (Rose, 1992). This is critical, because the greatest improvements in a population's health are likely to derive from interventions based on the first question. Because the majority of cases of illness arise within the bulk of the population outside the extremes of risk, prevention strategies must be applicable to a broad base of the population. American society experienced this approach to disease prevention and health promotion in the early twentieth century, when measures were taken to promote sanitation and food and water safety (CDC, 1999b), and in more recent policies on seat belt use, unleaded gasoline, vaccination, and water fluoridation, some of which are discussed later in this chapter.

### **The Impacts Of Socioeconomic And Other Social Factors On Most Health Outcomes**

A number of studies have attempted to assess the impact of social factors on health. A review by McGinnis et al. estimated that medical care was responsible for only 10%–15% of preventable mortality in the U.S.; while Mackenbach's studies suggest that this percentage may be an underestimate, they affirm the overwhelming importance of social factors. McGinnis and Foege concluded that half of all deaths in the U.S. involve behavioral causes; other

evidence has shown that health-related behaviors are strongly shaped by social factors, including income, education, and employment. Jemal et al., studying 2001 U.S. death data, concluded that “potentially avoidable factors associated with lower educational status account for almost half of all deaths among working-age adults in the U.S.” Galea and colleagues conducted a meta-analysis, concluding that the number of U.S. deaths in 2000 attributable to low education, racial segregation, and low social support was comparable with the number of deaths attributable to myocardial infarction, cerebrovascular disease, and lung cancer, respectively.

The health impact of social factors also is supported by the strong and widely observed associations between a wide range of health indicators and measures of individuals’ socioeconomic resources or social position, typically income, educational attainment, or rank in an occupational hierarchy. In U.S. as well as European data, this association often follows a stepwise gradient pattern, with health improving incrementally as social position rises. This stepwise gradient pattern was first noted in the United Kingdom. Although research on the socioeconomic gradient has been more limited in the U.S., the results of U.S. studies have mirrored the European findings. A few examples using U.S. data, with social position reflected by income or by educational attainment. Using national data, the National Center for Health Statistics’ “Health, United States, 1998” documented socioeconomic gradients in the majority of numerous health indicators measured across different life stages. Braveman and colleagues confirmed those findings using recent U.S. data. Both Pamuk et al. and Braveman et al. found that socioeconomic gradient patterns predominated when examining non-Latino black and white groups but were less consistent among Latino people. Minkler and colleagues found dramatic socioeconomic gradients in functional limitations among people aged 65–74 years. This finding is particularly remarkable because income gradients generally tend to flatten in old age. The socioeconomic gradients in health have been observed not only in the U.S. population overall, but within different racial/ethnic groups, demonstrating that the

socioeconomic differences are not explained by underlying racial/ethnic differences. Indeed, most studies that have examined racial/ethnic differences in health after adjusting for socioeconomic factors have found that the racial/ethnic differences disappeared or were substantially reduced. This does not imply that the only differences in experiences between racial/ethnic groups are socioeconomic; for example, racial discrimination could harm the health of individuals of all socioeconomic levels by acting as a pervasive stressor in social interactions, even in the absence of anyone's conscious intent to discriminate. Furthermore, the black-white disparity in birth outcomes is largest among highly educated women. Living in a society with a strong legacy of racial discrimination could damage health through psychobiologic pathways, even without overtly discriminatory incidents.

## **SOCIAL SUPPORT AND CAREGIVER AVAILABILITY**

Loneliness is one of the biggest and most underreported public health threats. While seniors are prone to feeling isolated as their social connections change with age, children and teenagers are also extremely likely to feel as if they are unable to share their emotions and thoughts with friends or family.

The stress of social isolation can lead to premature cognitive decline and dementia, increased risk of cardiovascular disease, exasperation of depression and anxiety, and premature death.

Strong social support networks for children and adolescents contribute to building mental and emotional resiliency that may help to reduce the likelihood of engaging in risk behaviors, succumbing to peer pressure, or developing anxiety-driven behavioral health concerns.

For seniors, caregivers are often involved in making critical health decisions and helping elderly patients cope with hospitalizations and declining independence. About half of elderly patients require significant help with decision-making when hospitalized, said a 2014 study from JAMA.

Nearly 60 percent of the decisions made by caregivers in these



situations involved life-sustaining care, while half involved discharge planning and post-acute care.

While the availability of caregivers is crucial for many patients, healthcare providers must also provide support for family members and friends charged with the difficult task of overseeing the needs of their loved ones.

Stress, anxiety, and depression among caregivers are extraordinarily prevalent, with some estimates showing that between 40 and 70 percent of caregivers experience clinically significant mental health concerns. As patients decline in health, the mental health impacts on their caregivers increase dramatically as feelings of frustration, helplessness, loneliness, grief, and guilt can rise.

Ensuring that both patients and their caregivers have the emotional and social support required to make the best possible decisions for themselves and their loved ones can help to reduce the negative impacts of many social determinants of health.

Robust social support networks and community initiatives can prevent malnutrition and improve social interactions among seniors, lower the risk of adolescents engaging in interpersonal violence or leaving school, reduce the risk of chronic disease development due to stress, and make it easier for caregivers to maintain stable employment as well as their own friendships and relationships while they make informed decisions about care.

Successful population health management programs that hope to address the myriad social determinants of health – including the many factors not directly outlined here – will be rooted in providing compassionate, holistic, and personalized support to individuals facing any number of socioeconomic challenges and obstacles in their daily lives.

## **HEALTH AND LIFE PROSPECTS**

Healthcare systems globally have experienced intensive changes, reforms, developments, and improvement over the past 30 years. Multiple actors (governmental and non-governmental) and countries have played their part in the reformation of the

global healthcare system. New opportunities are presenting themselves while multiple challenges still remain especially in developing countries. Better way to proceed would be to learn from historical patterns while we plan for the future in a technology-driven society with dynamic demographic, epidemiological and economic uncertainties.

Health care and health systems all over the world are undergoing intensive reforms. Internationally, the existing institutions for multilateral cooperation are facing unprecedented challenges. Many institutions are finding it increasingly difficult to fulfill their mandates. There are inefficient overlapping efforts among various multilateral organizations, but paradoxically, there are responsibility voids in executing some key functions. At the same time, other players, such as non-governmental organizations and transnational corporations, are gaining prominence.

In today's more complex world, it is difficult to define health systems, what it consists of, where it starts and where it ends. The World Health Organization in its report on Health systems in 2000 defined health systems as "all activities whose main responsibility is to promote, restore and maintain health".

Multiple forces are transforming the pattern of disease and health as well as creating a need for new institutional arrangements. Just as governments are reinventing their respective national health systems, international health must be rethought so that it can respond effectively to the emerging challenges.

The current paper discusses opportunities and challenges around global health care systems in next 25–30 years. The paper will analyze the future needs of healthcare in next 30 years and review key achievements and challenges faced globally both in developing and developed countries. Geo-political and environmental forces will drive the transformation of health care delivery and finance over the next decade, leading to changes in hospital and health system.

### **Current Challenges**

The current quality crisis in America's health care is well

recognized. Numerous recent studies have led to the conclusion that “the burden of harm conveyed by the collective impact of all of our health care quality problems is staggering”. Likewise, the President’s Advisory Commission on Consumer Protection and Quality in the Health Care Industry (1998: 21) note that “today, in America, there is no guarantee that any individual will receive high-quality care for any particular health problem.”

The related figures are illustrative. Estimates of the number of Americans dying each year as a result of medical errors are as high as 98,000—more than those who die from motor vehicle accidents, breast cancer, or AIDS (Institute of Medicine, 2000). The American public is dissatisfied with chronic care; 72 percent of those surveyed believe it is difficult for people living with chronic conditions to obtain the necessary care from their health care providers. Health professionals are also concerned: 57 percent of U.S. physicians surveyed said their ability to provide quality care has been reduced in the last 5 years, and 41 percent stated that they are discouraged from reporting or not encouraged to report medical errors (Blendon et al., 2001); 76 percent of nurses surveyed indicated that unsafe working conditions interfere with their ability to deliver quality care (American Nurses Association/NursingWorld.Org, 2001). A survey of over 800 physicians found that 35 percent of them reported errors in their own or a family member’s care (Blendon et al., 2002).

The committee that authored the *Quality Chasm* report (Institute of Medicine, 2001), speakers at the summit, health experts, employers, and health professionals and students have all identified reasons for this disconnect between an ideal system and what actually exists. These reasons include (1) poor design of systems and processes, (2) the system’s inability to respond to changing patient demographics and related requirements, (3) a failure to assimilate the rapidly growing and increasingly complex science and technology base, (4) slow adoption of information technology innovations needed to provide care, (5) little accommodation of patients’ diverse demands and needs, and (6) personnel shortages and poor working conditions.

***What System?***

The health care system can hardly be called a system. Rather it is a dizzying array of highly decentralized sectors. Although the size of physician groups is growing, 37 percent of practicing physicians are still in solo or two-person practices (Center for Studying Health System Change, 2002). The health plan sector is turning away from structures that can facilitate integration and coordination, with the market share of health maintenance organizations (HMOs) falling and preferred provider organizations (PPOs) becoming more popular (Kaiser Family Foundation and Health Research and Educational Trust, 2002). And even though the hospital sector has been consolidating in many markets—of the 5,000 community hospitals, more than 3,500 belong to some network or system—most of these arrangements are focused on administrative rather than clinical integration (American Hospital Association, 2000; Lesser and Ginsburg, 2000). As Ken Shine, former president of the Institute of Medicine (IOM), attested at the summit:

We operate our health care system like a cottage industry, big, big cottages with state-of-the-art technologies to care for patients, but infrastructure which is totally inadequate, systems which don't talk to each other (Shine, 2002).

The absence of systems, or poorly designed systems, and the resulting lack of integration are apparent across sectors, as well as within individual health care organizations. Such systems can harm patients or fail to deliver what patients need. A previous IOM report makes abundantly clear that the inability to apply knowledge about human factors in systems design and the failure to incorporate well-acknowledged safety principles into health care (such as standardizing and simplifying equipment, supplies, and processes) are key contributors to the unpardonably high number of medical errors that occur (Institute of Medicine, 2000).

Mary Naylor, School of Nursing, University of Pennsylvania, a panelist at the summit, echoed this reality:

We have both a culture and organization of care that separate our care into distinct systems—hospitals, home care, skilled nursing

facilities—with little formal communication, relationships, or collaboration between and among those settings....And providers don't necessarily see that they're responsible for what happens to people as they move from one level of care to another. We don't pay a lot of attention to issues of quality assessment, particularly in those difficult hand-offs or transitions from one level of care to another (Naylor, 2002).

The *Quality Chasm* report also stresses that a redesigned system is predicated on interdisciplinary teams. In the current system, however, health professionals work together, but display little of the coordination and collaboration that would characterize an interdisciplinary team. Many factors, including differing professional and personal perspectives and values, role competition and turf issues, lack of a common language among the professions, variations in professional socialization processes, differing accreditation and licensure regulations, payment systems, and existing hierarchies, have decreased the system's ability to function, causing defined roles to predominate over meeting patients' needs. The hierarchy in which physicians dominate and the emphasis on assuming individual responsibility for decision making result in a reliance on personal accountability and a failure to solicit the contributions of others who could bring added insight and relevant information, whatever their formal credentials (Helmreich, 2000; Institute of Medicine, 2001a).

The resulting lack of continuity and coordination of care, miscommunication, redundant and wasteful processes, and excess costs have resulted in patient suffering (Institute of Medicine, 2001a; Larson, 1999). Patients and families commonly report that caregivers appear not to coordinate their work or even to know what each other are doing. Patients spend a great deal of time consulting with an endless stream of physicians, nurses, therapists, social workers, home care workers, nutritionists, pharmacists, and other specialists, who too often are ignorant of past medical histories, medications, or treatment plans and therefore work at cross purposes. When patients are moved from one setting to another—for example, from hospital to rehabilitation center to

home—fragmentation of care results in overlapping or conflicting treatment that is costly and confusing and, worst of all, detrimental to the patient. In a recent survey, 85 percent of physicians surveyed stated that one or more adverse outcomes result from uncoordinated care, and more than half suggested that a lack of coordination is usually the cause of patients receiving contradictory health information from providers (Partnership for Solutions, 2002b).

### ***Poor Accommodation of Patients' Needs***

Americans are living longer, in part as a consequence of advances in medical science, technology, and health care delivery. As the population ages, there will be more patients with chronic conditions. In 2000, about 13 percent of the population (35 million Americans) were over age 65; this proportion is expected to rise to 20 percent (70 million) by 2030 (National Center for Health Statistics, 2002). An estimated 125 million Americans already have one or more chronic conditions, and more than half of these people have multiple such conditions (Wu and Green, 2000).

Moreover, although the majority of disease burden and health care resources is related to the treatment of chronic conditions, the nation's health care system is organized and oriented largely to provide acute care and is inadequate in meeting the needs of the chronically ill (Wagner et al., 2001). As William Richardson, Kellogg Foundation, noted in his remarks at the summit, "There are few clinical programs that can provide the full complement of services needed by people with heart disease, diabetes, asthma, or other common chronic conditions (Richardson, 2002).

Studies show that effective treatment of chronic conditions needs to be continuous across settings and types of providers. Clinicians need to collaborate with each other and with patients to develop joint care plans with agreed-upon goals, targets, and implementation steps. Such care should support patient self-management and encompass regular clinician follow-up, both face-to-face and through electronic means. Clinicians practicing in such an environment need to be effective members of an

interdisciplinary team, provide care that is patient-centered, and be proficient in informatics applications.

A recent survey underscored issues faced by the chronically ill, with about three of every four respondents reporting difficulty in obtaining medical care. Specifically, 72 percent had experienced difficulty in obtaining care from a primary care physician, 79 percent from a medical specialist, and 74 percent from providers of drug therapy (Partnership for Solutions, 2002b). This same survey indicated that, as a result of the lack of coordination, the chronically ill were receiving spotty or contradictory information and facing avoidable complications. At the summit, Mary Naylor described a typical real-life example of the lack of coordination for the chronically ill:

A 75-year old woman...had a number of chronic conditions: osteoporosis, hypertension, diabetes, and heart failure, and... was admitted to a hospital as a result of a fall...and fracture.... We followed her...from hospital admission, through one month's time, and she was the subject of about 20 major providers. That does not include the numbers of ancillary personnel and other support people involved in her care. While hospitalized, she interacted with an orthopedic surgeon and his team, a cardiologist, an endocrinologist, a primary care nurse, a physical therapist based in the hospital, and a social worker who helped facilitate her discharge to a skilled nursing facility. At that point, the hand-off was to a physician in the skilled nursing facility, a physical therapist, an occupational therapist, and a variety of other providers. Within 2 weeks' time, she was returned home to home care follow-up by the Visiting Nurse's Association, and had a nurse, occupational therapist, and physical therapist engage with her in care in the home.

Her care was characterized by poor communication....Very little attention [was paid] to her preferences or the preferences of her family members in decision making about what care [she should receive] and what site she should go to, and what the plan of care should be at each of those sites. There was very poor transfer of information from one site to the other; in fact, critical

pieces of her care plan were not communicated from the hospital to the nursing home, resulting in an emergency room visit within a couple of days of discharge to the skilled nursing facility. And there was no point person, no broker of care, no one there advocating for her, for her family, and coordinating this entire experience, all of which took place in a very short period of time (Naylor, 2002).

America's increasing chronic care needs also highlight the importance of health professionals being better prepared in prevention and health promotion. It has been estimated that approximately 40 percent of all deaths are caused by behavior patterns that could be modified (McGinnis et al., 2002). Prevention is also key in dealing with the nation's emerging infections, both those that occur naturally and those that are intentionally introduced. Since the events of September 11, 2001, and the anthrax attacks that followed, the once seemingly remote threat of a bioterrorist attack in the United States has now become plausible. The ability of health care professionals to apply population-based prevention strategies and activate the public health system is crucial to an effective response to such incidents. In a recent survey of health professionals, however, only a quarter of respondents said they felt prepared to respond to a bioterrorist event (Chen et al., 2002).

In addition to the need for the health system to be more responsive to those with chronic conditions and more focused on prevention, the system has not done a good job in accommodating the diverse cultural needs and varying preferences of racial and ethnic groups. A recent IOM report that reviews a large body of research concludes that racial and ethnic minorities tend to receive lower-quality care than Caucasians, even when one accounts for differences in insurance status, income, age, and severity of condition (Institute of Medicine, 2002). The IOM committee that prepared that report outlined steps needed to close this gap, including preparing health professionals to be competent in providing care that is culturally sensitive (Institute of Medicine, 2002). There is added urgency to address such inequities given



that ethnic/racial minorities are predicted to comprise a majority of the U.S. population by 2050 (U.S. Census Bureau, 2002).

***Inability to Assimilate the Increasingly Complex Science Base***

Over the last 50 years, there has been a steady increase in funding for biomedical research that has resulted in extraordinary advances in clinical knowledge and technology. From a start of about \$300 in 1887, the National Institutes of Health (NIH) has been appropriated nearly \$23.4 billion for 2002 (National Institutes of Health, 2002), while investment on the part of pharmaceutical firms has risen from \$13.5 billion to \$24 billion between 1993 and 1999. Likewise, research and development in the medical device industry, funded largely by private dollars, totaled \$8.9 billion in 1998 (The Lewin Group, 2000). Results of all this investment include a doubling of the average number of new drugs approved each year since the 1980s (The Henry J. Kaiser Family Foundation, 2000) and exponential growth in the number of clinical trials from about 500 a year in the 1970s to more than 10,000 a year today (Chassin, 1998). There are no signs that this growth is going to abate any time soon—nor would we want that to happen.

Traditionally, it has been assumed that health professionals are able to diagnose and treat, evaluate new tests and procedures, and develop clinical practice guidelines, all using the training initially received from their academic education and ongoing practice experience. This assumption is no longer valid, with human memory becoming increasingly unreliable in keeping pace with the ever-expanding knowledge base on effective care and its use in health care settings. For clinicians, just staying abreast of advances, let alone obtaining active training in or experience with new techniques and approaches, can be a daunting task. As David Eddy, a prominent quality expert, has said, the “complexity of modern medicine exceeds the inherent limitations of the unaided human mind” (Millenson, 1997:75). Although no practitioner needs to absorb the results of 10,000 clinical trials that span many areas of specialty, rapid expansion of knowledge is occurring even within specific areas. For example, as William Richardson noted at the summit, the number of randomized controlled trials on diabetes

published over the last 30 years increased from about 5 to more than 150 per year.

Few professionals are prepared to cope with the continuously expanding knowledge and technology base, and supports to help clinicians access and apply this knowledge base to practice are not widely available. Such supports would include providing relevant information in an accessible format at the point of care. However, the literature is “replete with evidence of the failure to provide care consistent with well established guidelines for common chronic conditions” (Institute of Medicine, 2001a: 28). And the lag between the discovery of more effective forms of treatment and their incorporation into routine patient care is, on average, 17 years (Balas, 2001). Obviously, the health system needs to do better in this regard.

As William Richardson asked summit participants, “If we can’t keep up now, how will we respond to the extraordinary advances that will emerge during this new century?” (Richardson, 2002). These advances include, among others, the use of genomics to diagnose and eventually treat disease; engineering discoveries such as miniaturization and robotics; and the application of advanced epidemiological knowledge, especially as it relates to bioterrorism, to large populations and databases (Institute of Medicine, 2001a).

## **HEALTH CARE CHALLENGES**

### **The Challenges of the Healthcare System in India**

The best thing about living in the 21st century has to be the rapid rate of change in every sector of society. Healthcare in India, in particular, has witnessed a significant amount of evolution. Right from advanced biomedical tools to unimaginable surgeries performed by robots, the healthcare industry in India is at its historical peak.

However, along with the fast-paced advancements comes the burden of bearing the second highest population in the world. An increasing global population puts a strain on India’s healthcare

resources, while longer life expectancies put a lot of stress on India's healthcare system.

With the health sector in India struggling under a staggering amount of infrastructural problems, there is a high need for our healthcare workers to be updated with the latest knowledge and provided with the newest resources.

Putting oneself out there is no easy task; with the healthcare industry in India demanding that much-needed influx of medical information, we have realised the importance of online healthcare courses for healthcare workers across the board.

Right from providing crucial knowledge regarding healthcare leadership and management to showcasing the positives of improving healthcare through research, these courses can provide valuable learning opportunities. Let us take a closer look at the positives and negatives of the healthcare industry in India.

### ***India's healthcare system***

The state government primarily dispenses healthcare in India. Capitalising on the vast human capital available in the country, the healthcare system in India has produced some of the finest medical surgeons and tools in the industry.

One thing is evident to any onlooker: India has an extensive healthcare system. Yet, there exist significant-quality discrepancies between rural and urban areas and between public and private healthcare providers.

Historically speaking, healthcare in India has seen many government-sponsored schemes aiming to provide good quality healthcare services to the poorest of the population. The National Rural Health Mission was established in 2005 to address the absence of medical coverage in rural areas. In order to improve health care in rural India, this mission concentrates resources on rural areas and poor states with poor health facilities.

In spite of the presence of a vast number of schemes for the economically disadvantaged population, ineffective public healthcare and insurance models have rendered this herculean

effort useless. Furthermore, extended hospital wait times, the perception that public health care in India is of poor quality, and significant labour and infrastructure shortages are all systemic impediments to access.

Despite this, India is a popular destination for medical tourists due to the low costs and good quality of its private institutions. Healthcare expenditure in India is one of the lowest around the globe, making it one of the most sought-after healthcare sectors in the whole world.

International students in India can anticipate excellent medical care from private hospitals, thanks to India's improvements in healthcare. One noteworthy mention goes to the incredible amount of research that has cropped up in recent years. Owing to this beautiful research-oriented approach in 21st-century healthcare in India, the quality of treatment and outpatient care has shot up in a positive direction.

### ***The effects of COVID-19 on healthcare in India***

With the COVID-19 pandemic putting even the world's most advanced healthcare systems to the test, India's healthcare system has also been disturbed. While usually sufficient, healthcare in India found itself on its knees by the ferocious second wave of COVID-19 in April 2021.

A devastated Indian healthcare system infrastructure was brutally exposed by the lack of oxygen and drugs required for the treatment of COVID-19 in India. Additionally, the lack of awareness regarding healthcare insurance made it very difficult for the ordinary person to receive the full extent of in-patient care for COVID-19.

However, not all news was bleak. The silver lining in the whole situation was that private Indian healthcare companies took the initiative and have been delivering the government with all of the resources it requires, including testing, isolation beds for treatment, medical personnel, and equipment at government COVID-19 hospitals, as well as home healthcare.

Furthermore, the sheer tenacity with which the health care

system in India implemented innovative treatment methods for COVID-19 shows how far the healthcare industry in India has progressed since its inception in the 1900s.

Various healthcare workers in the Indian healthcare sphere, ranging from nurses to doctors, have made a positive stride by updating their knowledge to suit the unique COVID-19 needs.

Managing change in India's healthcare is a task that is best left to academic reforms in imparting healthcare education, although healthcare workers can certainly make their voices heard.

The way the healthcare sector in India managed the second wave of COVID-19 is primarily thanks to the advanced healthcare education imparted at the college level to all students.

### **Current healthcare issues in India**

While the COVID-19 virus is still ravaging the country, we have seen that the healthcare sector in India has been fighting its monsters for the past 50 odd years. Current healthcare issues in India range anywhere from infrastructural problems to blatant inefficiency of the bureaucratic system of the hospital administration. Let us take a look at some of the most important ones:

#### ***Infrastructural issues***

Out of the current healthcare issues faced by the health sector in India, the biggest has to be a lack of infrastructure. Repeated insufficiency of hospital beds, a dearth of specialised faculty to treat major diseases, and high out-of-pocket financial expenditure makes for an impossibly stressed national health care system.

Add to it a low rate of training professionals compared to other countries; the workload on this struggling healthcare system is hanging by a thread at this point.

#### ***Child mortality rates***

While the world is going through a decline in mortality rates, India remains high despite the miraculous technological advancements conducted in the past two decades. According to

an article published by the Times of India, India has one of the highest infant mortality in the world at 721,000.

One of the primary reasons for continued mortality rates is the belief that infant care and pre-natal surgical procedures are too costly to be borne by the family. What we must do is make people aware of low-cost interventions that work just as well as the expensive ones. Not only will this reduce mortality rates in the long run, but it will also help increase people's belief in healthcare in India.

### ***Unmanageable patient-load***

Serving a population size of 1.4 billion, nearly 20% of the entire population of the planet, is a Herculean task in itself. Sustainably managing medical and human resources to fulfil the needs of the future generation should be the foremost thing on people's minds at the moment.

In order to drive adequate patient flow, healthcare facilities should employ technology wherever possible to optimize operational and clinical operations. Furthermore, there is the difficulty of thinking beyond the obvious and promoting virtual care protocols and telehealth services, both of which can significantly reduce patient load stress.

### ***What does the future hold?***

No one can predict what can really happen in the next decade or so. However, it is not hard to hypothesise the presence of a few elements that we will see in the health care system in India sooner or later:

- Medical tourism: In comparison to countries in Western Europe or the United States, India's healthcare sector appeals to overseas patients because of the availability of high-quality treatments at lower pricing. We can quickly expect a massive boost in the medical tourism front owing to the excellent vaccine supplying relations with stable economies like Russia and Brazil too.
- Use of technology: In today's world, online consultations and technological platforms are in high demand. Given

that the pandemic has extended the need to socially distance, teleconsultations have become a need rather than a want for a majority of the population. The ‘eSanjeevani’ app, an integrated web-based telemedicine service, was launched by the Ministry of Health and Family Welfare in August 2019. By bridging the gap between urban and rural India, it hopes to make healthcare more equitable.

- Health insurance awareness: The good news for India is that one of the country’s most pressing healthcare challenges, healthcare insurance, has dramatically improved. In recent years, there has been a greater awareness of health insurance products, and with each passing year, more people are purchasing them.

### ***Final thoughts***

Health systems and policies are essential in defining how health services are supplied, used, and impact health outcomes. Health care in India is struggling, but there is a vast sea of hope and improvement considering healthcare education’s direction in the country.

Aside from resolving the obvious infrastructural deficiencies, the training of professionals should be given the topmost priority. The utilization of online healthcare workshops and courses provided by trusted platforms allows for more advanced and specific training. The role of good quality medical training is truly invaluable and investing in this sphere will be beneficial for us in the long run.

### **Why Innovation in Health Care Is So Hard**

Health care—in the United States, certainly, but also in most other developed countries—is ailing and in need of help. Yes, medical treatment has made astonishing advances over the years. But the packaging and delivery of that treatment are often inefficient, ineffective, and consumer unfriendly.

The well-known problems range from medical errors, which by some accounts are the eighth leading cause of death in the

United States, to the soaring cost of health care. The amount spent now represents about one-sixth of the U.S. gross domestic product; it continues to grow much faster than the economy; and it threatens the economic future of the governments, businesses, and individuals called upon to foot the bill. Despite the outlay, more than 40 million people have no health insurance.

Such problems beg for innovative solutions involving every aspect of health care—its delivery to consumers, its technology, and its business models. Indeed, a great deal of money has been spent on the search for solutions. U.S. government spending on health care R&D, which came to \$26 billion in 2003, is topped only by the government's spending on defense R&D. Private-sector spending on health care R&D—in pharmaceuticals, biotechnology, medical devices, and health services—also runs into the tens of billions of dollars. According to one study of U.S. companies, only software spawns more new ventures receiving early-stage angel funding than the health field.

Despite this enormous investment in innovation and the magnitude of the opportunity for innovators to both do good and do well, all too many efforts fail, losing billions of investor dollars along the way. Some of the more conspicuous examples: the disastrous outcome of the managed care revolution, the \$40 billion lost by investors to biotech ventures, and the collapse of numerous businesses aimed at bringing economies of scale to fragmented physician practices.

So why is innovation so unsuccessful in health care? To answer, we must break down the problem, looking at the different types of innovation and the forces that affect them, for good or ill. This method of analysis, while applied here mainly to health care in the U.S., also offers a framework for understanding the health care problems of other developed economies—and for helping managers understand innovation challenges in any industry.

### **A Health Care Innovation Catalog**

Three kinds of innovation can make health care better and cheaper. One changes the ways *consumers* buy and use health care.



Another uses *technology* to develop new products and treatments or otherwise improve care. The third generates new *business models*, particularly those that involve the horizontal or vertical integration of separate health care organizations or activities.

### ***Consumer focused***

Innovations in the delivery of health care can result in more-convenient, more-effective, and less-expensive treatments for today's time-stressed and increasingly empowered health care consumers. For example, a health plan can involve consumers in the service delivery process by offering low-cost, high-deductible insurance, which can give members greater control over their personal health care spending. Or a health plan (or service provider) can focus on becoming more user-friendly. Patients, after all, are like other consumers: They want not only a good product—quality care at a good price—but also ease of use. People in the United States have to wait an average of three weeks for an appointment and, when they show up, 30 minutes to see a doctor, according to a 2003 study by the American Medical Association. More seriously, they often must travel from one facility to another for treatment, especially in the case of chronic diseases that involve several medical disciplines.

### ***Technology***

New drugs, diagnostic methods, drug delivery systems, and medical devices offer the hope of better treatment and of care that is less costly, disruptive, and painful. For example, implanted sensors can help patients monitor their diseases more effectively. And IT innovations that connect the many islands of information in the health care system can both vastly improve quality and lower costs by, for example, keeping a patient's various providers informed and thereby reducing errors of omission or commission.

### ***Business model***

Health care is still an astonishingly fragmented industry. More than half of U.S. physicians work in practices of three or fewer doctors; a quarter of the nation's 5,000 community hospitals and

nearly half of its 17,000 nursing homes are independent; and the medical device and biotechnology sectors are made up of thousands of small firms. Innovative business models, particularly those that integrate health care activities, can increase efficiency, improve care, and save consumers time. You can roll a number of independent players up into a single organization—horizontal integration—to generate economies of scale. Or you can bring the treatment of a chronic disease under one roof—vertical integration—and make the treatment more effective and convenient. In the latter case, patients get one-stop shopping and are freed from the burden of coordinating their care with myriad providers (for example, the ophthalmologists, podiatrists, cardiologists, neurologists, and nephrologists who care for diabetics). Such “focused factories,” to adopt C. Wickham Skinner’s term, cut costs by improving patients’ health. Furthermore, they reduce the likelihood that an individual’s care will fall between the cracks of different medical disciplines.

The health care system erects an array of barriers to each of these valuable types of innovation. More often than not, though, the obstacles can be overcome by managing the six forces that have an impact on health care innovation.

### **The Forces Affecting Innovation**

The six forces—industry players, funding, public policy, technology, customers, and accountability—can help or hinder efforts at innovation. Individually or in combination, the forces will affect the three types of innovation in different ways.

#### ***Players***

The health care sector has many stakeholders, each with an agenda. Often, these players have substantial resources and the power to influence public policy and opinion by attacking or helping the innovator. For example, hospitals and doctors sometimes blame technology-driven product innovators for the health care system’s high costs. Medical specialists wage turf warfare for control of patient services, and insurers battle medical service and technology providers over which treatments and

payments are acceptable. Inpatient hospitals and outpatient care providers vie for patients, while chains and independent organizations spar over market influence. Nonprofit, for-profit, and publicly funded institutions quarrel over their respective roles and rights. Patient advocates seek influence with policy makers and politicians, who may have a different agenda altogether—namely, seeking fame and public adulation through their decisions or votes.

The competing interests of the different groups aren't always clear or permanent. The AMA and the tort lawyers, bitter foes on the subject of physician malpractice, have lobbied together for legislation to enable people who are wrongly denied medical care to sue managed-care insurance plans. Unless innovators recognize and try to work with the complex interests of the different players, they will see their efforts stymied.

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### ***Funding***

Innovation in health care presents two kinds of financial challenges: funding the innovation's development and figuring out who will pay how much for the product or service it yields. One problem is the long investment time needed for new drugs or therapies that require FDA approval. While venture capitalists backing an IT start-up may be able to get their money out in two to three years, investors in a biotech firm have to wait ten years even to find out whether a product will be approved for use. Another problem is that many traditional sources of capital aren't familiar with the health care industry, so it's difficult to find investors, let alone investors who can provide helpful guidance to the innovator.

A frequent source of investor confusion is the health care sector's complex system of payments, or reimbursements, which typically come not from the ultimate consumer but from a third

party—the government or a private insurer. This arrangement raises an array of issues. Most obviously, insurers must approve a new product or service, and its pricing, before they will pay. And their perception of a product's value, which determines the level of reimbursement, may differ from patients'. Furthermore, insurers may disagree. Medicare, whose relationships with its enrollees sometimes last decades, may see far more value in an innovation with a long-term cost impact, such as an obesity reduction treatment or an expensive diagnostic test, than would a commercial insurer, which typically sees an annual 20% turnover. An additional complication: Innovations need to appeal to doctors, who are in a position to recommend new products to patients, and doctors' opinions differ. From a financial perspective, a physician who is paid a flat salary by a health maintenance organization may be less interested in, say, performing a procedure to implant a monitoring device than would a doctor who is paid a fee for such services.

### ***Policy***

Government regulation of health care can sometimes aid innovation ("orphan drug" laws provide incentives to companies that develop treatments for rare diseases) and sometimes hinder it (recent legislation in the United States placed a moratorium on the opening of new specialty hospitals that focus on certain surgical procedures). Thus, it is important for innovators to understand the extensive network of regulations that may affect a particular innovation and how and by whom those rules are enacted, modified, and applied. For instance, officials know they will be punished by the public and politicians more for underregulating—approving a harmful drug, say—than for tightening the approval process, even if doing so delays a useful innovation.

A company with a new health care idea should also be aware that regulators, to demonstrate their value to the public, may ripple their muscles occasionally by tightly interpreting ambiguous rules or punishing a hapless innovator.

### ***Technology***

As medical technology evolves, understanding how and when to adopt or invest in it is critically important. Move too early, and

the infrastructure needed to support the innovation may not yet be in place; wait too long, and the time to gain competitive advantage may have passed.

Keep in mind that competition exists not only within each technology—among drugs aimed at a disease category, for example—but also across different technologies. The polio vaccine eventually eliminated the need for drugs, devices, and services that had been used to treat the disease, just as kidney transplants have reduced the need for dialysis. Conversely, the discovery of an effective molecular diagnostic method for a disease such as Alzheimer's would greatly enhance the demand for therapeutic drugs and devices.

### ***Customers***

The empowered and engaged consumers of health care—the passive “patient” increasingly seems an anachronistic term—are a force to be reckoned with in all three types of health care innovation. Sick people and their families join disease associations such as the American Cancer Society that lobby for research funds. Interest groups, such as the elderly, advocate increased funding for their health care needs through powerful organizations such as AARP. Those who suffer from various ailments pressure health care providers for access to drugs, diagnostics, services, and devices they consider effective.

What's more, consumers spend tremendous sums out of their own pockets on health care services—for example, an estimated \$40 billion on complementary medicine such as acupuncture and meditation—that many traditional medical providers believe to be of dubious value. Armed with information gleaned from the Internet, such consumers disregard medical advice they don't agree with, choosing, for example, to shun certain drugs doctors have prescribed. A company that recognizes and leverages consumers' growing sense of empowerment, and actual power, can greatly enhance the adoption of an innovation.

### ***Accountability***

Increasingly, empowered consumers and cost-pressured payers

are demanding accountability from health care innovators. For instance, they require that technology innovators show cost-effectiveness and long-term safety, in addition to fulfilling the shorter-term efficacy and safety requirements of regulatory agencies. In the United States, the numerous industry organizations that have been created to meet these demands haven't fully succeeded in doing so. For example, a study found that the accreditation of hospitals by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO), an industry-dominated group, had scant correlation with mortality rates.

One reason for the limited success of these agencies is that they typically focus on process rather than on output, looking, say, not at improvements in patient health but at whether a provider has followed a treatment process. However well intentioned, these bodies usually aren't neutral auditors focused on the consumer but rather are extensions of the industries they regulate. For instance, JCAHO and the National Committee for Quality Assurance, the agencies primarily responsible for monitoring compliance with standards in the hospital and insurance sectors, are overseen mainly by the firms in those industries.

But whether the agents of accountability are effective or not, health care innovators must do everything possible to try to address their often opaque demands. Otherwise, innovating companies face the prospect of a forceful backlash from industry monitors or the public.

### **The Barriers to Innovation**

Unless the six forces are acknowledged and managed intelligently, any of them can create obstacles to innovation in each of the three areas.

#### ***In consumer-focused innovation***

The existence of hostile industry *players* or the absence of helpful ones can hinder consumer-focused innovation. Status quo organizations tend to view such innovation as a direct threat to their power. For example, many physicians resent direct-to-consumer pharmaceutical advertising or for-profit attempts to

provide health care in convenient locations, such as shopping malls, and use their influence to resist such moves. Conversely, companies' attempts to reach consumers with new products or services are often thwarted by a lack of developed consumer marketing and distribution channels in the health care sector as well as a lack of intermediaries, such as distributors, who would make the channels work. Opponents of consumer-focused innovation may try to influence public *policy*, often by playing on the general bias against for-profit ventures in health care or by arguing that a new type of service, such as a facility specializing in one disease, will cherry-pick the most profitable customers and leave the rest to nonprofit hospitals. Innovators must therefore be prepared to respond to those seeking *accountability* for a new product's or new service's cost-effectiveness, efficacy, and safety.

It also can be difficult for innovators to get *funding* for consumer-focused ventures because few traditional health care investors have significant expertise in products and services marketed to and purchased by the consumer. This hints at another financial challenge: Consumers generally aren't used to paying for conventional health care. While they may not blink at the purchase of a \$35,000 SUV—or even a medical service not traditionally covered by insurance, such as cosmetic surgery or vitamin supplements—many will hesitate to fork over \$1,000 for a medical image. Insurers and other third-party payers also may resist footing the bill for some consumer-focused services—for example, increased diagnostic testing—fearing a further increase in their costs.

These barriers impeded—and ultimately helped kill or drive into the arms of a competitor—two companies that offered innovative health care services directly to consumers. Health Stop was a venture capital-financed chain of conveniently located, no-appointment-needed health care centers in the eastern and midwestern U.S. for patients who were seeking fast medical treatment and did not require hospitalization. Although designed to serve people who had no primary care doctor or who needed treatment on nights and weekends, Health Stop unwittingly found

itself competing with local community doctors and nonprofit hospital emergency rooms for business.

Guess who won? The community doctors bad-mouthed Health Stop's quality of care and its faceless corporate ownership, while the hospitals argued in the media that their emergency rooms could not survive without revenue from the relatively healthy patients whom Health Stop targeted. The criticism tarnished the chain in the eyes of some patients. Because Health Stop hadn't fully anticipated this opposition, it hadn't worked in advance with the local physicians and hospitals to resolve problems and to sufficiently document to the medical community the quality of its care. The company's failure to foresee these setbacks was compounded by the lack of health services expertise of its major investor, a venture capital firm that typically bankrolled high-tech start-ups. Although the chain had more than 100 clinics and generated annual sales of more than \$50 million during its heyday, it was never profitable. The business was dissolved after a decade.

HealthAllies, founded as a health care "buying club" in 1999, met a similar fate. By aggregating purchases of medical services not typically covered by insurance—such as orthodontia, in vitro fertilization, and plastic surgery—it hoped to negotiate discounted rates with providers, thereby giving individual customers, who paid a small referral fee, the collective clout of an insurance company. It was a classic do-good, do-well venture, but it failed to flourish.

The main obstacle was the health care industry's absence of marketing and distribution channels for individual consumers. Potential intermediaries weren't sufficiently interested. For many employers, adding this service to the subsidized insurance they already offered employees would have meant new administrative hassles with little benefit. Insurance brokers found the commissions for selling the service—a small percentage of a small referral fee—unattractive, especially as customers were purchasing the right to participate for a one-time medical need rather than renewable policies. Without marketing channels, the company found that its customer acquisition costs were too high. HealthAllies was bought



for a modest amount in 2003. UnitedHealth Group, the giant insurance company that took it over, has found ready buyers for the company's service among the many employers it already sells insurance to.

### ***In technology-based innovation***

The obstacles to technological innovations are numerous. On the *accountability* front, an innovator faces the complex task of complying with a welter of often murky governmental regulations, which increasingly require companies to show that new products not only do what's claimed, safely, but also are cost-effective relative to competing products.

As for *funding*, the innovator must work with insurers in advance of a launch to see to it that the product will be eligible for reimbursement (usually easier if it's used in treatment than if it's for diagnostic purposes). In seeking this approval, the innovator will typically look for support from industry *players*—physicians, hospitals, and an array of powerful intermediaries, including group purchasing organizations, or GPOs, which consolidate the purchasing power of thousands of hospitals. GPOs typically favor suppliers with broad product lines rather than a single innovative product. The intermediaries also include pharmaceutical benefit managers, or PBMs, which create “formularies” for health insurers—that is, the menu of drugs that will be made available at relatively low prices to enrollees.

Innovators must also take into account the economics of insurers and health care providers and the relationships among them. For instance, insurers do not typically pay separately for capital equipment; payments for procedures that use new equipment must cover the capital costs in addition to the hospital's other expenses. So a vendor of a new anesthesia technology must be ready to help its hospital customers obtain additional reimbursement from insurers for the higher costs of the new devices.

Even technologies that unambiguously reduce costs—by substituting capital for labor, say, or shortening the length of a

hospital stay—face challenges. Because insurers tend to analyze their costs in silos, they often don't see the link between a reduction in hospital labor costs and the new technology responsible for it; they see only the new costs associated with the technology. For example, insurers may resist approving an expensive new heart drug even if, over the long term, it will decrease their payments for cardiac-related hospital admissions.

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Innovators must also take pains to identify the best parties to target for adoption of a new technology and then provide them with complete medical and financial information. Traditionally trained surgeons, for instance, may take a dim view of what are known as minimally invasive surgery, or MIS, techniques, which enable radiologists and other nonsurgeons to perform operations. In the early days of MIS, a spate of articles that could be interpreted as an attempt by surgeons to protect their turf appeared in the *New England Journal of Medicine* claiming the techniques would cause an explosion of unneeded surgeries.

A little-appreciated barrier to technology innovation involves *technology* itself—or, rather, innovators' tendency to be infatuated with their own gadgets and blind to competing ideas. While an innovative product may indeed offer an effective treatment that would save money, particular providers and insurers might, for a variety of reasons, prefer a completely different technology.

One technology-driven medical device firm saw a major product innovation foiled by several such obstacles. The company's product, an instrument for performing noninvasive surgery to correct acid reflux disease, simplified an expensive and complicated operation, enabling gastroenterologists to perform a procedure usually reserved for surgeons. The device would have allowed surgeons to increase the number of acid reflux procedures they performed. But instead of going to the surgeons to get their buy-in, the company targeted only gastroenterologists for training,

setting off a turf war. The firm also failed to work out with insurers a means to obtain coverage and payment—it didn't even obtain a new billing code for the device—before marketing the product. Without these reimbursement protocols in place, physicians and hospitals were reluctant to quickly adopt the new procedure.

Perhaps the biggest barrier was the company's failure to consider a formidable but less-than-obvious competing technology, one that involved no surgery at all. It was an approach that might be called the "Tums solution." Antacids like Tums—and, even more effectively, drugs like Pepcid and Zantac, which had recently come off patent—provided some relief and were deemed good enough by many consumers. As a result, the technologically innovative device for noninvasive surgery was adopted very slowly, permitting rival firms to enter the field.

Similarly, a company that developed a cochlear implant for the profoundly deaf was so infatuated with the technology that it didn't foresee opposition from militant segments of the hearing-impaired community that objected to the concept of a technological "fix" for deafness.

## Changes in Health and its Characteristics in India

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One of the striking features of India's health care sector is the range of quality in available services. India is home to global leaders in innovation in and quality of health care such as the Narayana Hospitals, known for providing high-quality cardiovascular surgery at low cost, and the Aravind Eye Care System, whose hospitals provide a high volume of cataract surgery, as well as globally renowned medical teaching institutions such as the All India Institute of Medical Sciences, in New Delhi. Simultaneously, many Indians—especially the poor—receive unacceptably low-quality primary and hospital care. The rapidly growing burden of chronic diseases in India makes the low quality of care highly salient for health policy.

The challenge of low quality in health care is not unique to India. Studies from a range of developed and developing countries have demonstrated widespread problems with providers who make little effort to ensure that patients receive high-quality care, geographic variations in the quality of health care services, and high levels of medical errors.

Efforts to improve the quality of health care services in low-resource settings, including India, have typically focused on structural constraints. Recent studies in low-income countries have documented low levels of provider knowledge, in both the public and the private sectors, and have found evidence of large gaps between providers' knowledge and the care provided, sometimes

called “know-do gaps.” In addition to providers’ lack of capacity or knowledge in such settings, low quality of care could also be due to the lack of incentives in the health system or information problems in the health care market, combined with a lack of accountability among providers and poorly functioning governance systems in the health system. It is important to understand the process of delivering health care services and the factors that can limit providers’ effectiveness.

A cluster of articles in this issue of *Health Affairs* focuses on challenges related to the quality of health care in India. The cluster includes articles that describe challenges in using data from household surveys and hospital administrative records to measure the quality of care, examine a delivery model for high-quality surgical care, and evaluate a state-run ambulance service program designed to improve access to and use of care, as well as a DataWatch article on trends in state-level maternal and child health indicators. In addition to reviewing the state of research and evidence on the quality of health care in India, this chapter discusses critical challenges related to scaling up promising innovations and governance issues related to the quality of care.

### **Measurement Of Quality**

Efforts to improve the quality of health care in India and attempts to evaluate the impact of these efforts invariably face challenges because of the lack of reliable administrative data. Of the three categories of Avedis Donabedian’s measures of the quality of health care (structure, process, and outcomes), structural measures have traditionally received the most attention in the form of government surveys of health facilities and record keeping to track the availability of resources such as numbers of hospital beds and personnel and quantities of supplies. Whether these resources can be used productively in delivering high-quality care to patients depends on the process aspects of care, including the capacity of health-sector workers. Measuring the quality of the process of delivering health care and the resulting health outcomes is especially challenging, requiring methods and approaches that go beyond standard service statistics and facility surveys.

**Research Methods**

Recent studies in India and elsewhere that employed research methods such as observations of health care providers' performance, exit interviews of patients, vignette-based interviews of providers, and standardized patients who present unannounced to assess the experience of real patients demonstrate the potential of research methods to measure quality for a range of illnesses in primary care settings.

However, these research methods of quality assessment have limitations. For example, measuring the quality of care in settings where providers are aware that they are being assessed (such as through methods of direct observation or patient exit interviews) could bias results because of the so-called Hawthorne effect, with providers changing their behavior because they know that they are being observed or evaluated.

Using standardized patients who are incognito can help circumvent concerns about differences in the composition of the patient populations of various providers, Hawthorne effects, and know-do gaps that would be limitations with other methods. The standardized patient method is considered a gold standard for the measurement of quality. However, it is limited in the types of cases that can be presented to providers and the settings in which the method can be used without potentially harming the standardized patient or revealing that he or she is not a real patient.

Furthermore, the research methods described above are often inadequate for quality measurement in hospitals, where the process of health care delivery is even more difficult to observe than it is in primary care settings. The limitations of the methods underscore the importance of high-quality administrative data for both policy makers and researchers trying to identify quality gaps or to evaluate the impact of efforts to improve quality. For example, the article by Kimberly Babiarz and coauthors in this issue of *Health Affairs* describes one of the first evaluations of the Emergency Management and Research Institute's 108-ambulance system in India; the authors report challenges in directly measuring the quality of care because of data limitations.

***Promising Efforts***

There are several promising efforts to create new data sources to address this specific data gap in the direct measurement of the quality of care. For example, the Indian government's proposal to increase the frequency of the National Family Health Survey—moving from a ten-year cycle to a three-year one—holds the promise of generating more timely district-level data on the quality of health care and on health outcomes.

While the availability of new administrative data from hospital records and new household surveys presents unique opportunities to understand issues related to the quality of care in India, the use of new data to measure that quality is also a challenge. Two articles in this issue use data from household surveys and hospital administrative records to present findings from new data sets. Jishnu Das and Aakash Mohpal analyze a unique data set that matched 23,275 households across 100 villages to health care providers in each of the villages, to document the quality of rural health care in the state of Madhya Pradesh. The authors find no within-village association between residents' socioeconomic characteristics and the quality of health care providers. Importantly, the article also highlights how using quality measures based on random samples of providers will not reflect the quality of providers used by households, especially in settings with large variations in patient loads or with households whose members seek care outside of sampling areas.

Another article in this issue, by Matthew Morton and coauthors, analyzes claims data in the context of hospitals' quality of care in a district in the state of Orissa. Although India's National Accreditation Board of Hospitals and Healthcare Providers has developed recommendations for administrative data requirements, it has not been possible to analyze the quality of care nationally using hospital data, because of a lack of availability of data from many hospitals. To address this major gap, the Government of India is considering a national-level initiative to measure hospital quality in a standardized manner.

Similarly, the advent in 2008 of the Rashtriya Swasthya Bima

Yojna (RSBY; the National Health Insurance Plan) in India, with its standardized reporting requirement, has the potential to significantly change this limitation. The article by Morton and coauthors reports findings from an attempt to develop quality metrics using RSBY claims data. The authors find several limitations in currently available data, such as lack of completeness and mismatches, and problems with different systems of patient identification that prevent records' being linked across government programs, and they provide recommendations that could significantly improve data quality and completeness in future.

### **Strategies To Improve Quality**

A unique aspect of India's health care sector is the limited availability of formally trained health care providers—those with at least a bachelor of medicine and bachelor of surgery (MBBS) degree, the equivalent of an MD in the United States—in rural areas, which is partly due to the challenges of recruiting and retaining qualified staff in the public sector in such areas. As a result, most health care in rural areas of India, where 75 percent of the country's population lives, is delivered by providers who do not have formal medical training. Perhaps even more concerning is the fact that empirical studies have found that providers in such rural areas in India with formal medical training do not provide significantly higher-quality care compared to informal providers—which suggests that increasing the supply of formally trained providers alone might not solve the problem.

An alternative strategy for improving the quality of care, in the interim, might be to increase the capacity of the existing supply of informal providers in rural areas by providing them with tools and incentives to deliver better care. However, empirical evidence on the impact of strategies to engage with informal-sector providers to improve the quality of care remains scarce.

In an experimental intervention in 2013 in West Bengal, the Liver Foundation—in collaboration with researchers—offered more than seventy sessions of training (covering a range of critical topics in health and health care) to informal-sector providers over a period of nine months. Not only did the intervention significantly



improve the quality of care in terms of providers' correctly managing cases, but it also improved adherence to checklists for best practices.

In contrast, another large-scale effort to engage with informal private providers—this one in the state of Bihar—relied on the use of social franchising and telemedicine to create a large network of health care providers in rural areas. Despite training thousands of informal providers and incorporating them into this network, the program failed to improve the quality of care or to achieve any of the target health outcomes at the population level.

### ***Lessons Learned***

These diverse experiences hold valuable lessons both for efforts to improve quality and for evidence-based policy. One key lesson is that improving the quality of care delivered by informal providers who are already providing health services requires intensive efforts over a sustained period of time to change providers' practices. A second lesson is that the effectiveness of new approaches to improve the quality of care needs to be demonstrated empirically before they are scaled up. In a positive example of evidence-based policy, building on the success of the Liver Foundation's training program, the government of the state of West Bengal has recently approved a statewide scaling-up of the training program, in which the government will conduct once-a-week training for seven thousand providers for a period of six months.

### ***Efforts In The Formal Care Sector***

In addition to improving the quality of care provided in rural areas by informal-sector providers, there are several major ongoing quality improvement efforts in both public and private institutions in the formal sector.

#### ***Public Sector***

Several state governments in India have undertaken quality improvement initiatives (mostly focused on maternal and child health), combined with independent evaluations of the performance and impact of these initiatives. For example, the states of Bihar and Uttar Pradesh, two of the largest states in India that also have some

of the worst health indicators, are collaborating with external donors and researchers to implement strategies such as nurse mentoring and direct observation of deliveries—where trained observers watch and document the quality of services provided during delivery. With more than eight thousand deliveries observed since 2012, these efforts are currently being evaluated. The Uttar Pradesh government is also conducting a large-scale randomized implementation and evaluation of social accountability interventions to monitor and improve the delivery of health care services at the village level. Efforts such as these signal increasing interest from state governments in improving the quality of care and, importantly, increasing openness to adopting innovative methods to improve quality and evaluating them rigorously. Finally, efforts to invest in better data, support evaluations, and promote accountability also reflect governance improvements in the health sector.

### ***Private Sector***

Similarly, innovations in the formal private sector can make major contributions to improving the quality of health care. The experience of innovators such as the Aravind Eye Care System has several lessons for the management of health systems in the public and private sector. As Hong-Gam Le and coauthors report in this issue of *Health Affairs*, the system adopted widespread task shifting, using paraprofessionals to conduct most pre- and perioperative tasks to deliver high-quality cataract surgery at low cost. However, efficiency-enhancing strategies such as having paraprofessionals discuss surgical options with patients and not requiring surgeons to change gloves or operating gowns between patients are not without peril. While they might have been implemented successfully in the highly controlled environment of the Aravind Eye Care System, expanding these methods broadly to other settings could pose significant risks to patients and patient satisfaction. Empirical evidence is critical for policy makers to decide whether models such as that used by the system can be replicated in other settings, applied to other health care services, or scaled up nationally to meet population health care needs in India.

Given that the majority of health care in India is obtained not in the public sector but in the private sector, engaging with private providers is strategically important for health policy. While public-private partnerships in health care have received considerable attention, previous large-scale efforts have not yielded significant improvements in targeted health outcomes or out-of-pocket spending.

Performance incentive contracts for health care providers are another promising option to improve quality through engagement with the private sector. Although governments in developing countries have been eager to experiment with performance-based contracts in health care delivery, most performance incentive programs do not reward health improvements directly.

Furthermore, evidence on the impact on health outcomes of programs that reward the provision of inputs has been mixed. A field experiment in the state of Karnataka randomly assigned obstetric care providers to receive contracts with performance incentives based on either inputs (adherence to best-practice guidelines for obstetric care issued jointly by the Government of India and the World Health Organization) or health outcomes, and researchers found that both types of contracts reduced rates of postpartum hemorrhage by 20 percent, relative to the control arm. The study also found that input-based contracts required smaller incentive payments to achieve these reductions than output-based contracts did, but implementing input-based contracts required reliable administrative data on the inputs provided that are not routinely available. These data were collected with intensive fieldwork as part of this experiment. A significant area of investment for state and central governments in coming years will be to improve the quality of administrative data, as Morton and coauthors point out. Ongoing efforts in various states in India to strengthen their health management information systems are promising steps in this direction.

### ***Scaling Up***

A related and equally important issue in quality improvement concerns scaling up quality initiatives that are often developed in

small-scale controlled settings. This is especially pertinent for innovations with demonstrated efficacy, but not effectiveness, in real-world settings. Successfully scaling up such innovations requires a careful assessment of underlying market demand, an understanding of how the innovations might evolve or need to evolve during implementation, and an understanding of how the key market actors (providers and patients) respond to changing market conditions during the scaling up. Examples such as the Assess, Innovate, Develop, Engage, Devolve (AIDED) model of scaling up family health programs could be adapted for use in India to help policy makers as they prepare to implement large innovative programs that require implementing agencies to adapt dynamically in a complex environment.

A more cautious approach to scaling up successful pilot programs, given the scarcity of resources in countries such as India, would be to require evidence of effectiveness before scaling up a program—insofar as that is possible. Even when innovative programs have evidence of effectiveness, it would be prudent to rigorously evaluate the impact of their scaled-up implementation. Another critical reason to invest in generating robust empirical evidence on program effectiveness is that such evidence could prevent successful innovative programs from being discontinued for reasons of political economy or because of evolving trends in global health priorities.

### **Moving Forward On Improving Health Care Quality**

This cluster of *Health Affairs* articles examines issues central to the quality of health care in India against a background of significant ongoing reforms that create new opportunities for states to change their allocations of resources to the health sector. Given the measurement and data challenges that these articles address, it is important to note that even with improved data to clarify the problems and challenges in providing high-quality health care, the ability of national and state governments to take appropriate action to improve the quality of care is related to overall governance and accountability. In India's federalist structure, health is a matter of state jurisdiction. Although the central government has

traditionally tried to influence health-sector priorities through policies and vertical programs, states are ultimately responsible for how their respective health systems function.

A significant recent financial development in India was the fiscal federalism reform in 2015 that was part of the Fourteenth Finance Commission's effort to give states more control of spending. India's central government decided to increase the share of total tax revenue to be returned to individual states from 32 percent to 42 percent—an annual increase of approximately \$16 billion that states will have full autonomy in deciding how to allocate. However, major federally funded central programs such as the National Health Mission, an initiative to address the health needs of underserved and vulnerable population groups in India, witnessed reductions in federal commitments of funds, raising concerns that the health sector might be receiving fewer financial resources under the current administration than in the past.

Nonetheless, with increased autonomy as a result of the fiscal decentralization, state governments have the opportunity to respond to the needs of their respective populations and allocate resources as needed. Depending on states' ability and capacity to identify such needs and adequately address them with policy reforms, topics such as the quality of health care could receive timely attention. While multiple models of resource allocation and heterogeneity in state priorities are bound to emerge, we hope that policy makers and researchers in India will direct more attention to issues related to the quality of care in the health system.

## **DEMOGRAPHIC CHARACTERISTICS AND PROCESSES**

Demography is the study of human populations – their size, composition and distribution across space – and the process through which populations change. Births, deaths and migration are the big influencers of demography, jointly producing population stability or change. Apart from demographic concerns, study of human population also provides age specific data for planning, scientific, technical and commercial purposes.

**Demographic cycle**

There is a demographic cycle of 5 stages through which a nation passes.

- First stage (High stationary): This stage is characterized by a high birth rate and high death rate which cancel each other and the population remains stationary. Till 1920, India was in this stage.
- Second stage (Early expanding): The death rate begins to decline while the birth rate remains unchanged. As the birth rates remain high, the population starts to grow rapidly.
- Third stage (Late expanding)- Death rate declines still further and birth rate tends to fall, but population tends to grow as birth rate supersedes the death rates, but rates of population growth decelerates.
- Fourth stage (Low stationary)- This stage is characterized by low birth and low death rate with the result that the population becomes stationary. Most industrialized countries have gone through a demographic transition from a high birth and high death rates to low birth and low death rates.
- Fifth stage (Declining): Population begins to decline because birth rate is lower than death rate.

Our total fertility rate (TFR), the average number of children that would be born to a woman over her lifetime, is 2.2 and has reached replacement level, that is, the level of fertility at which a population exactly replaces itself from one generation to the next, in 17 of 28 states and 8 of 9 Union Territories (UT). This means that couples in most parts of India have just two children. And in the remaining states and one Union Territory (Dadra and Nagar Haveli), the pace of the decline over the last decade has been significant in most areas, and across all social groups, and will likely reach replacement levels in the next two decades. The wanted total fertility rate in India, that is, the number of children a couple wants or wanted over the course of their married life is

just 1.8, well below replacement level in all but four states and not a single UT\*.

Rather than our patriotic duty being defined by the number of children we bear, the narrative must shift to enabling all couples to achieve the number of children they want. One in ten Indian couples wants to delay the next pregnancy but fails to practise a method of contraception, because methods of their choice are inaccessible, they don't know about how to use these methods, or the system does not support them to overcome family objections and other obstacles. As a result, the unmet need for family planning is widespread, especially among the young, the population most likely to shape the future course of India's fertility. Among them, more than one in five (22 percent) wish to postpone pregnancy but don't have the information, means or self-efficacy to do so\*. Equally, for those who have an unintended pregnancy, the right to seek a safe abortion is effectively constrained by limited awareness of its legal status and the paucity of facilities and trained providers.

Our patriotic duty is also to ensure adherence to our enlightened laws and policies.

Our patriotic duty is also to ensure adherence to our enlightened laws and policies. Despite the Prevention of Child Marriage Act (PCMA), for example, more than one in four girls marry in childhood, and many without a say in when or whom they will marry. Both early marriage and the early childbearing that ensues are violations of girls' rights, denying them the very opportunities—education, work, health—that will enable them to space their pregnancies.

Our patriotic duty is also to ensure that all children attain at least a secondary school education. Yet the NFHS-4 reports that of those aged 20-24, just 60 percent of males and 52 percent of females had completed Class 10, and ASER reports have repeatedly shown mediocre learning outcomes. We have steadfastly denied boys and girls the right to grow into adulthood fully informed about pregnancy and how to prevent unintended pregnancy. The provision of comprehensive sexuality education remains taboo in

many settings—the Population Council’s UDAYA study (Bihar and Uttar Pradesh), for example, notes that just 19 percent of girls and 8 percent of boys had ever received sex education. As a result, many enter adulthood and marriage unaware of even the basics of how pregnancy happens—many do not know that pregnancy can occur the first time a girl has sexual relations, or that a missed period may be a sign of pregnancy. Neither teachers nor health care providers are comfortable about providing this information to the young.

### **Factors influencing healthy ageing**

A longer life brings with it opportunities, not only for older people and their families, but also for societies as a whole. Additional years provide the chance to pursue new activities such as further education, a new career or a long-neglected passion. Older people also contribute in many ways to their families and communities. Yet the extent of these opportunities and contributions depends heavily on one factor: health.

Evidence suggests that the proportion of life in good health has remained broadly constant, implying that the additional years are in poor health. If people can experience these extra years of life in good health and if they live in a supportive environment, their ability to do the things they value will be little different from that of a younger person. If these added years are dominated by declines in physical and mental capacity, the implications for older people and for society are more negative.

Although some of the variations in older people’s health are genetic, most is due to people’s physical and social environments – including their homes, neighbourhoods, and communities, as well as their personal characteristics – such as their sex, ethnicity, or socioeconomic status. The environments that people live in as children – or even as developing fetuses – combined with their personal characteristics, have long-term effects on how they age.

Physical and social environments can affect health directly or through barriers or incentives that affect opportunities, decisions and health behaviour. Maintaining healthy behaviours throughout life, particularly eating a balanced diet, engaging in regular physical



activity and refraining from tobacco use, all contribute to reducing the risk of non-communicable diseases, improving physical and mental capacity and delaying care dependency.

Supportive physical and social environments also enable people to do what is important to them, despite losses in capacity. The availability of safe and accessible public buildings and transport, and places that are easy to walk around, are examples of supportive environments. In developing a public-health response to ageing, it is important not just to consider individual and environmental approaches that ameliorate the losses associated with older age, but also those that may reinforce recovery, adaptation and psychosocial growth.

### ***Challenges in responding to population ageing***

There is no typical older person. Some 80-year-olds have physical and mental capacities similar to many 30-year-olds. Other people experience significant declines in capacities at much younger ages. A comprehensive public health response must address this wide range of older people's experiences and needs.

The diversity seen in older age is not random. A large part arises from people's physical and social environments and the impact of these environments on their opportunities and health behaviour. The relationship we have with our environments is skewed by personal characteristics such as the family we were born into, our sex and our ethnicity, leading to inequalities in health.

Older people are often assumed to be frail or dependent and a burden to society. Public health professionals, and society as a whole, need to address these and other ageist attitudes, which can lead to discrimination, affect the way policies are developed and the opportunities older people have to experience healthy aging.

Globalization, technological developments (e.g., in transport and communication), urbanization, migration and changing gender norms are influencing the lives of older people in direct and indirect ways. A public health response must take stock of these current and projected trends and frame policies accordingly.

**HEALTH AND LIFE PROSPECTS, CAUSES OF DEATH****Healthcare in India: Problems and Prospects**

By the application of e-Health, knowledge or information pertaining to a quality and sophisticated healthcare system can be made accessible to remote corners of India, where only rudimentary health infrastructure is available. For example, a team of medical experts sitting in London or the USA can impart their diagnostic skills or prescribe appropriate medication to a critically ill patient in rural Bihar, through the help of effective information technology networks. Telemedicine can also help in training of medical personnel across the country, and thereby India can improve its human resource in health sector, by making them abreast of the current developments in the field of medicine.

Despite all the recent hypes about India's perceived emergence as a knowledge superpower, which are bandied by the popular media with tacit support from the establishment, with uncommon enthusiasm, there is no denying the fact that India as a country, even after six decades of its political independence, is still failing miserably to address the basic needs of its multitude of teeming millions. And it is common economic wisdom that without sustained development measures, knowledge can't flourish in a society. At best it can remain confined to the elite echelons of the society, who have their eyes set on the Silicon Valley.

Perhaps one of the most basic of these basic development parameters is the need for basic healthcare to its population. Health is a very neglected sector in India. In the past decade, the average expenditure of the Union Government on health and related areas has been around 0.35 per cent of GDP, and in the 2007-08 budget, the budgetary allocation for health was only a dismal 0.2 percent of India's GDP. This is abysmally low by global standards.

***A Lopsided Story***

The WHO recommendation for spending in health is 5 percent of the state's GDP; a target which needs enormous political will for India to reach in the near future. However, this meagre spending on health is also not evenly distributed; a major chunk of the

public healthcare spending is concentrated in the metros. Ironically 80 percent of health allocation in India is in urban areas, though 74 percent of India's population lives in rural areas. It doesn't take a statistician to gauge that rural India of 2007 has very limited access to quality healthcare.

The unequal true story doesn't end here. About 85 percent of healthcare in India is channeled through private enterprises, and private healthcare is beyond the reach of majority of Indian populace. Though India boasts of a few super-specialty hospital chains like Apollo, Fortis and Max, etc. and they do offer medical services at par with global standards, but their prohibitive costs are beyond the reach of the vast majority of Indian populace.

The fact that majority in India is outside the safety net of medical insurance, further compounds the problem. Thus there is a yawning gap between the privileged, and the not so privileged, and the underprivileged class in India, in terms of access to quality healthcare, both in terms of medical and human resources. While India has 30,000 MBBS graduates coming out of its colleges every year, the entire rural health system of more than 750 million people never has more than 26,000 doctors. Moreover, the better skilled and educated among them always naturally opt for greener pastures in metros and foreign countries, leaving rural India reeling under an acute paucity of high level medical specialists.

Amidst the backdrop of such a sordid scenario, it comes as no wonder that in India, annually, on an average, 22 lakh infants and children die from preventable illnesses and about one lakh mothers succumb to death during child birth. India has an unhealthy infant mortality ratio of 57 per 1000 live births, which is even higher than that of the less developed nations like Bangladesh and Namibia, and the maternal mortality ratio of the country; even as late as 2006, stood at a shameless 540 for every 100,000 live births. In rural areas this figure was 619. What's more, according to UNICEF, India also has the dubious distinction of accounting for 20 percent of the world's maternal mortality cases. It is alarming that there are 2.5 million HIV/AIDS victims in India, but what is more alarming is that lakhs of people die in this

country through tuberculosis every year, which is easily curable by today's medicine.

At the very outset, we have to acknowledge that the main problem in India's health sector is not the unavailability of medicine and human resources, but their proper accessibility and distribution. Like in everything else, the health sector in India is plagued more by the distribution lacunae than the production bottlenecks.

### ***Silver Linings***

By rattling off the above statistics, I am here not implying that nothing has been done to improve India's healthcare. There have been developments in the recent years, but much more needs to be done to address this mammoth problem. The fact that the Union Government has proposed to increase the allocation of the National Rural Health Mission(NRHM) from Rs.8207 crore in the 2006-07 budget to Rs.9947 crore in the 2007-08 budget reflects the present government's concern about the country's appalling healthcare. Overall, the Finance Minister has enhanced the expenditure on health and family welfare by 21.9 percent in the current fiscal, as compared to that of the previous fiscal year. The Finance Minister has also expressed the present government's determination and resolve to achieve zero level growth of HIV/AIDS in his recent budget. The provision for the AIDS Control Programme has also been proposed to be stepped up in the current budget to Rs.969 crore. But all said and done, these are small steps...we need some revolution of sorts to make any significant difference to our healthcare system.

### ***IT can be a Healthy Solution***

In this depressing scenario, e-Health or electronically enabled healthcare can provide the much-needed silver lining and bridge the gaps in healthcare access that is present in the Indian society. In fact, India and many other developing countries need e-Health more than the developed world, because conventional healthcare has failed to reach the former group's large sections of underserved population.

By application of e-Health, knowledge or information pertaining to a quality and sophisticated healthcare system can be made accessible to remote corners of India, where only rudimentary health infrastructure is available. For example, a team of medical experts sitting in London or the USA can impart their diagnostic skills or prescribe appropriate medication to a critically ill patient in rural Bihar, through the help of effective information technology networks. Telemedicine can also help in training of medical personnel across the country, and thereby India can improve its human resource in health sector, by making them abreast of the current developments in the field of medicine. However, before all things, the government and the private players have to collectively ensure that the cost to incur the benefits of e-Health are within the reach of the majority of India; otherwise the entire exercise will be a futile one from a development perspective, though reflecting mercenary dividends.

Besides ensuring a more equitable access to healthcare delivery, e-Health in India, among myriad other welfare-oriented aspects, can also ensure knowledge management in healthcare industry and facilitate a more optimal utilization of limited medical resources. The example of the former is an electronic data base of patients' history and other basic health performance indicators such as sterilisation, birth attendance, and immunisation rates in a given district. Electronic health records can ensure easy access to patient's information across the globe, minus the clinical errors. Another example of optimal allocation of limited healthcare resources can be the proper allocation of healthcare centers across the geographic ambit of a given district, achieved through geographic mapping systems.

### ***Inches Achieved, Miles to go***

There are some significant initiatives by the public as well as the private sector to increase e-Health's incidence in the health sector. The Integrated Disease Surveillance Project of the Ministry of Health and Family Welfare, and the Department of Information Technology's initiatives of networking the district hospitals in Mizoram and Sikkim with Apollo Hospital, Delhi, and its

development of Teleoncology network in Kerala and Tamil Nadu, are noteworthy e-Healthy achievements in the public sector.

ISRO's telemedicine programme aims at connecting the rural and district hospitals in the country with the super-specialty hospitals in the cities through INSAT. Under this satellite network, while ISRO provides the software, hardware and communication equipments as well as satellite bandwidth, the specialty hospitals provide the infrastructure and human resource, and also maintain the system. Presently ISRO's telemedicine network covers 165 hospitals, which include 132 district/rural hospitals and 33 super-specialty hospitals. What's more, the Indian Space Research Organisation (ISRO) is envisaging to bring more government hospitals across the country, under the ambit of its telemedicine programme. Other important players and institutions furthering the cause of e-Health in the country include the names of AIIMS, C-DAC and Sanjay Gandhi Postgraduate Institute of Medical Sciences(SGPGIMS) in Lucknow. In the private sphere, Apollo Telemedicine Networking Foundation(ATNF) is doing a yeomen service to facilitate the progress of telemedicine across India, and has even established overseas telemedicine units in Colombo, Dhaka, Maldives and Lagos among others. With over 17,000 teleconsultations, ATNF has emerged as possibly the largest multi-specialty telemedicine network in South Asia. However, though Apollo may be the first player to enter the field of telemedicine, when it started its telemedicine network in the Aragonda village of Andhra Pradesh way back in 1999, but lately there have been many other private players making noteworthy inroads in the e-Health domain. The names of Narayana Hrudayalaya, Bangalore and Aravind Eye Hospital based in Madurai, must deserve special mentions in this regard.

### ***Handle With Care***

However, all said and done, we have taken only a few fumbling forays towards realising the seemingly enormous potential of e-Health in our healthcare scenario, and there are miles to go. For this, only talks and seminars wouldn't do. We need proactive action to translate the idea of e-Health into a welcome reality. We need to pull up our socks as far as adoption of ICT in medicine in India

is concerned. At present the penetration of e-Health in the Indian context leaves much to be desired. An average mid-sized hospital in India (which are mostly concentrated in cities) spends less than 1.5 percent of its turnover on IT (new investments plus the annual maintenance) while a large hospital spends only around two percent of its turnover on IT, which by any standards is not a noteworthy achievement. At the same time, we should not throw caution to winds and celebrate the adoption of this amalgamation of ICT and medicine without circumspection. e-Health's usage must be very prudent, and care should be taken to see that the benefits of ICT revolution helps to transmit the benefits of medical knowledge effectively to the underserved sections of the population of India, without compromising on their privacy, which may be revealed through insensitive dissemination of sensitive electronic health records among other things.

### **Causes of death in India**

You're more likely to die of a stroke than a plane crash. But several fatal conditions on this list can be prevented and cured.



***Fig. India's leading causes of death include diseases such as tuberculosis and respiratory problems, which can be easily cured with medication.***

Do you worry about your airplane crashing each time you take a flight? Don't be. There is a one in a 1,000,000 chance of a traveller being harmed in an aircraft. Your risk of being harmed during medical treatment is one in 300, which has prodded India's Health Ministry to invite comments for.

Most of us have misplaced anxieties and fears about what is most likely to kill us, but those who fear heart disease have got it right, shows data for India from The Global Burden of Disease Study for 2016, which is an observational epidemiological study of risk to health and life from diseases, injuries and risk factors, such as bad diets, tobacco use and high blood pressure. Unhealthy diets alone are a risk factor in one in five global deaths, raising the risk of heart disease, diabetes, obesity, high blood pressure, among others.

The Institute for Health Metrics and Evaluation at the University of Washington uses GDB 2016 data to list the top causes of deaths in India.

1. Heart disease: Heart disease has remained the leading cause of death in India for more than two decades fuelled by unhealthy diets leading to high blood pressure and the buildup of blood fats (plaque) inside the walls of the arteries, inactivity, obesity and smoking.
2. Chronic obstructive pulmonary disease: Chronic obstructive pulmonary disease, including pulmonary hypertension, occupational lung disease, and interstitial lung disease, cause irreversible damage to the airways and other lung structures to lower breathing capacity. Lung diseases are not curable, but can be managed using treatments that dilate major air passages and improve shortness of breath. Smoking, air pollution, occupational chemicals, dust and frequent lower respiratory infections aggravate lung conditions.
3. Diarrhoea: Diarrhoeal diseases are one of the biggest causes of under-5 deaths, killing between 800,000 and one million children, hospitalising 900,000 and causing 327,000 visits to clinics each year. Adding Rotavirus vaccine to India's



universal vaccination programme in 2016 to protect children against the leading cause of severe diarrhoea in young children, helped lower numbers rapidly.

4. Stroke: Stroke, which was ranked as the sixth biggest cause of death in 2005, rose to become the fourth biggest killer in India. The risk factors for stroke, which is also known as cerebrovascular disease, are the same as heart disease, but the disability caused by a brain attack is often higher as it may cause partial or full paralysis
5. Lower respiratory infections: With improved diagnosis and infection management, lower respiratory infections such as pneumonia, lung abscess and acute bronchitis have slipped one position down to become the fifth biggest cause of death. It's among the most common infection in older adults and people with lowered immunity from other infections, such as seasonal influenza. Symptoms include shortness of breath, weakness, fever, coughing and fatigue that persist for more than a week must be investigated.
6. Tuberculosis: India accounts for 2.8 million of the 10.4 million new tuberculosis (TB) cases globally, according to the World Health Organization's Global TB Report 2016. India's national programme provides free medicines and treatment to all but many patients do not complete the full course of medicine, which must be taken for six to eight months for uncomplicated disease. This leads to drug resistant infection, which takes longer to treat using more toxic and expensive medicines.
7. Neonatal preterm birth: With 80.8% of India's 226 lakh annual births taking place in hospitals, health centres and clinics, deaths from premature birth-related complications such as low birth-weight have dropped since 2005, when it was the fourth cause of death.
8. Self harm: Ranked the 10th cause of death in 2005, self harm or suicide is now India's eighth biggest killer. Data from the National Crime Records Bureau (NCRB) has

recorded a corresponding increase of 17.3%, 1,33,623 in 2015, up from 1,13,914 in 2005, in suicides over the past two decades decade.

9. Road injuries: Death from traffic accidents rose three points over two decades. Road accidents rose by 3.1% in one year, from 4,50,898 in 2014 to 4,64,674 in 2015 – with deaths going up by 5.1%, from 1,41,526 to 1,48,707 during the same period, shows NCRB data. States that show the sharpest increase were Kerala, Uttar Pradesh and Chhattisgarh.
10. Other neonatal conditions: Breastfeeding, vaccination against common infection and neonatal care is helping more babies thrive and survive neonatal : nfections such as septicaemia, birth asphyxia and birth trauma.

## **THE RELATIONSHIPS OF HEALTH**

India's health system faces the ongoing challenge of responding to the needs of the most disadvantaged members of Indian society. Despite progress in improving access to health care, inequalities by socioeconomic status, geography and gender continue to persist. This is compounded by high out-of-pocket expenditures, with the rising financial burden of health care falling overwhelming on private households, which account for more than three-quarter of health spending in India. Health expenditures are responsible for more than half of Indian households falling into poverty; the impact of this has been increasing pushing around 39 million Indians into poverty each year. In this paper, we identify key challenges to equity in service delivery, and equity in financing and financial risk protection in India.

In much of India, the experience of family relationship quality is shaped by the joint family system. In an archetypal joint family, an older married couple resides along with their sons, daughters-in-law, unmarried daughters, and grandchildren in a single household. The joint family system incorporates both joint and nuclear forms as family members shift over time. When examined from the life course of a woman, married life is customarily begun

as a daughter-in-law in a joint family where she resides with her husband and in-laws. Over time, her joint family transitions into a nuclear family as her parents-in-law die or the family partitions. Joint families partition for a variety of reasons, including becoming too large to occupy a single home and family members migrating to other locations for work. Later in life, as her sons marry and bring their wives into the family, a woman again becomes a member of a joint family, but this time as a mother-in-law. This pattern can be seen in the survey data from Madhya Pradesh used in this study. Ninety percent of respondents began married life in a joint family, but by the time of their third pregnancy just over half of respondents resided in a joint family.

### **Getting Center-State Relationships Right for Health in India**

India represents about one fifth of global disease burden, and much of it is preventable. Yet India's government spends only 1 percent of GDP on health, of which 80 percent is subnational, raised and spent by states themselves. Recent reports suggest that expenditure by the central Ministry of Health and Family Welfare will be reduced by 20% for the current financial year to achieve fiscal deficit targets. But in spite of these cuts, an accessible, affordable, and effective health system is still a priority for Prime Minister Modi's government.

The government's strategy is to run more central money directly to states in the spirit of 'cooperative federalism' – a strategy some called Modi's "biggest bang political reform." However, state-level public service provision in India has chronically underperformed and is plagued by poor quality and corruption.

While life expectancy has increased dramatically over the past decade, it has been a challenge to directly link improvements in health outcomes with public spending on health or health services. For example, the National Rural Health Mission's (NHRM) budget tripled between 2005-06 and 2011-12, but failed to lower India's infant mortality, maternal mortality, and total fertility rates to targeted levels. Similarly, while NRHM enabled state governments to convert more than 14,500 primary health facilities to 24/7 facilities

(an increase of 500%), the influx of money failed to increase doctor attendance rates in these facilities.

The advent of Rashtriya Swastha Bima Yojana (National Health Insurance Scheme, RSBY) and other state-level health insurance schemes did lead to increases in financial protection for the poor but there has been little good news elsewhere to report (and some incredibly bad news here: Are Institutional Births Institutionalizing Death?).

This begs the question: how can spending the same money through current arrangements really make a difference?

### ***What we know about current programs***

Understanding the impact and limitations of current programs is a first step to finding the answer. Both NRHM and RSBY require better evaluation, particularly of their impact on health. In the meantime, a couple of issues stand out.

First, NRHM was a noble mission designed by well-meaning Delhi bureaucrats to strengthen state health systems. However, in practice, the scheme adopted a one-size-fits-all approach that placed little regard on the socio-economic diversity across states and forced states to buy into conditions that may have limited innovation or created unnecessary structures – a health center had to look a certain way, an “accredited social health activist” or ASHA had to be part of the plan.

India is simply too big and too decentralized to require single solutions for health care provision.

Second, a main problem with centrally sponsored schemes in general is that federal monies have done little to respond to need; the figure below illustrates that center-to-state transfers are divided more or less equally across states on a per capita basis in 2009-2010, with no regard for differences in need nor the amount of funding that states mobilize themselves for health. While states like Kerala may have enough of their own funds to reduce IMR, states like Uttar Pradesh require greater levels of central assistance to tackle this problem.

Finally, the current approach does little to relate funding to gains in health and health care. There is a small performance-related transfer currently in the NRHM but forthcoming work suggests that the rewards formula as currently designed does not in fact reward performance. In the absence of transfers that reward performance, the state and center are stuck in a principal-agent trap and efforts must be made to realign these incentives.

### **Infant Mortality Rate and Per Capita Health Expenditures across Indian States in 2009-2010**

#### ***A better way forward***

Before implementing a new reform, government will need to examine current programs, the fiscal architecture underpinning centrally-sponsored schemes and identify the health outcomes it would like to see improved. A two-pronged approach of equalization grants and performance/accountability incentives may help India strengthen its system of fiscal transfers as well as its health system.

Equalization grants don't mean the same amount of money for every state as is current practice, but instead should level the playing field so that the poorest states are able to provide a similar standard of health care as the wealthiest state. This means that a portion of federal monies should compensate for differentials in levels of underlying health and fiscal need. Some thought should also be given on how central monies do or do not incentivize a state's own fiscal effort on health.

As for performance incentives, India may consider models where the central and state governments collaboratively design a performance-based resource allocation to link a district's funding to its health needs. Each district might automatically receive 70 percent of its base allocation; to claim the remaining 30 percent, a district could improve performance according to defined indicators including quality and coverage. This approach, tried out in Argentina's Plan Nacer and Pakistan's Punjab province for example, gives a clearer incentive to improve delivery as well as outcomes.

Better and timelier data, and rigorous monitoring and evaluation, are also needed, whatever transfer scheme is adopted. One key near-term data issue relates to costing; proposed health insurance benefits plans are not costed but instead extrapolated from spending on existing insurance schemes, not recognizing state-level differences in need and cost structures, and inefficiencies in existing provision. Further, relating costed benefits plans to sizing and risk adjustment of center-to-state transfers is also pending. In too many countries, a benefits plan has little to do with the amount of per capita public transfer to subnationals actually available, which may argue for starting from the budget constraint to set priorities.

## The Health Care Provision System in India

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India is home to one of the world's largest healthcare systems. Despite huge challenges, the country provides free, albeit basic, healthcare to over one billion people. That's no small accomplishment! It's also enjoyed significant triumphs, such as eradicating polio in 2011. Additionally, communicable diseases in India fell by a remarkable 50% between 1990 and 2016. These are tremendous feats for the world's second most populated country. However, behind these achievements are some harrowing statistics. The country ranks 112 out of 191 countries on the World Health Organization's ranking of global healthcare systems. Infant mortality remains unacceptably high, approximately seven times that of the United States. *India's healthcare system* presents many serious challenges for both residents and visitors.

### Overview of the Indian Healthcare System

In theory, at least, India has universal healthcare. In some states, as much as 90% of the public relies on government-run hospitals, which are free. However, as critics quickly point out, India's universal healthcare is not exactly universal in nature. There are significant gaps in care based on gender, social class, and geography.

By law, providing healthcare services is a state responsibility. States are additionally charged with addressing public health,

nutrition, and standards of living. Just how well they succeed in their undertakings varies tremendously. Corruption is widespread, both among government and healthcare officials. As a result, public facilities are underfunded. Standards of care are basic (at best) and sometimes abhorrent (at worst). Supplies that are supposed to be guaranteed, such as free medications, are often unavailable. Unsurprisingly, wait times are significant. Patients sometimes resort to bribery in an effort to receive timely care.

However, Indian patients have reason to be hopeful. Some 150,000 Health and Wellness Centres (HWCs) have been established to improve timely healthcare access. This has been achieved in part by transforming existing Sub Health Centres to deliver comprehensive primary health care.

### **COSTS OF THE HEALTHCARE SYSTEM**

India's healthcare system is funded through government taxation. In 2019, the government was spending \$36 billion on healthcare annually, or roughly 1.23% of its GDP. When out-of-pocket costs that patients spend for private healthcare are taken into account, the country's total healthcare GDP equals 3.6%.

India has the largest private healthcare system in the world. It's so pervasive that only about 20% of all healthcare services fall under the purview of public funding. Unlike many other countries, it's not just wealthy citizens using private facilities. Much of the demand is driven by financially precarious citizens who can ill-afford to go to a private clinic. However, they feel they have no other choice in order to receive timely care.

In an effort to relieve the financial and healthcare burdens of India's most vulnerable people, the government introduced a new national health protection plan in 2018. Called Ayushman Bharat, it targets the poorest half of India's population, some 500 million people. Patients are allocated \$7,200 in annual coverage to put towards the cost of care at private hospitals. The country's newly developed Health and Wellness Centres are an additional core component of Ayushman Bharat, as their focus is on making comprehensive primary care more accessible.



**The Differences Between Private and Public Care**

While a significant proportion of India's population makes use of private healthcare facilities, very few carry private health insurance. Just 17% to 25% are thought to have this form of coverage. As there is no regulatory authority in India to oversee private healthcare providers and insurance companies, costs can be high. The majority of local patients opt to pay a la carte for services as they need them. Sadly, in some cases, patients take on significant debt in order to afford care.

The standard of healthcare in private facilities ranges from adequate to world-class. Those private facilities which mainly target local working-class residents differ greatly from those targeting expats and wealthy locals. In all cases, patients can expect comfortable facilities with greater personal privacy. Facilities are cleaner, more organized, and more up-to-date than public ones. Wait times are shorter and there is a wide variety of specialists on staff. And, at the high end of the scale, the swankiest private hospitals can resemble hotels. They feature large, comfortable rooms, good food, and personalized care.

Perhaps unsurprisingly, India is a world leader in medical tourism, thanks in large part to the standard of care found at the country's top private hospitals. Uninsured patients from countries such as the United States can travel to India for procedures such as joint replacement and pay just a fraction of the price they'd face at home.

***Rural Healthcare In India***

The state of healthcare in rural India is problematic, to say the least. 74% of India's doctors serve urban areas. In India's vast rural territories, doctors are very sparse indeed. This statistic seems unlikely to change significantly. Doctors are frustrated by the poor housing, education options, and infrastructure in rural areas. Then there are the hospitals themselves. There are half as many beds compared to urban facilities. Additionally, rural hospitals are perpetually the last to receive new equipment. This all adds up to devastating results for local healthcare. For instance, children

under five in certain rural areas have higher mortality rates than those in urban environments.

### **Healthcare System In India**

India has a vast health care system, but there remain many differences in quality between rural and urban areas as well as between public and private health care. Despite this, India is a popular destination for medical tourists, given the relatively low costs and high quality of its private hospitals. International students in India should expect to rely on private hospitals for advanced medical care.

Studying in India offers a number of health challenges that students from developed countries may be unused to, so it is important to know how the health care system in India operates in the event you need it. Health care in India is a vast system and can be much like the rest of the country: full of complexity and paradoxes.

#### ***History and Today***

India's Ministry of Health was established with independence from Britain in 1947. The government has made health a priority in its series of five-year plans, each of which determines state spending priorities for the coming five years. The National Health Policy was endorsed by Parliament in 1983. The policy aimed at universal health care coverage by 2000, and the program was updated in 2002.

The health care system in India is primarily administered by the states. India's Constitution tasks each state with providing health care for its people. In order to address lack of medical coverage in rural areas, the national government launched the National Rural Health Mission in 2005. This mission focuses resources on rural areas and poor states which have weak health services in the hope of improving health care in India's poorest regions.

#### ***Private and Public***

The health care system in India is universal. That being said,

there is great discrepancy in the quality and coverage of medical treatment in India. Healthcare between states and rural and urban areas can be vastly different. Rural areas often suffer from physician shortages, and disparities between states mean that residents of the poorest states, like Bihar, often have less access to adequate healthcare than residents of relatively more affluent states. State governments provide healthcare services and health education, while the central government offers administrative and technical services.

Lack of adequate coverage by the health care system in India means that many Indians turn to private healthcare providers, although this is an option generally inaccessible to the poor. To help pay for healthcare costs, insurance is available, often provided by employers, but most Indians lack health insurance, and out-of-pocket costs make up a large portion of the spending on medical treatment in India.

On the other hand private hospitals in India offer world class quality health care at a fraction of the price of hospitals in developed countries. This aspect of health care in India makes it a popular destination for medical tourists. India also is a top destination for medical tourists seeking alternative treatments, such as ayurvedic medicine. India is also a popular destination for students of alternative medicine.

International students should expect to rely on private hospitals for advanced medical treatment in India. Local pharmacists can be a valuable resource for most minor health ailments.

## **HEALTH SYSTEMS STRENGTHENING**

Adoption of the Indian Public Health Standards: This defined not only the service package that each facility must provide, but also specified the minimum inputs required to ensure quality of care, in terms of infrastructure, equipment, skilled human resources, and supplies. It was an assurance to the states of financing the gaps between available levels of these inputs and the levels needed to achieve the IPHS norms. A substantial increase in these inputs was driven by facility surveys to identify gaps and then planning and financing to close these gaps.

Quality standards have been defined with respect to clinical protocols, administrative and management processes and for support services. The Operational Guidelines for Maternal and Newborn care published by the Ministry of Health and Family Welfare comprehensively defined such quality standards for RCH care.

**Skill gaps and Standard Treatment Protocols:** Skill sets and standard treatment protocols required for provide quality RCH services and training packages that would provide these skill sets were designed. These include the Skilled Birth Attendance (SBA) training package for ANMs, the Navjat Shishu Suraksha Karyakram (NSSK) and the IMNCI packages for ANMs, the Home Based Newborn Care (HBNC) for ASHAs, and the Emergency Obstetric Care (EmOC) package for doctors. These training packages also introduced the standard treatment protocols in each of these areas.

**Hospital Management Societies (RKS) and untied funds:** The mandatory creation of a hospital management society (Rogi Kalyan Samiti) and empowering this body with untied funds has allowed public participation also contributed to improved quality of care. RKS members were trained and sensitized on quality of care issues. Before the onset of NRHM, many states generated funds from user fees, however the untied grants to all public health facilities were made available under NRHM which reduced financial barriers to access of health care. This is clearly evident from the increased utilization of indoor and outdoor services at health facilities

**Quality Improvement Programmes:** NRHM also supports initiatives for building quality management systems. These range from formation of quality assurance committees which use check lists and periodic monitoring visits to assess quality gaps, to more structured quality management systems leading to a third party audit and quality certification- either using ISO 9001: 2008 or NABH. Till date, 82 facilities have been certified by ISO, nine facilities have been certified by NABH and 446 facilities are under process of certification.

## **THE STRUCTURE OF THE PROVISION SYSTEM**

### **Public health-care infrastructure in India**

India has a mixed health-care system, inclusive of public and private health-care service providers. However, most of the private health-care providers are concentrated in urban India, providing secondary and tertiary care health-care services. The public health-care infrastructure in rural areas has been developed as a three-tier system based on the population norms and described below. The urban health system is discussed in the article on *Urban Newborn*.

#### ***Sub-centers***

A sub-center (SC) is established in a plain area with a population of 5000 people and in hilly/difficult to reach/tribal areas with a population of 3000, and it is the most peripheral and first contact point between the primary health-care system and the community. Each SC is required to be staffed by at least one auxiliary nurse midwife (ANM)/female health worker and one male health worker (for details see recommended staffing structure under the Indian Public Health Standards (IPHS)). Under National Rural Health Mission (NRHM), there is a provision for one additional ANM on a contract basis.

SCs are assigned tasks relating to interpersonal communication in order to bring about behavioral change and provide services in relation to maternal and child health, family welfare, nutrition, immunization, diarrhea control and control of communicable diseases programs. The Ministry of Health & Family Welfare is providing 100% central assistance to all the SCs in the country since April 2002 in the form of salaries, rent and contingencies in addition to drugs and equipment.

#### ***Primary health centers***

A primary health center (PHC) is established in a plain area with a population of 30000 people and in hilly/difficult to reach/tribal areas with a population of 20000, and is the first contact point between the village community and the medical officer.

PHCs were envisaged to provide integrated curative and preventive health care to the rural population with emphasis on the preventive and promotive aspects of health care.

The PHCs are established and maintained by the State Governments under the Minimum Needs Program (MNP)/Basic Minimum Services (BMS) Program. As per minimum requirement, a PHC is to be staffed by a medical officer supported by 14 paramedical and other staff. Under NRHM, there is a provision for two additional staff nurses at PHCs on a contract basis. It acts as a referral unit for 5-6 SCs and has 4-6 beds for in-patients. The activities of PHCs involve health-care promotion and curative services.

### ***Community health centers***

Community health centers (CHCs) are established and maintained by the State Government under the MNP/BMS program in an area with a population of 120000 people and in hilly/difficult to reach/tribal areas with a population of 80000. As per minimum norms, a CHC is required to be staffed by four medical specialists, that is, surgeon, physician, gynecologist/obstetrician and pediatrician supported by 21 paramedical and other staff. It has 30 beds with an operating theater, X-ray, labor room and laboratory facilities. It serves as a referral center for PHCs within the block and also provides facilities for obstetric care and specialist consultations.

### ***First referral units***

An existing facility (district hospital, sub-divisional hospital, CHC) can be declared a fully operational first referral unit (FRU) only if it is equipped to provide round-the-clock services for emergency obstetric and newborn care, in addition to all emergencies that any hospital is required to provide.

It should be noted that there are three critical determinants of a facility being declared as a FRU: (i) emergency obstetric care including surgical interventions such as caesarean sections; (ii) care for small and sick newborns; and (iii) blood storage facility on a 24-h basis.

**THE REGIONAL DIFFERENCES OF THE HEALTH CARE PROVISION SYSTEM**

The phenomenon of population aging in India has emerged as a major concern for policymakers, researchers and other stakeholders. In light of the profound impact that the aging of population in India can potentially have on the social, political and economic spheres alike, research on the health and well-being of the elderly population is the need of the hour to ensure and facilitate the process of healthy aging. India has been experiencing a gradual increase in both the size and share of the older population over the past few decades.

The elderly population has increased from 24.71 million in 1961 to 104 million in 2011, constituting 5.6% in 1961 to 8.6% of the total population in 2011. The older population in India is growing at a rate three times higher than the rate of growth of population as a whole. This changing demographic landscape of India is largely attributed to an improvement in the longevity, among other factors like falling fertility. Life expectancy at birth in India has increased from 42years in 1961 to 69years in 2018 and is projected to increase to 76years by 2050. Likewise, both life expectancy at age 60 and 80 has improved considerably and stands at 18 and 7years respectively, projected to rise to 21 and 8.5years by 2050. However, the more important question that lingers is whether this increase in longevity has been accompanied by a commensurate improvement in health status and health care utilisation among the elderly population in India. On the one hand, while the increase in absolute numbers and share of older population in the country due to improved life expectancy is indicative of social, economic and epidemiological/ health achievements, on the other hand, a challenge of this demographic transition is manifested in the form of increasing old-age dependency ratio, that has increased from 5% in 1960 to 9% in 2018, projected to further rise steadily to 19% in the next three decades. Clearly, population aging in India poses a demographic burden on a country such as India with inadequate social security systems and very low public investment in health and other welfare programmes.

Furthermore, the distribution of aging population in India, by place of residence, revealed that a vast majority (67%) of India's older population resides in the rural areas. At the country level, 27.72% of the older population reported an illness whether chronic or short-term in India. However, urban elderlies reported illnesses at a higher rate (34.04%) than their rural counterparts (24.63%). This may be an implication of inaccessibility of healthcare and lack of social awareness which have been argued to blur individual's conception of morbidity and its reporting thereof. Studies have also found that in areas with inadequate access to healthcare, the morbidity level might actually reflect the level of healthcare utilization, rather than the actual health-status.

Moreover, the data on treatment seeking behaviour among the elderly population indicated that a smaller share of ailing elderly in rural India (89%) sought medical treatment for an illness compared to their urban counterparts (96%). An overwhelming majority (80%) of the elderly with unmet needs of healthcare are concentrated in the rural areas.

With the setting up of newer health facilities at the grassroots level under the aegis of the National Rural Health Mission, 2005, an increase in the share of rural patients availing public health services has been observed. This trend continued as rural elderly persons utilized public healthcare services at a higher rate (39.7%) in comparison to urban dwellers (25.5%). A higher share of elderly in rural areas (9%) cited 'required specific services not available' as a reason behind not availing government health facilities than urban residents (5%). Healthcare services in urban areas in India have been found to usually receive a larger share of public resources, resulting in lower investments in rural health infrastructure that suffers from issues of ill-management, absenteeism among health facility staff and lack of training for capacity building of health personnel. Majority of the ailing elderly, across rural and urban areas, did not avail government services and had to depend largely on the private health sector services mainly due to unsatisfactory quality of government services or long waiting involved even when quality was satisfactory. Given



this existing rural-urban disparity in the proportion of persons responded as ailing (PPRA) as well as utilisation of healthcare, it, therefore, becomes a matter of great importance to investigate whether all elderly persons with similar health needs are able to access the same set of health services of comparable quality irrespective of their geographies, demographic factors or socio-economic status.

Accessibility and utilisation are the two critical aspects of the efficiency of healthcare services, representing broadly the supply and demand sides of the healthcare delivery system respectively. While prior studies have established sub-national healthcare disparities due to inadequate bandwidth of existing infrastructure to serve the length and breadth of India, there has been a limited body of research work attempting the exploration of the determinants of the rural-urban gap in utilisation of healthcare. Moreover, many of the studies addressing the issue of the rural-urban inequalities are based on a small sample size, conducted locally at micro-level. An important objective of India's National Health Policy (2017) is to "*progressively achieve universal health coverage*" which is posited upon mitigating the sub-national disparity that necessitates identifying the drivers of the disparity for targeted policy intervention. This study, therefore, aims to delve into the central question: what are the magnitude and contributory factors of rural-urban differential in health care utilisation among the elderly population in India who have reported some ailment in the past 15days recall period? In this regard the study wants to test the socio-economic gradient hypothesis that the health-seeking behaviour of the Indian elderly has positive associations with their Socio-Economic Status (SES).

### **Similarities: decentralization, influence of private sector**

India has a decentralized public health care system, run largely by its 28 states and seven territories. The central government's only constitutional mandate is to oversee medical education and collect infectious diseases statistics, Rao said. Health care quality and access in rural areas lag far behind that of cities. To boost

health care throughout the nation, the central government—with its tax-collecting powers and therefore greater financial resources—provides support for the states while nudging them to make improvements. Rao said there is ongoing debate in India about how much power the central government should have in overseeing health care and how much the states should have.

After Rao's description of the Indian health care system, Jha asked the audience, "Does this sound like the United States?" Rao and Jha went on to note some of the other similarities between the two systems. In both countries, special interest groups—high-paid doctors, hospitals, insurance companies, drug companies—lobby politicians for health care policies that will be advantageous to them. One audience member commented, "People with more money have more voice. It's always the same."

Rao observed that the corporate sector in India is expanding to gain market depth in the health care area through mergers, acquisitions, or franchising. If unregulated, she said, these corporate moves could undermine the benefits provided by smaller operations—like nursing homes, family-run physician practices, or nonprofit hospitals—which are typically run simply and inexpensively.

### ***Differences: public health, social solidarity***

One of the biggest differences between the United States and India is in the public health arena. "There's not enough spent on safe water, sanitation, and nutrition," Rao said of her country. "Only 25% of the population has access to sanitation. At a human level, this is a real problem."

Part of the problem, she thinks, is that India lacks "social solidarity"—a sense that people should take care of other people—and this has resulted in a health system rife with inequities. Rao wondered aloud whether it makes sense for India to take lessons from the United States, given its own struggles to fashion an effective health care system. But she concluded, "I feel you have a lot to teach us—both for your mistakes and for the things you do right." — *Karen Feldscher*

### **Rethinking the healthcare paradigm**

The Covid-19 crisis offers a chance to completely overhaul India's redundant health security nets, ensure a more secure future for citizens.



***Prime Minister Narendra Modi's government was caught unawares by the massive migration that followed the sudden lockdown — which must have affected about 400 million workers.***

The Indian government is easing, slowly, the lockdown of 1.3 billion people. India's trajectory of COVID-19 deaths (in the few states with reliable mortality statistics) appears to be less steep than Europe, but it is still growing. Maharashtra is struggling, and fears about a widespread flood of hospitalisations have yet to materialise.

Prime Minister Narendra Modi's government was caught unawares by the massive migration that followed the sudden lockdown — which must have affected about 400 million workers. The government quickly organised some remedies. The public health priorities in the battle against COVID-19 are clear: Expand testing and contact tracing massively, pay infected people to quarantine, protect staff in the hospitals from infection so that these facilities do not become hotspots of transmission, and invest in data. The record to date on these is mixed, with some success

in testing and quarantine, but only partial success on preventing hospital infection. On data, the government has been far too conservative, worried about adverse publicity. Innovative, often youth-led efforts, have resulted in a set of databases and apps that are available on the web and social media. Yet, the data gaps are not being met sufficiently so as to map a route out of the pandemic and to reopen the economy safely.

Although spared the dreadful death rates as seen in the US, the COVID-19 crisis has highlighted the glaring holes in India's social safety nets. COVID-19 could drive 10 million Indians below the poverty line: Already, over 40 million Indians become poor annually from catastrophic healthcare costs (costs exceeding 10 per cent of a household's total expenditures). Eighty per cent of health services are paid out-of-pocket. Hence, millions of Indians depend on daily wages not only to eat, but as their modest safety net.

Savvy political leaders encourage us to never let a good crisis go to waste. Barack Obama pushed the Affordable Care Act on the heels of the global 2008 recession. The Act has not only substantially reduced the number of uninsured (which remains higher than in countries with universal health insurance), but also reduced poverty. The Act, eventually, gained wide public support, and it will be a key issue in the 2020 election. England launched its National Health System (beloved across party lines) after World War II, while it was relatively poor.

Could India seize a similar opportunity? In 2018, Modi launched the National Health Protection Scheme to provide about Rs 5 lakh (about \$10,000) in health insurance to the 100 million poorest households. However, a programme focused only on the poor is likely to end up as a poor programme. Universal programmes garner broader public solidarity, and avoid the inherent stigma of targeting. Importantly, India has an unparalleled opportunity to develop digital insurance platforms, given the mostly successful national identity cards, wide use of e-payments (a side effect of the demonetisation experiment), and a high level of access to broadband internet, even in rural areas.

Public financing of universal health care (including discretionary clinical services) would substantially free Indians to use their money better. Current out-of-pocket spending consumes a large proportion of poorer households' income, precludes more productive household investments, often remains untaxed, as doctors and hospitals are frequently paid under the counter and creates few jobs. Aspirations to be internationally competitive in manufacturing and services requires a publicly insured, mobile Indian workforce with little or no financing burdens on workers or corporations. COVID-19 has demonstrated the impact of reduced income in populations facing catastrophic health costs in India and also in the US, where much of health insurance is inefficiently linked to employment.

Moving to tax-payer and prepaid universal health insurance will not be easy. Such an idea would need a few states to start carefully on it to demonstrate its viability. A hefty price tag need not deter financing or borrowing: This human capital investment yields huge economic and social returns. Indeed, net costs would be far less than the COVID-19 economic relief — costing 10 per cent of GDP — that's currently underway. The most politically demanding task might well be the requirement to turn India's notoriously unregulated private hospitals into autonomous trusts. Steps to move decision-making away from politicians onto accountable technocrats and public health cadres, and rapidly expanding open data systems that build on the Indian ethos of democracy are warranted. This would involve local trusts or regional health authorities who can be held accountable by their neighbours and community.

The principle that "everyone is covered, but not everything is covered," means documenting the most cost-effective services as well as ineffective or expensive services that should not be publicly financed. Insured services can expand as incomes and government revenues increase. And wise choices, like a substantial increase in cigarette taxes, can yield a triple win — reduce disease, protect families from catastrophic healthcare costs of smoking-attributable diseases like cancer, and raise more revenue. Finally,

public finance need not mean only public delivery. Public payment of private or franchised services is possible, provided good data on quality is agreed upon as part of the contract. Indian governments can draw upon their experience with the now-(mostly) dismantled “license Raj” to build regulatory approaches.

COVID-19 offers a chance to choose a new direction for the health of Indians. India has occasionally been tagged as the country “that never misses an opportunity to miss an opportunity”. This might not be fair. If this label is rendered obsolete, a stronger and healthier post-COVID India could emerge.

## Environmental Health

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Environmental Health is the branch of public health concerned with all aspects of the natural and built environment affecting human health. Environmental health focuses on the natural and built environments for the benefit of human health. The major subdisciplines of environmental health are: environmental science; environmental and occupational medicine, toxicology and environmental epidemiology.

Other terms referring to or concerning environmental health are environmental public health, and health protection.

### Definitions

Environmental health was defined in a 1989 document by the World Health Organization (WHO) as: Those aspects of human health and disease that are determined by factors in the environment. It is also referred to the theory and practice of accessing and controlling factors in the environment that can potentially affect health.

Environmental health as used by the WHO(world health organization) Regional Office for Europe, includes both the direct pathological effects of chemicals, radiation and some biological agents, and the effects (often indirect) on health and well being of the broad physical, psychological, social and cultural environment, which includes housing, urban development, land use and transport.

As of 2016 the WHO website on environmental health states “Environmental health addresses all the physical, chemical, and biological factors external to a person, and all the related factors impacting behaviours. It encompasses the assessment and control of those environmental factors that can potentially affect health. It is targeted towards preventing disease and creating health-supportive environments. This definition excludes behaviour not related to environment, as well as behaviour related to the social and cultural environment, as well as genetics.”

The WHO has also defined environmental health services as “those services which implement environmental health policies through monitoring and control activities. They also carry out that role by promoting the improvement of environmental parameters and by encouraging the use of environmentally friendly and healthy technologies and behaviors. They also have a leading role in developing and suggesting new policy areas.”

The term environmental medicine may be seen as a medical specialty, or branch of the broader field of environmental health. Terminology is not fully established, and in many European countries they are used interchangeably.

Children’s environmental health is the academic discipline that studies how environmental exposures in early life—chemical, nutritional, and social—influence health and development in childhood and across the entire human life span.

### **Disciplines**

Five basic disciplines generally contribute to the field of environmental health: environmental epidemiology, toxicology, exposure science, environmental engineering, and environmental law. Each of these five disciplines contributes different information to describe problems and solutions in environmental health. However, there is some overlap among them.

- Environmental epidemiology studies the relationship between environmental exposures (including exposure to chemicals, radiation, microbiological agents, etc.) and human health. Observational studies, which simply observe



exposures that people have already experienced, are common in environmental epidemiology because humans cannot ethically be exposed to agents that are known or suspected to cause disease. While the inability to use experimental study designs is a limitation of environmental epidemiology, this discipline directly observes effects on human health rather than estimating effects from animal studies. *Environmental epidemiology* is the study of the effect on human health of physical, biologic, and chemical factors in the external environment, broadly conceived. Also, examining specific populations or communities exposed to different ambient environments, Epidemiology in our environment aims to clarify the relationship that exist between physical, biologic or chemical factors and human health.

- Toxicology studies how environmental exposures lead to specific health outcomes, generally in animals, as a means to understand possible health outcomes in humans. Toxicology has the advantage of being able to conduct randomized controlled trials and other experimental studies because they can use animal subjects. However, there are many differences in animal and human biology, and there can be a lot of uncertainty when interpreting the results of animal studies for their implications for human health.
- Exposure science studies human exposure to environmental contaminants by both identifying and quantifying exposures. Exposure science can be used to support environmental epidemiology by better describing environmental exposures that may lead to a particular health outcome, identify common exposures whose health outcomes may be better understood through a toxicology study, or can be used in a risk assessment to determine whether current levels of exposure might exceed recommended levels. Exposure science has the advantage of being able to very accurately quantify exposures to specific chemicals, but it does not generate any information

about health outcomes like environmental epidemiology or toxicology.

- Environmental engineering applies scientific and engineering principles for protection of human populations from the effects of adverse environmental factors; protection of environments from potentially deleterious effects of natural and human activities; and general improvement of environmental quality.
- Environmental law includes the network of treaties, statutes, regulations, common and customary laws addressing the effects of human activity on the natural environment.

Information from epidemiology, toxicology, and exposure science can be combined to conduct a risk assessment for specific chemicals, mixtures of chemicals or other risk factors to determine whether an exposure poses significant risk to human health (exposure would likely result in the development of pollution-related diseases). This can in turn be used to develop and implement environmental health policy that, for example, regulates chemical emissions, or imposes standards for proper sanitation. Actions of engineering and law can be combined to provide risk management to minimize, monitor, and otherwise manage the impact of exposure to protect human health to achieve the objectives of environmental health policy.

### ***Concerns***

Environmental health addresses all human-health-related aspects of the natural environment and the built environment. Environmental health concerns include:

- Air quality, including both ambient outdoor air and indoor air quality, which also comprises concerns about environmental tobacco smoke.
- Biosafety
- Disaster preparedness and response.
- Climate change and its effects on health.

- Environmental racism, wherein certain groups of people can be put at higher risk for environmental hazards, such as air, soil, and water pollution. This often happens due to marginalization, economic and political processes, and ultimately, racism. Environmental racism disproportionately affects different groups globally, however generally the most marginalized groups of any given region/nation.
- Food safety, including in agriculture, transportation, food processing, wholesale and retail distribution and sale.
- Hazardous materials management, including hazardous waste management, contaminated site remediation, the prevention of leaks from underground storage tanks and the prevention of hazardous materials releases to the environment and responses to emergency situations resulting from such releases.
- Housing, including substandard housing abatement and the inspection of jails and prisons.
- Childhood lead poisoning prevention.
- Land use planning, including smart growth.
- Liquid waste disposal, including city waste water treatment plants and on-site waste water disposal systems, such as septic tank systems and chemical toilets.
- Medical waste management and disposal.
- Noise pollution control.
- Occupational health and industrial hygiene.
- Radiological health, including exposure to ionizing radiation from X-rays or radioactive isotopes.
- Recreational water illness prevention, including from swimming pools, spas and ocean and freshwater bathing places.
- Safe drinking water.
- Solid waste management, including landfills, recycling facilities, composting and solid waste transfer stations.

- Toxic chemical exposure whether in consumer products, housing, workplaces, air, water or soil.
- Vector control, including the control of mosquitoes, rodents, flies, cockroaches and other animals that may transmit pathogens.

According to recent estimates, about 5 to 10% of Disability-adjusted life years (DALYs) lost are due to environmental causes in Europe. By far the most important factor is fine particulate matter pollution in urban air. Similarly, environmental exposures have been estimated to contribute to 4.9 million (8.7%) deaths and 86 million (5.7%) DALYs globally. In the United States, Superfund sites created by various companies have been found to be hazardous to human and environmental health in nearby communities. It was this perceived threat, raising the specter of miscarriages, mutations, birth defects, and cancers that most frightened the public.

### ***Information***

The Toxicology and Environmental Health Information Program (TEHIP) is a comprehensive toxicology and environmental health web site, that includes open access to resources produced by US government agencies and organizations, and is maintained under the umbrella of the Specialized Information Service at the United States National Library of Medicine. TEHIP includes links to technical databases, bibliographies, tutorials, and consumer-oriented resources. TEHIP is responsible for the Toxicology Data Network (TOXNET), an integrated system of toxicology and environmental health databases including the Hazardous Substances Data Bank, that are open access, i.e. available free of charge. TOXNET was retired in 2019.

### ***Mapping***

There are many environmental health mapping tools. TOXMAP is a geographic information system (GIS) from the Division of Specialized Information Services of the United States National Library of Medicine (NLM) that uses maps of the United States to help users visually explore data from the United States

Environmental Protection Agency's (EPA) Toxics Release Inventory and Superfund Basic Research Programs. TOXMAP is a resource funded by the US federal government. TOXMAP's chemical and environmental health information is taken from the NLM's Toxicology Data Network (TOXNET) and PubMed, and from other authoritative sources.

### ***Environmental health profession***

Environmental health professionals may be known as environmental health officers, public health inspectors, environmental health specialists or environmental health practitioners. Researchers and policy-makers also play important roles in how environmental health is practiced in the field. In many European countries, physicians and veterinarians are involved in environmental health. In the United Kingdom, practitioners must have a graduate degree in environmental health and be certified and registered with the Chartered Institute of Environmental Health or the Royal Environmental Health Institute of Scotland. In Canada, practitioners in environmental health are required to obtain an approved bachelor's degree in environmental health along with the national professional certificate, the Certificate in Public Health Inspection (Canada), CPHI(C). Many states in the United States also require that individuals have a bachelor's degree and professional licenses in order to practice environmental health. California state law defines the scope of practice of environmental health as follows:

"Scope of practice in environmental health" means the practice of environmental health by registered environmental health specialists in the public and private sector within the meaning of this chapter and includes, but is not limited to, organization, management, education, enforcement, consultation, and emergency response for the purpose of prevention of environmental health hazards and the promotion and protection of the public health and the environment in the following areas: food protection; housing; institutional environmental health; land use; community noise control; recreational swimming areas and waters; electromagnetic radiation control; solid, liquid, and hazardous materials

management; underground storage tank control; onsite septic systems; vector control; drinking water quality; water sanitation; emergency preparedness; and milk and dairy sanitation pursuant to Section 33113 of the Food and Agricultural Code.

The environmental health profession had its modern-day roots in the sanitary and public health movement of the United Kingdom. This was epitomized by Sir Edwin Chadwick, who was instrumental in the repeal of the poor laws, and in 1884 was the founding president of the Association of Public Sanitary Inspectors, now called the Chartered Institute of Environmental Health.

### **ENVIRONMENTAL HEALTH INDICATORS**

Healthier environments could prevent almost one quarter of the global burden of disease. The COVID-19 pandemic is a further reminder of the delicate relationship between people and our planet.

Clean air, stable climate, adequate water, sanitation and hygiene, safe use of chemicals, protection from radiation, healthy and safe workplaces, sound agricultural practices, health-supportive cities and built environments, and a preserved nature are all prerequisites for good health.

### **What are environmental health indicators?**

Environmental health indicators describe the link between the environment and health. They are based on known or plausible cause-and-effect relationships between the environment and health.

The indicators provide information for action. They provide key evidence to help decision-makers, and raise awareness of environmental health risks, to improve human health.

### ***What topics do the New Zealand indicators cover?***

The New Zealand environmental health indicators currently cover a wide range of topics arranged in 12 domains:

- Air quality
- Animals & human health
- Alcohol-related harm

- Border health
- Children
- Climate change
- Hazardous substances
- Indoor environment
- Population vulnerability
- Transport
- UV exposure
- Water

***Who will find the indicators useful?***

The information will be particularly useful for health officials and public health staff in District Health Boards, local government, and other central government agencies.

***What are the key purposes of the indicators?***

Environmental health indicators help identify potential risks to human health, including emerging risks. The indicators can help to guide policy actions, target action and allocate resources.

The key purposes of the New Zealand Environmental Health Indicators are:

- to monitor trends in the state of the environment
- to monitor trends in health outcomes linked to environmental hazards and exposures
- to compare the environmental health status of geographic areas
- to monitor the effectiveness of policies and other interventions on environmental health
- to help raise awareness about environmental health issues
- to help initiate further investigations into links between the environment and health.

***What do the indicators measure?***

Environmental health indicators usually describe one aspect

of the environment-health relationship. They can generally be classified into:

- Exposure indicators: possible environmental determinants of health
- Health indicators: possible health effects from environmental hazards and risks

For example, air quality is measured with indicators about the sources of air pollution, air quality monitoring results, and health effects of air pollution.

The indicators don't take into account the effect of other factors (eg, risk factors such as diet, smoking etc) on health. Usually the available data does not measure an individual's or population's actual exposure to environmental hazards and risks.

The data for indicators are generally sourced from other agencies.

### **Definition of Environmental Health Indicators**

Several organizations have crafted comprehensive definitions of environmental health indicators. The National Association of County and City Health Officials (NACCHO) has called them "tools for quantifying, through direct or indirect measures, a significant aspect of an environmental health issue," which "can be used to assess and communicate the status of and trends in overall environmental health" (NACCHO, 2000).

A definition of an environmental health indicator, developed by the World Health Organization (WHO) and others, is that it "provides information about a scientifically based linkage between environment and health"; thus, "an indicator which purely describes the state of the environment or a pure health status indicator with no obvious link to environmental causation, cannot be considered an environmental health indicator." The term environmental health indicator "implies monitoring and action" (Kjellstrom and Corvalan, 1995).

According to the Council of State and Territorial Epidemiologists (CSTE), "Environmental public health indicators



provide information about a population's health status with respect to environmental factors. Core indicators can be used to measure health or a factor associated with health such as a risk or intervention in a specified population" (CSTE, 2001). Burke suggested that indicators are tools that can be direct or indirect measures.

### ***Identifying Environmental Health Indicators***

Burke suggested several criteria for a useful environmental health indicator. The indicator must be:

- simple—measure only one item;
- measurable—comparable and quantifiable;
- understandable—comprehensible to policy makers and the public; and
- defensible—support a relationship between environmental factors and health status.

The term "environmental indicator" implies an association, or a suggestion of an association, between a factor and an outcome. Some participants speculated about how broad a view should be taken about which kinds of outcomes are "suitable" for environmental health indicators. Should only those outcomes be used for which there is a proven association with an environmental hazard? Alternatively, should outcomes or linkages be considered that have not yet been proven conclusively, but for which there are possible associations? Burke suggested that a true indicator should have an association and/or should indicate the presence of a risk, but we must not be too narrow in our focus because "perfectionism is sometimes the enemy of progress." The issue is whether our goal is prevention and precaution or proof because they are fundamentally different. In environmental public health, indicators are essential for understanding risk and evaluating interventions.

William Pease of GetActive Software suggested that an environmental health indicator also must be credible, relevant, and able to be acted on. Because complete information is lacking in vast areas of environmental health, we must be realistic about the credibility we can expect from the indicators that we provide

to the public, noted Pease. Scientists working with environmental health indicators tend to place a high value on establishing clearly the entire causal chain from source to effect. Because this amount of information is seldom available, we must learn how to accept statements as credible in the absence of full information. If we take a rigorous, science-based approach to environmental health indicators, we risk missing information critical to assessment. The scope of environmental problems and the activities that generate adverse environmental consequences require a large number of indicators.

Another aspect of credibility involves the role of the entity that develops and promotes the indicator, its so-called social status. Indicators have to be viewed as objective, or at least science-based, and not distorted by any conflict of interest, in order to engender trust, noted Pease. In many cases, environmental organizations or other nongovernmental organizations may be in a better position than federal regulatory agencies to produce environmental health indicators that are trusted.

A trade-off may be needed between having core indicators that are valuable nationally, and even internationally, and having indicators that are relevant to local needs, noted Burke. Identifying the indicators that will allow health and environmental health officials and regulatory agencies to better understand the environmental risk at the local level is a particular challenge. A national exposure report, such as the one being compiled by the CDC on chemical exposures, provides a profile for the nation but may reveal little about risks in a particular region—for example, the risk of mercury exposure by women of childbearing age near the Chesapeake Bay who consume contaminated fish from areas with closures and advisories.

### **Components of Environmental Health Monitoring and Corresponding Indicators**

Environmental health monitoring has three major components: hazard monitoring, exposure monitoring, and health outcome (health effects) monitoring. Each component has corresponding

indicators—hazard indicators, such chemical spills, and motor vehicle emissions; exposure indicators, such as blood lead level in children; and health outcome (health effects) indicators, such as pesticide-related poisoning in children, and melanoma. A step beyond these three indicators is the intervention indicator. Examples of intervention indicators are laws pertaining to smoke-free indoor air, boil-water advisories, and alternative fuel use in motor vehicles.

As a nation, we have been quite successful at hazard monitoring, and legislation has pushed us to identify sources and potential routes of exposure, stated Burke. The work of the Environmental Protection Agency (EPA), exemplified in the EPA inventories, regulatory programs, and monitoring programs, has helped illuminate and, to a certain extent, control environmental hazards. We have not been as successful with exposure tracking, although we have made some progress recently with the National Report on Human Exposure to Environmental Chemicals (CDC, 2003), a CDC effort to monitor national exposure to a range of environmental toxicants. This report will be a cornerstone of the new monitoring-based approach to environmental health. However, the report is still in its infancy, and the tools it describes are not yet available for use by the public health and environmental health communities to help with outcome monitoring.

### **International Frameworks For Developing Environmental Health Indicators**

In the early 1990s, the Organization for Economic Co-operation and Development (OECD) published its Pressure-State-Response (PSR) framework to promote a common set of “environmental performance indicators.” Many indicators provide an easily interpretable measure of the state of the environment or the health of a defined population. Examples are urban air quality variables and life expectancies of populations. These “one-dimensional” indicators have been widely adopted internationally and are important for describing time trends and geographic variations. According to Kjellstrom, U.S. government agencies, academic institutions, industry, and other interested parties have been active

in developing such indicators. However, creating indicators that can be interpreted in terms of linkages between environmental quality and public health has been a major challenge.

A series of activities was begun in 1992 at the World Health Organization to establish a method for how such indicators could be developed and tested. A new framework, the DPSEEA framework, was devised that incorporates transparent linkages between various one-dimensional environment or health indicators and places the focus on public health. DPSEEA stands for Driving force-Pressure-State-Exposure-Effect-Action. Numerous case studies have shown that this framework is helpful in developing indicators. Indicators at all levels in the DPSEEA framework could apply locally, nationally, or internationally, depending on the context. According to Kjellstrom, this framework has the potential to "bridge the chasm between public health and the environment."

The character of the environmental health problem defines the level of the policy decision. Kjellstrom gave an example of how, in New Zealand, a ban on burning coal is a local issue, and no decision is involved at the national level. In contrast, the ban on lead in gasoline required a national decision because New Zealand has only one oil refinery. Some issues, such as global climate change, must be dealt with at the international level.

In New Zealand and Australia, there has been interest in a core environmental health indicators list. However, such an approach may be unproductive because each community has its own concerns. As long as a nation does not commit to some "magical" core national set of indicators, without responding to the needs and concerns of individual communities, progress will be made.

Kjellstrom has concluded that the ultimate environmental health indicator would be the number of people affected by a specific environmental hazard. The Ministry of Transport in New Zealand recently used such an indicator—the number of fatalities from vehicle-related air pollution in the country (annually estimated at 400)—as an argument for better-quality fuels, better testing of vehicle emissions, and the use of catalytic converters. A related

indicator is the number of “obesogenic” car-related deaths, that is, deaths caused by environmental factors that create obesity. Tentative estimates for the city of Auckland, New Zealand, indicated that the number of such deaths related to lack of daily physical activity because of car use instead of “active transport” could be at similar levels as the numbers of car crash deaths (annually estimated at 40). Kjellstrom suggested that this indicator would be particularly relevant to the United States, where the dramatic rise in obesity rates in recent years may be strongly related to environmental factors, such as increased driving time, decreased exercise, and greater availability of high-calorie fast food.

### **Major Human Problems of Air Pollution**

Air pollution is one of the major problems of the present world. There are so many causes that can pollute the air completely and spread different types of dangerous diseases. On the basis of the different causes of air pollution it can be distinguished into different types. Mainly the type of the air pollution depends on some of the natural resources and most of them are composed of natural sources. Some important and common types that have great effect on the air of the environment and they also take part in spreading different types of dangerous diseases. Some types of air pollution are as follows:

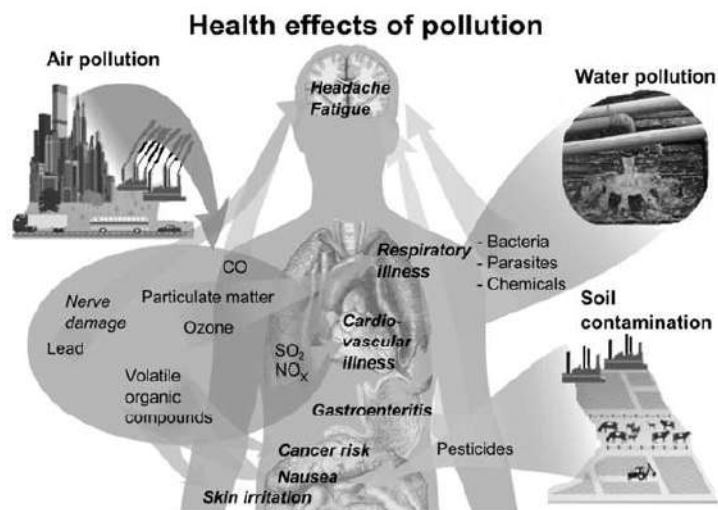
#### ***Smog***

The first type of the air pollution is the smog. It is defined as when the smoke present in the atmosphere after emitting from different sources is combined with the fog present in the air, a mixture formed that is referred to as smog. Basically different types of factories or the industries are responsible for the formation of the smog. when the industries do their production from different materials, they can use different types of chemicals for the cleaning, refining or some kind of production processes, as a result these chemicals can produce different types of toxic materials that can emits in the form of the smoke from the chimney of the factory and form a bond of with the fog and cause different harmful

diseases. Living in the smog is equal to the living with smokers; it can cause serious respiratory diseases.

### ***Green House Effect***

Another type of the air pollution is the green house effect. It is that type of air pollution that is formed due to the contamination of several important gases with the air. It is characterized when the gases called as green house gases when move upward and combine with the atmosphere and then return back to the earth and destroy different types of things such as crops, plants, human lives, livestock etc. These gases are basically six in number and they are; methane, sulphur, nitrogen, carbon monoxide, hydrogen and ozone. Basically the pollution is raised due to the burning of fossil fuel. It is very harmful for the human skin and can also cause some kind of cancer.



### ***Accidental air Pollution***

It is the type of pollution that is characterized due to the causes that are accidentally in nature. Commonly it is defined as the type of air pollution that is generated due to the different types of fuel consumption by the vehicles or when the forest are burnt different types of gases are evolved that are mixed with the air

and pollute the air. Some times this pollution is also spread due to the plant leakage or different types of blasts in the furnaces of the manufacturing plants.

### ***Industrial Air Pollution***

Another type of air pollution that pollutes the environment as a result of the industrial processes is called as industrial pollution. Commonly it is characterized due to the working of the thermal plants and also the different plants that are used to manufacture different types of fertilizers or pesticides. The reactions that are used to produce different types of building material such as cement or steel etc. also encourage the production of toxic materials for producing air pollution. On the whole the air pollution due to the industrial wastes is called as industrial air pollution. Different type of atomic units also contributes in that type of pollution.

### ***Transport Related Air Pollution***

It is that type of air pollution that is characterized due to the smoke emitting by different types of vehicles used for transportation. As fuel such as petrol or diesel burnt in the engine can emit different types of poisonous gases in the form of smoke. This pollution can cause different types of harmful diseases.

## **Carbon Dioxide and Temperature Levels**

Since the late 1990s, perhaps the most vivid and compelling image of the connection between changes in CO<sub>2</sub> and changes in global temperatures has been the chart—in a series of increasingly refined versions, now going back a million years—showing the two variables rising and falling together through a succession of ice ages. The rub has been that the changes in carbon dioxide have appeared to lag changes in temperature, rather than lead them (as one would expect if they were causing the temperature changes), and that the lags can be as long as thousands of years. In a paper that appeared on March 1 in *Science* magazine, a team of scientists report that using new techniques and reanalyzing data, they have virtually eliminated that puzzling temperature/CO<sub>2</sub> lag for the last ice age termination, the one most highly resolved..

The underlying problem has to do with uncertainties in estimation of annual changes in carbon dioxide levels. Yearly temperatures are inferred directly from changes in the isotopic composition of water deposited annually in snowfall; yearly accumulations are fairly easily distinguished because each year the top surface of the snow melts and then refreezes, forming a kind of crust called "firn." But the air bubbles in which carbon dioxide is trapped tend to diffuse through the crust, making it difficult to match up the bubbles with the years in which they originally were trapped. As a companion commentary to the *Science* article explains, "Over the top 50 or 100 m of an ice sheet, the snowpack (firn) gradually becomes denser before it becomes solid ice containing air bubbles. Air diffuses rapidly through the firn, and the trapped air is therefore younger than the surrounding ice. In places with little snowfall, the age difference can be several thousand years. The age difference cannot be reconstructed perfectly, leading to uncertainty in the age of air..."

In the work reported on Friday, the multi-national team of European scientists used a proxy to better estimate the time of air bubble formation in the Antarctic core EPICA Dome C. Whereas the original analysis of that core had found changes in carbon dioxide lagging temperature changes by an average of 800 years in the last deglaciation, plus/minus 600 years, the new analysis halves the lag and cuts the uncertainty by a factor of three. "Their analysis indicates that CO<sub>2</sub> concentrations and Antarctic temperature were tightly coupled throughout the deglaciation, within a quoted uncertainty of less than 200 years," says commentator Edward J. Brook, of Oregon State University, Corvallis.

How much of an impression will the new results make? Will they materially change the chemistry of the debate over human-induced climate change and climate policy? Doubtful.

For one thing, in part because of the complexity of the scientific methods used in both the original study and the new re-analysis, it will be easy for stubborn skeptics to believe that the scientists have simply picked a method that gives them the result they want.



Second, much as one hates to trot out a tired cliché, the new results may raise more questions than they settle. Even if the changes in the two variables are indeed much more tightly linked, what co-factors are responsible for the whole pattern?

Brook puts it like this in the concluding paragraph of his commentary: "The ultimate question is what mechanisms influence both Antarctic climate and CO<sub>2</sub> concentrations on such intimate timescales. Many have been discussed, and many are plausible, including changes in CO<sub>2</sub> outgassing from the ocean due to changes in sea ice, changes in iron input to the ocean that influence CO<sub>2</sub> uptake by phytoplankton, and large-scale ocean circulation changes that cause release of CO<sub>2</sub> to the atmosphere. Deciding which are viable has proven difficult..."

#### **Air Pollution Most Hazardous to Humans**



There are two forms of air pollution considered to be most harmful to humans by the American Lung Association. These are ozone, or smog, and particle pollution, or soot. Most ozone is formed by a chemical reaction between sunlight and the vapors emitted by the burning of carbon based or fossil fuels. Ozone pollution is generally highest during the sunniest months of the

year, from May through October. This pollutant can cause short term health issues immediately following exposure, such as irritation to skin and the respiratory system, and long term exposure can lead to more serious health problems, such as impaired lung function, inflammation of the lung lining, and higher rates of pulmonary disease.

### ***Particle Pollution***

Particle pollution also takes a place at the top of the list of most dangerous to human health, and is very widespread throughout the environment. This type of air pollution consists of solid and liquid particles made up of ash, metals, soot, diesel exhaust, and chemicals. Particle pollution is produced by the burning of coal in power plants and other industries, and by the use of diesel fuel in passenger vehicles, cargo vehicles, and heavy equipment. Wood burning is a source of particle pollution, as are many of today's agricultural practices. Capable of triggering strokes, heart attacks, and irregular heart rates, particle pollution can be dangerous even in low concentrations. Lung cancer and premature birth have also been linked to exposure to particle pollution, and it is known to irritate respiratory conditions, including asthma, and cause coughing, wheezing, and even shorter life spans.

### ***Other Common Air Pollutants***

Other common air pollutants that can pose health risks to humans are carbon monoxide, nitrogen oxides, sulphur dioxide, and lead. Carbon monoxide is produced by the incomplete burning of fossil fuels in vehicles, home heating equipment, and industrial plants, among many other sources, and is a colorless and odorless gas, poisonous to humans and animals when inhaled. Nitrogen oxides are gases that contribute to smog and acid rain. Sulphur dioxide is produced by the burning of sulphur containing fuels like oil and coal, and can cause health issues, especially in those with existing heart or lung conditions. Lead is emitted into the air by vehicles and industrial sites, as well as by waste burning facilities. Lead is a neurotoxin when present in the body in high concentrations, and can cause immune issues, reproductive problems, kidney disease, and cardiovascular problems.

***Greenhouse Gases***

Perhaps the most publicized form of air pollution these days is the mixture of gases emitted into the air that are thought to be responsible for producing the greenhouse effect, leading to global warming and climate change. A certain percentage of greenhouse gases are produced by natural sources and are necessary to moderating the climate of the earth, making it possible for its life forms to survive. However, beginning with the Industrial Revolution, man has added to that production of greenhouse gases, primarily by the burning of fossil fuels. Among the most common of these are carbon dioxide, methane, and nitrous oxide.

Greenhouse gases collect in the atmosphere, forming a layer of reflective and absorbent materials that prevents some of the heat radiated by the sun from escaping the Earth's atmosphere, keeping the temperature sufficiently warm for plant and animal life to thrive. However, with the addition of man made greenhouse gases, too much heat can be reflected back into the atmosphere, giving rise to the current fears about global warming. Estimates made by the IPCC, or Intergovernmental Panel on Climate Change, predict that greenhouse gas emissions will double within the next 50 to 100 years at current rates of growth, leading to a variety of detrimental environmental effects. Among these are the melting of polar ice, raising ocean levels and flooding coastal and other low lying land areas. Increased storm activity and increased force and severity of hurricanes, cyclones, and tropical storms are among the possible consequences of climate change, as are severely altered ecosystems and extinctions of plant and animal species.

***New Concern and New Hope for the Future***

While the many types of air pollution that contaminate our air today are certainly of concern, awareness is growing about the danger they pose to our health and our planet. New regulations put into place over the past decade or two, such as the Clean Air Act and others, have significantly reduced the amounts of pollution pumped into the air we breathe every day. While there is much more to be done, environmentalists have managed to bring global warming and other environmental hazards to the forefront, gaining

support from the public and the politically connected, advancing their cause in the halls of the United States government as well as in international forums.

### ***Environmental Values***

Every human being has a great variety of feelings for different aspects of his or her surroundings. The Western, modern approach values the resources of Nature for their utilitarian importance alone. However true environmental values go beyond valuing a river for its water, a forest for its timber and non-wood forest products, or the sea for its fish.

Environmental values are inherent in feelings that bring about a sensitivity for preserving nature as a whole. This is a more spiritual, Eastern traditional value. There are several writings and sayings in Indian thought that support the concept of the oneness of all creation, of respecting and valuing all the different components of Nature. Our environmental values must translate to pro conservation actions in all our day to day activities. Most of our actions have adverse environmental impacts unless we consciously avoid them. The sentiment that attempts to reverse these trends is enshrined in our environmental values. Values lead to a process of decision making which leads to action. For value education in relation to the environment, this process is learned through an understanding and appreciation of Nature's oneness and the importance of its conservation.

Humans have an inborn desire to explore Nature. Wanting to unravel its mysteries is a part of human nature. However, modern society and educational processes have invariably suppressed these innate sentiments. Once exposed to the wonders of the wilderness, people tend to bond closely to Nature.

They begin to appreciate its complexity and fragility and this awakens a new desire to want to protect our natural heritage. This feeling for Nature is a part of our Constitution, which strongly emphasises this value. Concepts of what constitutes right and wrong behaviour changes with time. Values are not constant.

It was once considered 'sport' to shoot animals. It was considered a royal, brave and much desirable activity to kill a

tiger. In today's context, with wildlife reduced to a tiny fraction of what there was in the past, it is now looked down upon as a crime against biodiversity conservation. Thus the value system has been altered with time. Similarly with the large tracts of forest that existed in the past, cutting a few trees was not a significant criminal act.

Today this constitutes a major concern. We need a strong new environmental value system in which felling trees is considered unwise behaviour. With the small human numbers in the past, throwing away a little household degradable garbage could not have been considered wrong. But with enormous numbers of people throwing away large quantities of non-degradable waste, it is indeed extremely damaging to the environment and our value system must prevent this through a strong environmental value education system.

Appreciating the negative effects of our actions on the environment must become a part of our day to day thinking. Our current value system extols economic and technical progress as being what we need in our developing country.

### ***Human-Environment Interaction***

Human beings are endowed by nature to be reflective and active. Their biological evolution gives them capacity to forge tools and establish an adaptive relationship with nature. In the beginning, human life was more biological than cultural and was somewhat similar to other animals where environmental considerations dictated the place of human residence. In the process of adaptive relationship man gradually evolved tools with the help of which the resources of the environment could be put to use.

The tool making ability developed over a very long period of time as it began with the use of materials locally obtainable. The tools shaped human life such that we witness the emergence and growth of 'cultures'.

The different stages of human culture have been identified on the basis of the tools used by them. The earliest was the paleolithic

age representing the beginning of the tool industry. In this age humans lived by gathering plant foods and hunting animals.

It was inherent in the nature of the economy of the period that humans could not lead sedentary life and were forced to migrate to new places in search of plant foods and game. This kind of life-style restricted the size of the peregrinating human groups. It can be safely argued that during this phase of human history the environment dictated terms and humans had just started making an effort to modify their dependence on nature. Nonetheless, it is necessary to point out that mobility had led to greater interaction between numerous groups of humans spread over different parts of the world.

It will be not out of place here to delineate the adaptive strategy of the early humans so as to explain his interaction with the environment. For this purpose we focus on southwest France. During the upper Palaeolithic phase (35000-12000 years ago), the climate of this region was strongly oceanic, with cool summers and mild winters (by Ice age standards) affecting the environment. Summer temperature may have been in the 53.6 °F to 59 °F range, with winter readings around 32 °F. The vegetation-growing season was longer on the open plains to the north and east, and snow cover had retreated considerably.

Thus food resources for large herbivores were now more readily available, perhaps resulting in a much higher density of game animals as well as more plentiful edible foods. This region was marked as a region of diverse food resources. The people were mainly subsisted off Reindeer, but they took wild ox, red deer, bison, ibex, chamois, woolly rhinoceros and mammoth too. Many of these resources were relatively predictable. The large-scale salmon fishing during seasonal runs was a major factor in the evolution of complex hunter-gatherer societies in the region.

Effective exploitation of salmon runs requires not only efficient fishing technology but the services of considerable numbers of people to dry and store the thousands of fresh fish before they spoil. These people extensively used fishhooks and harpoons. The people tended to choose many of their settlement sites with

reference to plentiful water supply and good views of the surrounding landscape, so they could observe game. When the people occupied a rock shelter or cave, it invariably faced south, so they could benefit from the sun's rays on cool days.

Some of the largest cave and rock shelter sites lay close to river fords, places, perhaps, where migrating reindeer would cross each year. The relationship between nature and man was redefined with the advent of agriculture. Till the beginning of agriculture, the sources of food had mostly been naturally available products and man had no control over their availability. An important contribution of agriculture has been the cultivation of cereals. The fact is that the shelf-life of cereals is unlimited whereas fruits and meat had very limited shelf-life.

It has been a very significant factor as this property of cereals encouraged accumulation, which perhaps was one of the causes for the introduction and intensification of social stratification. In the beginning agriculture was a highly unreliable source of food, and transition from hunter-gatherer to peasant was not very smooth and was a long drawn process. The development of technology/tools to increase agricultural production was a continuing process in which development of irrigation technology too played an important role. Slowly but surely agriculture became the major source of subsistence and increased productivity contributed towards increase in population.

Initially agriculture was confined to highly favourable locations with natural irrigation. With the growth in population, however, man was forced to migrate to less-favourable locations, necessitating irrigation. The development of irrigation facilities required larger social participation and better management resulting in a transition towards complex society. Furthermore better management of agriculture insured food security and provided humans with surplus time since agriculture was a seasonal activity.

Likewise demand for improved tools and technology for better irrigation to ensure larger production led to depletion of locally available raw materials for tools (for example stone, as man moved away from foothills to open plains). This compelled man to look

for other kinds of materials and other locations to augment the supply of raw material for tool making. Meanwhile, the introduction of the wheel had revolutionized movement and encouraged the emergence of wheel-based pottery, a highly specialized occupation.

The gradual development in technology attained another stage as metallurgy developed. The discovery of metallic ores once again redefined the man-environment interaction. The major advantage of metal tools over stone was its reusable character: stone tools once broken could not be used again whereas metal tools could be remoulded. However, the relative scarcity of mineral ores together with the limited capabilities of processing, beginning from procurement to transportation and finally extraction made metal procurement a labour intensive and expensive proposition.

The most important feature of metallurgy was the highly specialized knowledge required and expertise, which made it a full-time occupation. The emergence of such professionals could be sustained only with the availability of agricultural surplus. This led to the emergence of a section of the population not directly involved with the food production. The parasitic character of this section of population gradually liberated from direct dependence on nature and heralded a new era where certain sections of the inhabitants survived solely on their professional knowledge.

The character of agriculture based societies has been defined in terms of complex social stratification with specialization of craft. The growing ability of humans to make use of a variety of environmental resources opened up the possibilities of the exploitation of natural resources for self-benefit. The larger equity based and open community now witnessed a transition towards a rudimentary system of sociopolitico- economic hierarchy. Still, we cannot say that humans were controlling the environment rather the nature of dependence on environment had changed drastically.

The most defined form of control over nature became visible only in the Industrial Age. Unprecedented growth of technology during the Industrial Age (second half of the 18th century to the beginning of 20th century) liberated man from physical labour



and an alienation with the natural world gradually set in. The Industrial Age introduced the exploitation of abiotic source of energy (which are not biologically procurable) and gradually replaced human and animal energy as the dominating forms. Since the ancient past thermal energy had been used in direct application, but during the Industrial Age it was used to mechanize tools. The Industrial Age witnessed the conversion of thermal energy to mechanical energy and thus enhanced the possibilities of greater exploitation of natural resources.

The conversion of thermal energy to other forms of energy tremendously increased the overall demand for energy and resulted in a gradual depletion of the sources of energy. Consequently search for newer sources of thermal energy began: hydrocarbons, i.e., coal, petroleum products, etc., were explored and the magnitude of their exploitation widened. Unlike the earlier renewable source of energy like human and animal labour and wood, newer sources of energy i.e. hydrocarbons are non-renewable in character or have economically unviable extralong cycles of renewal.

The introduction of non-renewable source of energy redefined the relationship between the environment and humans. In the modern age ever-growing demand for energy coupled with the steady depletion of sources of energy forced man to reconsider priorities and we see the beginning of the movement for 'conservation.' Better technology ensured greater agricultural production which contributed to a rise in life-expectancy and decline in the mortality rate. The resultant increase in the population in real terms was unprecedented.

It is not that human civilisation had never witnessed the growth of population in the past, but the magnitude has been very high in the modern age- the nineteenth century. Ferdinand Braudel has attempted to define it in terms of the ecological watershed, i.e.,

the end of the 'Biological ancien regime'. He writes: 'What was shattered ... with the eighteenth century was a "Biological ancien regime", a set of restrictions, obstacles, structures, proportions and numerical relationships that had hitherto been the norm.

*The chief constituents are:*

- Number of death roughly equivalent to the number of births
- Very high infant mortality
- Famine
- Chronic undernourishment
- Formidable epidemics.

It is rather broader definition to explain the ecological watershed as it traces the causes in a very long-term perspective beginning with the middle ages and at-least the geographical explorations. At this juncture it is necessary to point out that since the ancient past in Europe we could witness the prevalence of anthropocentric social attitudes. The clearest manifestation was seen in the concept of cosmology in ancient discourses. The earth, the abode of humans, was considered at the centre of the universe and was enveloped by seven strata.



All the seven strata were supposed to have emanated from the earth. The growth of capitalism and the breakdown of the 'biological regime' led to an exponential growth in population. Another corollary of excessive exploitation of environmental resources during the Industrial Age has been the growth of democratic values and institutions. In the same era, scientific knowledge along

with technological development provided a world vision where technology was portrayed as a solution to all human problems, especially the problem of hunger and poverty.

Moreover, the growth of scientific and technological knowledge furthered the traditional anthropocentric view and the exploitation of the environment gained a fresh momentum that continues unabated till today. The greater use of energy led to major problem of environmental pollution. The greater consumption and generation of energy induced a 'green house effect'.

However, what has been a more bothersome fall-out of this process is the development of materials not naturally available in the world, i.e., polymers. The chemical revolution of the 1930's & 1940's developed an artificial material which was not biodegradable and was thus difficult to destroy and decompose. At the same time, the wider applications of the material in industrial and domestic use and low cost of production encouraged its wider circulation.

However, the problem of decomposition of the material made it a major cause of concern for the scientific community. Similarly, the question of the viability of nuclear fuel as a source of energy has been a major issue of concern. The production of non-natural radioactive substance for energy production has been a major scientific and technological development, but again the decay or the proper and cost effective decomposition of the residue has been a major technological failure.

## **ENVIRONMENTAL HEALTH IN INDIA**

India is on a transition wherein 55% of mortality is attributed to non-communicable diseases, and 33% is attributed to infectious diseases. Interstate variations in the presence of infectious diseases highly vary in India. Also sociological and economic factors determine the intensity of exposure to environmental risk factors and access to health system services. Illnesses impact the well being of the people, increases the economic burden of family, affects public resources, and weaken the societies. Therefore, health is an important aspect that cannot be neglected when discussing

sustainable development. It is precisely for this reason that one of the Sustainable Development Goals is Health and SDG 3 mainly focuses on the eradication of diseases, strengthening of the health system and addressing emerging health issues.

The biggest takeaway from all the existing research is that health needs to be considered in all policies. In order to eradicate diseases due to environmental risk factors, it is crucial to understand and address the environmental risk factors from a multidimensional perspective. Similarly, strengthening the health system to cater to the needs of environmental health is also essential. For this, the local, state and national governments should be equipped with resources, knowledge, and professionals working in the area. Understanding and addressing environmental determinants of health from a multidisciplinary perspective is the need of the hour.

### **Environmental issues in India**

There are many environmental issues in India. Air pollution, water pollution, garbage, domestically prohibited goods and pollution of the natural environment are all challenges for India. Nature is also causing some drastic effects on India. The situation was worse between 1947 through 1995. According to data collected and environmental assessments studied by World Bank experts, between 1995 through 2010, India has made some of the fastest progress in addressing its environmental issues and improving its environmental quality in the world. Still, India has a long way to go to reach environmental quality similar to those enjoyed in developed economies. Pollution remains a major challenge and opportunity for India.

Environmental issues are one of the primary causes of disease, health issues and long term livelihood impact for India.

### ***Law and policies***

British rule of India saw several laws related to the environment. Amongst the earliest ones were Shore Nuisance (Bombay and Kolkata) Act of 1853 and the Oriental Gas Company Act of 1857. The Indian Penal Code of 1860, imposed a fine on

anyone who voluntarily fouls the water of any public spring or reservoir. In addition, the Code penalised negligent acts. British India also enacted laws aimed at controlling air pollution. Prominent amongst these were the Bengal Smoke Nuisance Act of 1905 and the Bombay Smoke Nuisance Act of 1912. Whilst these laws failed in having the intended effect, British-enacted legislations pioneered the growth of environmental regulations in India.

Upon independence from Britain, India adopted a constitution and numerous British-enacted laws, without any specific constitutional provision on protecting the environment. India amended its constitution in 1976. Article 48(A) of Part IV of the amended constitution, read: The State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country. Article 51 A (g) imposed additional environmental mandates on the Indian state.

Other Indian laws from recent history include the Water (Prevention and Control of Pollution) Act of 1974, the Forest (Conservation) Act of 1980, and the Air (Prevention and Control of Pollution) Act of 1981. The Air Act was inspired by the decisions made at Stockholm Conference. The Bhopal gas tragedy triggered the Government of India to enact the Environment (Protection) Act of 1986. India has also enacted a set of Noise Pollution (Regulation & Control) Rules in 2000.

In 1985, the Indian government created the Ministry of Environment and Forests. This ministry is the central administrative organisation in India for regulating and ensuring environmental protection.

Despite the active passage of laws by the central government of India, the reality of environmental quality mostly worsened between 1947 and 1990. Rural poor had no choice, but to sustain life in whatever way possible. Air emissions increased, water pollution worsened, forest cover decreased.

Starting in the 1990s, reforms were introduced. Since then, for the first time in Indian history, major air pollutant concentrations have dropped in every 5-year period. Between 1992 and 2010, satellite data confirms India's forest coverage has increased for the

first time by over 4 million hectares, a 7% increase. In August 2019, the Indian government imposed a nationwide ban on single-use plastics that will take effect on 2 Oct.

### ***Possible causes***

Some have cited economic development as the cause regarding the environmental issues. It is suggested that India's growing population is the primary cause of India's environmental degradation. Empirical evidence from countries such as Japan, England and Singapore, each with population density similar to or higher than that of India, yet each enjoying environmental quality vastly superior to India's, suggests population density may not be the only factor affecting India's issues.

### ***Major issues***

Major environmental issues are forests and agricultural degradation of land, resource depletion (such as water, mineral, forest, sand, and rocks), environmental degradation, public health, loss of biodiversity, loss of resilience in ecosystems, livelihood security for the poor.

The major sources of pollution in India include the rapid burning of fuelwood and biomass such as dried waste from livestock as the primary source of energy, lack of organised garbage and waste removal services, lack of sewage treatment operations, lack of flood control and monsoon water drainage system, diversion of consumer waste into rivers, using large land area for burial purposes, cremation practices near major rivers, government mandated protection of highly polluting old public transport, and continued operation by Indian government of government-owned, high emission plants built between 1950 and 1980.

Air pollution, poor management of waste, growing water scarcity, falling groundwater tables, water pollution, preservation and quality of forests, biodiversity loss, and land/soil degradation are some of the major environmental issues India faces today.

India's population growth adds pressure to environmental issues and its resources. Rapid urbanization has caused a buildup of heavy metals in the soil of the city of Ghaziabad, and these

metals are being ingested through contaminated vegetables. Heavy metals are hazardous to people's health and are known carcinogens.

***Population growth and environmental quality***

There is a long history of study and debate about the interactions between population growth and the environment. According to a British thinker Malthus, for example, a growing population exerts pressure on agricultural land, causing environmental degradation, and forcing the cultivation of land of higher as well as poorer quality. This environmental degradation ultimately reduces agricultural yields and food availability, famines and diseases and death, thereby reducing the rate of population growth.

Population growth, because it can place increased pressure on the assimilative capacity of the environment, is also seen as a major cause of air, water, and solid-waste pollution. The result, Malthus theorised, is an equilibrium population that enjoys low levels of both income and Environmental quality. Malthus suggested positive and preventative forced control of human population, along with abolition of poor laws.

Malthus theory, published between 1798 and 1826, has been analysed and criticised ever since. The American thinker Henry George, for example, observed with his characteristic piquancy in dismissing Malthus: "Both the jayhawk and the man eat chickens; but the more jayhawks, the fewer chickens, while the more men, the more chickens." Similarly, the American economist Julian Lincoln Simon criticised Malthus's theory. He noted that the facts of human history have proven the predictions of Malthus and of the Neo-Malthusians to be flawed. Massive geometric population growth in the 20th century did not result in a Malthusian catastrophe. The possible reasons include: increase in human knowledge, rapid increases in productivity, innovation and application of knowledge, general improvements in farming methods (industrial agriculture), mechanisation of work (tractors), the introduction of high-yield varieties of rice and wheat among other plants (Green Revolution), the use of pesticides to control crop pests.

More recent scholarly articles concede that whilst there is no question that population growth may contribute to environmental degradation, its effects can be modified by economic growth and modern technology. Research in environmental economics has uncovered a relationship between environmental quality, measured by ambient concentrations of air pollutants and per capita income. This so-called environmental Kuznets curve shows environmental quality worsening up until about \$5,000 of per capita income on purchasing parity basis, and improving thereafter. The key requirement, for this to be true, is continued adoption of technology and scientific management of resources, continued increases in productivity in every economic sector, entrepreneurial innovation and economic expansion.

Other data suggest that population density has little correlation to environmental quality and human quality of life. India's population density, in 2011, was about 368 human beings per square kilometre. Many countries with population density similar or higher than India enjoy environmental quality as well as human quality of life far superior than India. For example: Singapore (7148 /km<sup>2</sup>), Hong Kong (6349 /km<sup>2</sup>), South Korea (487 /km<sup>2</sup>), Netherlands (403 /km<sup>2</sup>), Belgium (355 / km<sup>2</sup>), England (395 /km<sup>2</sup>) and Japan (337/ km<sup>2</sup>).

### ***Water pollution***

India has major water pollution issues. Discharge of untreated sewage is an important cause for pollution of surface and ground water in India, since there is a large gap between the generation and treatment of domestic waste water. The problem is not only that India lacks sufficient treatment capacity but also that the sewage treatment plants that exist do not operate and are not maintained.

The majority of government-owned sewage treatment plants remain closed most of the time due to improper design, poor maintenance, or lack of reliable electricity supply, along with severe understaffing. The waste water generated in these areas normally percolates in the soil or evaporates. The uncollected



waste accumulates in urban areas, causing unhygienic conditions and releasing pollutants that reach to surface and groundwater.

According to a World Health Organization study, out of India's 3,119 towns and cities, just 209 had partial sewage treatment facilities, and only 8 have full wastewater treatment facilities (1992). Over 100 Indian cities dump untreated sewage directly into the Ganges River. Investment is needed to bridge the gap between 29,000 million litre per day of sewage India generates, and a treatment capacity of mere 6000 million litre per day.

Other sources of water pollution include agriculture runoff and small scale factories along the rivers and lakes of India. Fertilizers and pesticides used in agriculture in northwestern India have been found in rivers, lakes and ground water. Flooding during monsoons worsens India's water pollution problem, as it washes and moves all sorts of solid garbage and contaminated soils into its rivers and wetlands.

### ***Water resources***

According to NASA groundwater declines are highest on Earth between 2002 and 2008 in northern India. Agricultural productivity is dependent on irrigation. A collapse of agricultural output and severe shortages of potable water may influence 114 million residents in India. In July 2012, about 670 million people or 10% of the world's population lost power blame on the severe drought restricting the power delivered by hydroelectric dams.

### ***Air pollution***

Air pollution in India is a serious issue, with the major sources being biomass burning, fuel adulteration, vehicle emission, and traffic congestion. Air pollution is also the main cause of the Asian brown cloud, which has been causing the monsoon season to be delayed. India is the world's largest consumer of fuelwood, agricultural waste, and biomass for energy purposes. Traditional fuel (fuelwood, crop residue and dung cake) dominates domestic energy use in rural India and account for about 90% of the total. In urban areas, traditional fuel constitutes about 24% of the total. Fuel wood, agricultural waste and biomass cake burning release

over 165 million tonnes of combustion products every year. These biomass-based household stoves in India are also a leading source of greenhouse emissions, which contribute to climate change.

The annual crop burning practice in northwest India, north India and eastern Pakistan, before and after monsoons, from April and May to October to November, are a major seasonal source of air pollution since 1980.

Approximately 500 million tons of crop residue are burnt in the open, releasing NO<sub>x</sub>, SO<sub>x</sub>, PAHs and particulate matter into the air.

This burning has been found to be a leading cause of smog and haze problems through the winter over Punjab, cities such as Delhi, and major population centers along the rivers through West Bengal. In other states of India, rice straw and other crop residue burning in open is a major source of air pollution.

Vehicle emissions are another source of air pollution. Vehicle emissions are worsened by fuel adulteration and poor fuel combustion efficiencies from traffic congestion and low density of quality, high speed road network per 1000 people.

In order to reduce air pollution effects India is introducing hybrid and electric vehicles as per the Faster Adoption and Manufacturing of Electric vehicles in India scheme. While challenges are slowing down the development cleaner combustion fuels are being use in motor vehicles.

As of now Delhi Transport Corporation is the world's largest operator of CNG bus fleet. Many Indian cities are testing out with cleaner fossil fuels mostly CNG fuel and renewable biofuels such as biodiesel and E85 blended petroleum. In June 2020, the supreme court promised that in order to improve emissions from vehicles all BS4 vehicles will be upgraded to BS6 standards.

On per capita basis, India is a small emitter of carbon dioxide greenhouse. In 2009, IEA estimates that it emitted about 1.4 tons of gas per person, in comparison to the United States' 17 tons per person, and a world average of 5.3 tons per person. However, India was the third largest emitter of total carbon dioxide in 2009

at 1.65 Gt per year, after China (6.9 Gt per year) and the United States (5.2 Gt per year). With 17 percent of world population, India contributed some 5 percent of human-sourced carbon dioxide emission; compared to China's 24 percent share.

The Air (Prevention and Control of Pollution) Act was passed in 1981 to regulate air pollution and there have been some measurable improvements. However, the 2012 Environmental Performance Index ranked India at 177th position out of 180 countries in 2018, as having the poorest relative air quality out of 132 countries. Of the world's 30 most polluted cities, India is home to 21 as of 2020.

### ***Solid waste pollution***

Trash and garbage is a common sight in urban and rural areas of India. It is a major source of pollution. Indian cities alone generate more than 100 million tons of solid waste a year. Street corners are piled with trash.

Public places and sidewalks are despoiled with filth and litter, rivers and canals act as garbage dumps. In part, India's garbage crisis is from rising congestion. India's waste problem also points to a stunning failure of governance. The tourism regions in the country mainly hill stations are also facing this issue in the recent years.

In 2000, India's Supreme Court directed all Indian cities to implement a comprehensive waste-management programme that would include household collection of segregated waste, recycling and composting. These directions have simply been ignored. No major city runs a comprehensive programme of the kind envisioned by the Supreme Court.

Indeed, forget waste segregation and recycling directive of the India's Supreme Court, the Organisation for Economic Cooperation and Development estimates that up to 40 percent of municipal waste in India remains simply uncollected. Even medical waste, theoretically controlled by stringent rules that require hospitals to operate incinerators, is routinely dumped with regular municipal garbage. A recent study found that about half of India's medical waste is improperly disposed of.

Municipalities in Indian cities and towns have waste collection employees. However, these are unionised government workers and their work performance is neither measured nor monitored.

Some of the few solid waste landfills India has, near its major cities, are overflowing and poorly managed. They have become significant sources of greenhouse emissions and breeding sites for disease vectors such as flies, mosquitoes, cockroaches, rats, and other pests.

In 2011, several Indian cities embarked on waste-to-energy projects of the type in use in Germany, Switzerland and Japan. For example, New Delhi is implementing two incinerator projects aimed at turning the city's trash problem into electricity resource. These plants are being welcomed for addressing the city's chronic problems of excess untreated waste and a shortage of electric power.

They are also being welcomed by those who seek to prevent water pollution, hygiene problems, and eliminate rotting trash that produces potent greenhouse gas methane. The projects are being opposed by waste collection workers & local unions who fear changing technology may deprive them of their livelihood and way of life.

### ***Noise pollution***

Noise pollution or noise disturbance is the most efficiently changing and disturbing or excessive noise that may harm the activity or balance of human or animal life.

The source of most outdoor noise worldwide is mainly caused by machines and transportation systems, motor vehicles, aircraft, and trains. In India the outdoor noise is also caused by loud music during festival seasons.

Outdoor noise is summarized by the word environmental noise. Poor urban planning may give rise to noise pollution, since side-by-side industrial and residential buildings can result in noise pollution in the residential areas.

Indoor noise can be caused by machines, building activities, and music performances, especially in some workplaces. Noise-

induced hearing loss can be caused by outside (e.g. trains) or inside (e.g. music) noise.

High noise levels can contribute to cardiovascular effects in humans and an increased incidence of coronary artery disease. In animals, noise can increase the risk of death by altering predator or prey detection and avoidance, interfere with reproduction and navigation, and contribute to permanent hearing loss.

The Supreme Court of India which is in New Delhi gave a significant verdict on noise pollution in 2005. Unnecessary honking of vehicles makes for a high decibel level of noise in cities. The use of loudspeakers for political purposes and for sermons by temples and mosques makes noise pollution in residential areas worse.

In January 2010, Government of India published norms of permissible noise levels in urban and rural areas.

### ***Erosion of sands***

In March 2009, the issue of Punjab attracted press coverage. It was alleged to be caused by flying ash ponds of thermal power stations, which reportedly lead to severe birth defects in children in the Faridkot and Bhatinda districts of Punjab. The news reports claimed the uranium levels were more than 60 times the maximum safe limit. In 2012, the Government of India confirmed that the ground water in Malwa belt of Punjab has uranium metal that is 50% above the trace limits set by the United Nations' World Health Organization.

Scientific studies, based on over 1000 samples from various sampling points, could not trace the source to fly ash and any sources from thermal power plants or industry as originally alleged. The study also revealed that the uranium concentration in ground water of Malwa district is not 60 times the WHO limits, but only 50% above the WHO limit in 3 locations. This highest concentration found in samples was less than those found naturally in ground waters currently used for human purposes elsewhere, such as Finland. Research is underway to identify natural or other sources for the uranium.

***Greenhouse gas emissions***

India was the third largest emitter of carbon dioxide, a major greenhouse gas, in 2009 at 1.65 Gt per year, after China and the United States. With 17 percent of world population, India contributed some 5 percent of human-sourced carbon dioxide emission; compared to China's 24 percent share. On per capita basis, India emitted about 1.4 tons of carbon dioxide per person, in comparison to the United States' 17 tons per person, and a world average of 5.3 tons per person.

## The Connections between Nutrition and Health Geography

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Many people worry that when they stop eating meat and fish, they might be in danger of some nutritional deficiency. This is not the case as all the nutrients you need can easily be obtained from a vegetarian diet. In fact research shows that in many ways a vegetarian diet is healthier than that of a typical meat-eater.

Nutrients are usually divided into five classes: carbohydrates, proteins, fats (including oil), vitamins and minerals. We also need fibre and water. All are equally important to our well-being, although they are needed in varying quantities, from about 250g of carbohydrate a day to less than two micrograms of vitamin B12. Carbohydrate, fat and protein are usually called macro-nutrients and the vitamins and minerals are usually called micro-nutrients. Most foods contain a mixture of nutrients (there are a few exceptions, like pure salt or sugar) but it is convenient to classify them by the main nutrient they provide. Still, it is worth remembering that everything you eat gives you a whole range of essential nutrients. Meat supplies protein, fat, some B vitamins and minerals (mostly iron, zinc, potassium and phosphorous). Fish, in addition to the above, supplies vitamins A, D, and E, and the mineral iodine. All these nutrients can be easily obtained by vegetarians from other sources.

In general, cheese supplies a great deal of calcium, protein, phosphorus and fat. A 30-gram (1.1 oz) serving of Cheddar cheese contains about 7 grams (0.25 oz) of protein and 200 milligrams of calcium. Nutritionally, cheese is essentially concentrated milk: it takes about 200 grams (7.1 oz) of milk to provide that much protein, and 150 grams (5.3 oz) to equal the calcium. Cheese potentially shares other nutritional properties of milk. The Centre for Science in the Public Interest describes cheese as America's number one source of saturated fat, adding that the average American ate 30 lb (14 kg) of cheese in the year 2000, up from 11 lb (5 kg) in 1970. Their recommendation is to limit full-fat cheese consumption to 2 oz (57 g) a week. Whether cheese's highly saturated fat actually leads to an increased risk of heart disease is called into question when considering France and Greece, which lead the world in cheese eating (more than 14 oz/400 g a week per person, or over 45 lb/20 kg a year) yet have relatively low rates of heart disease. This seeming discrepancy is called the French paradox; the higher rates of consumption of red wine in these countries is often invoked as at least a partial explanation. Some studies claim that cheddar, mozzarella, Swiss and American cheeses can help to prevent tooth decay. Several mechanisms for this protection have been proposed:

- The calcium, protein, and phosphorus in cheese may act to protect tooth enamel.
- Cheese increases saliva flow, washing away acids and sugars.

### ***Controversy***

***Effect on Sleep:*** A study by the British Cheese Board in 2005 to determine the effect of cheese upon sleep and dreaming discovered that, contrary to the idea that cheese commonly causes nightmares, the effect of cheese upon sleep was positive. The majority of the two hundred people tested over a fortnight claimed beneficial results from consuming cheeses before going to bed, the cheese promoting good sleep. Six cheeses were tested and the findings were that the dreams produced were specific to the type of cheese. Although the apparent effects were in some cases



described as colourful and vivid, or cryptic, none of the cheeses tested were found to induce nightmares. However, the six cheeses were all British. The results might be entirely different if a wider range of cheeses were tested. Cheese contains tryptophan, an amino acid that has been found to relieve stress and induce sleep.

### ***Casein***

Like other dairy products, cheese contains casein, a substance that when digested by humans breaks down into several chemicals, including casomorphine, an opioid peptide. In the early 1960s it was hypothesized that autism can be caused or aggravated by opioid peptides. Studies supporting these claims have had significant flaws, so the data are inadequate to guide autism treatment recommendations.

### ***Lactose***

Cheese is often avoided by those who are lactose intolerant, but ripened cheeses like Cheddar contain only about 5% of the lactose found in whole milk, and aged cheeses contain almost none. Nevertheless, people with severe lactose intolerance should avoid eating dairy cheese. As a natural product, the same kind of cheese may contain different amounts of lactose on different occasions, causing unexpected painful reactions. As an alternative, also for vegans, there is already a wide range of different soy cheese kinds available. Some people suffer reactions to amines found in cheese, particularly histamine and tyramine. Some aged cheeses contain significant concentrations of these amines, which can trigger symptoms mimicking an allergic reaction: headaches, rashes, and blood pressure elevations.

### ***Pasteurization***

A number of food safety agencies around the world have warned of the risks of raw-milk cheeses. The U.S. Food and Drug Administration states that soft raw-milk cheeses can cause “serious infectious diseases including listeriosis, brucellosis, salmonellosis and tuberculosis”. It is U.S. law since 1944 that all raw-milk cheeses (including imports since 1951) must be aged at least 60 days.

Australia has a wide ban on raw-milk cheeses as well, though in recent years exceptions have been made for Swiss Gruyère, Emmental and Sbrinz, and for French Roquefort. There is a trend for cheeses to be pasteurized even when not required by law.

Compulsory pasteurization is controversial. Pasteurization does change the flavour of cheeses, and unpasteurized cheeses are often considered to have better flavour, so there are reasons not to pasteurize all cheeses. Some say that health concerns are overstated, pointing out that milk pasteurization does not ensure cheese safety.

Pregnant women may face an additional risk from cheese; the U.S. Centres for Disease Control has warned pregnant women against eating soft-ripened cheeses and blue-veined cheeses, due to the listeria risk, which can cause miscarriage or harm to the fetus during birth.

## **NUTRITION AND THE QUALITY OF LIFE**

Good nutrition promotes health-related quality of life (HRQOL) by averting malnutrition, preventing dietary deficiency disease and promoting optimal functioning. However, definitions of quality of life also encompass life satisfaction and both physical and mental well-being. Nutrition and diet have not been a part of mainstream research on quality of life and are not included among key quality of life domains.

### **Dimensions of Quality of Life**

Researchers in the social and biomedical sciences conceptualize and use the term “quality of life” differently. The broadest use of the term quality of life by social scientists refers to overall life satisfaction. Some of the dimensions (constructs or domains) that are covered in life satisfaction include general behavioral competence, perceived quality of life, psychological well-being, physical/physiological status, and other environmental factors (such as living alone) that can be objectively assessed and that may also influence one’s satisfaction with his or her lot. The domains and constructs encompassed by the HRQOL measures are much narrower and more specific than those employed by social

scientists. The HRQOL concept is more biomedically oriented, focusing upon physical and mental health dimensions that change with disease, changes in functional status, or treatment of these changes.

Some researchers find it helpful to think of the various measures of life satisfaction and quality of life as constituting a hierarchy, similar to that popularized by Abraham Maslow in his "hierarchy of basic needs." The most basic needs are simply measures of functional status, such as ADLs, which focus on physical function, and minimal psychological and social functioning required for independent living (IADLs). Although these basic functions have some nutritional aspects, few are specified precisely or evaluated when these tools are used. For example, the ADL has an item that evaluates the ability to eat independently, and the IADL has items that evaluate the ability to shop and cook, but none of the dimensions of these tools are specific to nutrition except as they relate to these basic functions. Other measures of functional status, such as the Karnovsky Index, also involve very basic needs. More complex or higher level functions related to food and eating, such as the ability to choose one's own diet or enjoyment of food, are not included in any of these instruments. Food-, eating-, and nutrition-related functions and dimensions tapped by HRQOL tools are also limited in their scope and focus on "basic needs" or vegetative functions rather than on higher order sensory and cognitive dimensions of food and eating. This is understandable, since much of the initial interest in nutrition focused on nutritional status as it was associated with medical treatments and HRQOL. However, other dimensions of food and eating that involve enjoyment are also important, especially for older persons. Global tools that measure overall life satisfaction and quality of life do not explicitly tap these nutritional dimensions.

### **Uses of Health-Related Quality-of-Life Measures in Nutrition**

It is important to determine which dimensions are of greatest interest when one is selecting tools to measure quality of life.

Many or only a few dimensions may be involved, even when the focus is limited to HRQOL. The uses to which HRQOL measurements will be put largely determine what dimensions the tools need to include. Common uses include the following: providing data to assist in clinical decision making; evaluating differences in quality of life between populations and/or individuals; helping to elucidate factors that contribute to changes in quality of life; determining this dimension in surveys of health care quality; and evaluating the effectiveness of interventions. HRQOL measures are also used as screening tools for improving management of chronic diseases and illnesses in patients.

### **Relationship Between Nutrition and Changes in Quality of Life in Older Adults**

#### ***Age-Associated Changes That Affect Quality of Life***

The relationships between nutrition, aging, and quality of life are recursive. Aging-caused or aging-associated factors alter certain aspects of nutrition, such as the sense of smell and taste, ability to chew and swallow, and gastrointestinal and bowel function, and these in turn may influence quality of life. At the same time, poor nutrition and lack of physical activity can lead to lack of appetite, inability to perform ADLs, changes in quality of life, morbidity, and mortality.

Some of the physical and psychological changes that occur with aging that have potential adverse impacts upon the nutritional aspects of HRQOL. These include changes in body composition, physiology, disease burden, and social functioning. All of these changes potentially influence the individual's HRQOL. Poor nutrition causes many of the changes in functional status that take place during aging. Therefore, it is important to assess diet and nutritional status when evaluating HRQOL and to alter poor nutritional status whenever it is possible to do so. It is also important to tap other dimensions of experience associated with dietary behaviors, such as taste, enjoyment, and social aspects of an elderly person's eating experiences. There is therefore a need to measure functional status and HRQOL, in addition to nutritional status.

***Benefits of Food and Nutrition on Quality of Life***

Good nutrition improves HRQOL by promoting health, preventing dietary deficiency disease, and ameliorating or averting secondary malnutrition that is caused by or associated with other disease. Food and nutrition are essential components of “the good life.” Good food is a sensory and psychological pleasure in its own right. Meals may also add a sense of security, meaning, order, and structure to an elderly person’s day; imbue that person with feelings of independence, control, and sense of mastery over his or her environment; and provide opportunities for making food choices. Eating with others may increase social interactions. When the social aspects of eating are attended to, food consumption may increase, thereby improving nutritional status. The positive psychological and social aspects of eating are important pleasures of life, which can persist into old age. They have potent contributions to well-being that must not be forgotten.

The sequelae of malnutrition include physical, mental, and social disability. If inadequate dietary intake continues for a long time (e.g., weeks or months), undernutrition results. If undernutrition is extreme, it results in diminished muscle mass and vigor, functional impairment, and decreased HRQOL. Malnutrition also causes lack of enjoyment in eating and anorexia, which may generate psychological, medical, and social problems. The associations between malnutrition and disability can operate in both directions. Malnourished individuals are likely to be disabled, and disabled individuals are at greater risk for nutritional problems because of their greater dependence on others. Undernutrition can also cause stigmatization of the afflicted elderly person by others. For example, very thin, cachectic individuals are viewed as being ill and are often singled out by healthier elderly individuals as being “old and sick”.

Excessive dietary intake and insufficient physical activity also may pose health and mental health problems, especially when they result in obesity, as studies of obese elderly individuals in rural Pennsylvania have shown. The consequences of obesity include increased risk of diabetes, cancer, cardiovascular disease,

and premature death. Excessive intake of alcohol also has a well-known toxic effect on mental health, social interaction, physical health and well-being, and HRQOL. Both inadequate and excessive intakes of some vitamins and minerals may also cause health and mental problems in older individuals.

### **Specific Nutritional Problems and Associations With Functional Status and Health-Related Quality of Life**

Some common nutritional conditions and problems associated with aging that may affect quality of life. Some of the types of malnutrition and their possible association with two measures of functional status. These conditions have been studied extensively from the pathophysiological standpoint, with an emphasis on how their occurrence modifies health status, but links between them to quality of life have rarely been studied.

Each of these malnutrition-related conditions may affect functional status differently. The specific nutritional dimensions affected are usually not documented completely, nor is the degree to which malnutrition is associated with each disease or how it adversely impacts outcomes.

### ***Tools for Measuring Quality of Life***

Many measures and scales have been used to address and quantify the impact of nutrition on HRQOL. Until recently, most were used only in research studies. Today they are used increasingly in clinical settings as well.

Different types of HRQOL tools are needed for each purpose. HRQOL measures include general/generic tools that can be used in many conditions, and disease-specific tools that are designed for specific conditions. The generic tools, such as the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36), assess general health from a holistic standpoint. Disease-specific tools focus on specific health, functional, and other problems (e.g., psychological and social) associated with a specific disease or condition, and also contain some general questions. One example of such a tool is the Kidney Disease Quality-of-Life Questionnaire

(KDQOL) , which is used extensively among patients in end-stage kidney disease.

## **HEALTHY DIETS**

Consuming a healthy diet throughout the life-course helps to prevent malnutrition in all its forms as well as a range of noncommunicable diseases (NCDs) and conditions. However, increased production of processed foods, rapid urbanization and changing lifestyles have led to a shift in dietary patterns. People are now consuming more foods high in energy, fats, free sugars and salt/sodium, and many people do not eat enough fruit, vegetables and other dietary fibre such as whole grains.

The exact make-up of a diversified, balanced and healthy diet will vary depending on individual characteristics (e.g. age, gender, lifestyle and degree of physical activity), cultural context, locally available foods and dietary customs. However, the basic principles of what constitutes a healthy diet remain the same.

### ***For adults***

A healthy diet includes the following:

- Fruit, vegetables, legumes (e.g. lentils and beans), nuts and whole grains (e.g. unprocessed maize, millet, oats, wheat and brown rice).
- At least 400 g (i.e. five portions) of fruit and vegetables per day , excluding potatoes, sweet potatoes, cassava and other starchy roots.
- Less than 10% of total energy intake from free sugars , which is equivalent to 50 g (or about 12 level teaspoons) for a person of healthy body weight consuming about 2000 calories per day, but ideally is less than 5% of total energy intake for additional health benefits. Free sugars are all sugars added to foods or drinks by the manufacturer, cook or consumer, as well as sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates.
- Less than 30% of total energy intake from fats. Unsaturated fats (found in fish, avocado and nuts, and in sunflower,

soybean, canola and olive oils) are preferable to saturated fats (found in fatty meat, butter, palm and coconut oil, cream, cheese, ghee and lard) and *trans*-fats of all kinds, including both industrially-produced *trans*-fats (found in baked and fried foods, and pre-packaged snacks and foods, such as frozen pizza, pies, cookies, biscuits, wafers, and cooking oils and spreads) and ruminant *trans*-fats (found in meat and dairy foods from ruminant animals, such as cows, sheep, goats and camels). It is suggested that the intake of saturated fats be reduced to less than 10% of total energy intake and *trans*-fats to less than 1% of total energy intake. In particular, industrially-produced *trans*-fats are not part of a healthy diet and should be avoided.

- Less than 5 g of salt (equivalent to about one teaspoon) per day. Salt should be iodized.

### ***For infants and young children***

In the first 2 years of a child's life, optimal nutrition fosters healthy growth and improves cognitive development. It also reduces the risk of becoming overweight or obese and developing NCDs later in life.

Advice on a healthy diet for infants and children is similar to that for adults, but the following elements are also important:

- Infants should be breastfed exclusively during the first 6 months of life.
- Infants should be breastfed continuously until 2 years of age and beyond.
- From 6 months of age, breast milk should be complemented with a variety of adequate, safe and nutrient-dense foods. Salt and sugars should not be added to complementary foods.

## **Practical advice on maintaining a healthy diet**

### ***Fruit and vegetables***

Eating at least 400 g, or five portions, of fruit and vegetables



per day reduces the risk of NCDs and helps to ensure an adequate daily intake of dietary fibre.

Fruit and vegetable intake can be improved by:

- always including vegetables in meals;
- eating fresh fruit and raw vegetables as snacks;
- eating fresh fruit and vegetables that are in season; and
- eating a variety of fruit and vegetables.

### ***Fats***

Reducing the amount of total fat intake to less than 30% of total energy intake helps to prevent unhealthy weight gain in the adult population. Also, the risk of developing NCDs is lowered by:

- reducing saturated fats to less than 10% of total energy intake;
- reducing *trans*-fats to less than 1% of total energy intake; and
- replacing both saturated fats and *trans*-fats with unsaturated fats – in particular, with polyunsaturated fats.

Fat intake, especially saturated fat and industrially-produced *trans*-fat intake, can be reduced by:

- steaming or boiling instead of frying when cooking;
- replacing butter, lard and ghee with oils rich in polyunsaturated fats, such as soybean, canola (rapeseed), corn, safflower and sunflower oils;
- eating reduced-fat dairy foods and lean meats, or trimming visible fat from meat; and
- limiting the consumption of baked and fried foods, and pre-packaged snacks and foods (e.g. doughnuts, cakes, pies, cookies, biscuits and wafers) that contain industrially-produced *trans*-fats.

### ***Salt, sodium and potassium***

Most people consume too much sodium through salt (corresponding to consuming an average of 9–12 g of salt per day)

and not enough potassium (less than 3.5 g). High sodium intake and insufficient potassium intake contribute to high blood pressure, which in turn increases the risk of heart disease and stroke.

Reducing salt intake to the recommended level of less than 5 g per day could prevent 1.7 million deaths each year.

People are often unaware of the amount of salt they consume. In many countries, most salt comes from processed foods (e.g. ready meals; processed meats such as bacon, ham and salami; cheese; and salty snacks) or from foods consumed frequently in large amounts (e.g. bread). Salt is also added to foods during cooking (e.g. bouillon, stock cubes, soy sauce and fish sauce) or at the point of consumption (e.g. table salt).

Salt intake can be reduced by:

- limiting the amount of salt and high-sodium condiments (e.g. soy sauce, fish sauce and bouillon) when cooking and preparing foods;
- not having salt or high-sodium sauces on the table;
- limiting the consumption of salty snacks; and
- choosing products with lower sodium content.

Some food manufacturers are reformulating recipes to reduce the sodium content of their products, and people should be encouraged to check nutrition labels to see how much sodium is in a product before purchasing or consuming it.

Potassium can mitigate the negative effects of elevated sodium consumption on blood pressure. Intake of potassium can be increased by consuming fresh fruit and vegetables.

### ***Sugars***

In both adults and children, the intake of free sugars should be reduced to less than 10% of total energy intake. A reduction to less than 5% of total energy intake would provide additional health benefits.

Consuming free sugars increases the risk of dental caries (tooth decay). Excess calories from foods and drinks high in free sugars

also contribute to unhealthy weight gain, which can lead to overweight and obesity. Recent evidence also shows that free sugars influence blood pressure and serum lipids, and suggests that a reduction in free sugars intake reduces risk factors for cardiovascular diseases.

Sugars intake can be reduced by:

- limiting the consumption of foods and drinks containing high amounts of sugars, such as sugary snacks, candies and sugar-sweetened beverages (i.e. all types of beverages containing free sugars – these include carbonated or noncarbonated soft drinks, fruit or vegetable juices and drinks, liquid and powder concentrates, flavoured water, energy and sports drinks, readytodrink tea, readytodrink coffee and flavoured milk drinks); and
- eating fresh fruit and raw vegetables as snacks instead of sugary snacks.

### ***How to promote healthy diets***

Diet evolves over time, being influenced by many social and economic factors that interact in a complex manner to shape individual dietary patterns. These factors include income, food prices (which will affect the availability and affordability of healthy foods), individual preferences and beliefs, cultural traditions, and geographical and environmental aspects (including climate change). Therefore, promoting a healthy food environment – including food systems that promote a diversified, balanced and healthy diet – requires the involvement of multiple sectors and stakeholders, including government, and the public and private sectors.

Governments have a central role in creating a healthy food environment that enables people to adopt and maintain healthy dietary practices. Effective actions by policy-makers to create a healthy food environment include the following:

- Creating coherence in national policies and investment plans – including trade, food and agricultural policies – to promote a healthy diet and protect public health through:

- o increasing incentives for producers and retailers to grow, use and sell fresh fruit and vegetables;
  - o reducing incentives for the food industry to continue or increase production of processed foods containing high levels of saturated fats, *trans*-fats, free sugars and salt/sodium;
  - o encouraging reformulation of food products to reduce the contents of saturated fats, *trans*-fats, free sugars and salt/sodium, with the goal of eliminating industrially-produced *trans*-fats;
  - o implementing the WHO recommendations on the marketing of foods and non-alcoholic beverages to children;
  - o establishing standards to foster healthy dietary practices through ensuring the availability of healthy, nutritious, safe and affordable foods in pre-schools, schools, other public institutions and the workplace;
  - o exploring regulatory and voluntary instruments (e.g. marketing regulations and nutrition labelling policies), and economic incentives or disincentives (e.g. taxation and subsidies) to promote a healthy diet; and
  - o encouraging transnational, national and local food services and catering outlets to improve the nutritional quality of their foods – ensuring the availability and affordability of healthy choices – and review portion sizes and pricing.
- Encouraging consumer demand for healthy foods and meals through:
    - o promoting consumer awareness of a healthy diet;
    - o developing school policies and programmes that encourage children to adopt and maintain a healthy diet;
    - o educating children, adolescents and adults about nutrition and healthy dietary practices;

- o encouraging culinary skills, including in children through schools;
- o supporting point-of-sale information, including through nutrition labelling that ensures accurate, standardized and comprehensible information on nutrient contents in foods (in line with the Codex Alimentarius Commission guidelines), with the addition of front-of-pack labelling to facilitate consumer understanding; and
- o providing nutrition and dietary counselling at primary health-care facilities.
- Promoting appropriate infant and young child feeding practices through:
  - o implementing the International Code of Marketing of Breast-milk Substitutes and subsequent relevant World Health Assembly resolutions;
  - o implementing policies and practices to promote protection of working mothers; and
  - o promoting, protecting and supporting breastfeeding in health services and the community, including through the Baby-friendly Hospital Initiative.

### **Simple Steps to a Healthier Diet**

Do you think eating healthy means you have to radically change your diet and give up all your favorite foods? Think again. Improving your health could be as easy as switching from white to whole-wheat bread, adding a tablespoon of ground flaxseed to your afternoon yogurt, or ordering your favorite coffee drink with skim milk instead of whole. Making little changes to your diet can add up to BIG health benefits.

#### ***Switch to 100% whole-wheat or whole-grain bread***

Just switching to whole grains from refined grain products benefits your body about 10 different ways, from lengthening your life span to helping control weight to reducing your risk of type 2 diabetes, heart disease, stroke, and cancer.

Every sandwich made with 100% whole wheat bread instead of white bread, for example, adds about 4 grams of fiber along with an assortment of vitamins, minerals, and phytochemicals.

***Use mustard on sandwiches***

Mayonnaise or mayo-based spreads are one of the worst condiment choices because they're usually high in calories, fat grams, and omega-6 fatty acids.

Every sandwich made with a teaspoon of mustard instead of a tablespoon of mayonnaise, for example, trims 100 calories, 11 grams of fat, 1.5 grams saturated fat, and 7.2 grams omega-6 fatty acids from your daily total.

***Make your oatmeal with skim or 1% milk instead of water***

Whether you prefer instant or regular oatmeal, this simple step will boost the protein and calcium in your breakfast. Using 2/3 cup of skim milk instead of water adds 6 grams of quality protein, 255 milligrams (mg) potassium, 205 mg calcium, 14% of the Recommended Dietary Intake for vitamin B-12, and 67 international units (IU) of vitamin D.

***Add a little ground flaxseed to yogurt and smoothies***

Do this every time you reach for a yogurt or order a smoothie. Adding 2 tablespoons of flaxseed adds 4 grams of fiber, 2.4 grams of healthy plant omega-3s fatty acids, and some healthy phytoestrogens (lignans) to your snack.

***Use spinach leaves instead of iceberg lettuce in salads***

A 4-cup serving of raw spinach leaves has 20 milligrams of omega-3s, 9800 IU vitamin A, 5,890 micrograms (mcg) of beta-carotene, 260 mg potassium, 26 mg Vitamin C, 150 mcg folic acid, 2 mg vitamin E, and 68 mg calcium more than the same-size serving of iceberg lettuce.

***Drink unsweetened tea instead of sweetened tea or soda***

A serving of bottled or canned sweetened tea, sweetened tea from a restaurant, or soda has about 140 calories and 32 grams

of sugar per 12-ounce serving. Switching to unsweetened tea can save 7,840 calories and 448 teaspoons of sugar per month if you drink about 2 servings of soda or sweetened tea a day.

***Order broiled or grilled fish instead of steak when dining out***

Eating fish a couple times a week will pump heart-healthy fish omega-3s into your diet. If the fish replaces a steak, you'll also be dramatically reducing the amount of saturated fat in the meal.

The typical 8-ounce T-bone steak served at a restaurant (with 1/8-inch trim) has 635 calories, 17 grams saturated fat, and 140 mg of cholesterol – not including any fat added during cooking or as a garnish. The typical 4-ounce broiled salmon filet served at a restaurant has 206 calories, 9 grams fat, 1.4 grams saturated fat, 80 mg of cholesterol and 2.5 grams of omega-3s. Switching to fish trims 16 grams of saturated fat while adding 2.5 grams of omega-3s.

***Have pasta with tomato-based sauce instead of white sauce***

Butter or cream-based white pasta sauce (like Alfredo) is loaded with saturated fat and calories. Tomato-based sauce (like marinara) is generally lower-fat and also adds antioxidants and healthy phytochemicals.

***Order your sandwich or entrée with fruit or fresh veggies instead of fries or chips***

French fries or potato chips typically come with many of our favorite restaurant entrees. But most of the time you can substitute a side of fruit or fresh vegetables for the fries; you just have to ask for it.

Each time you order a side of fruit or vegetables instead of French fries, you shave around 350 calories and 18 grams fat (5 or more of which are saturated). You'll also add 3 grams of fiber and an assortment of antioxidants.

***Order coffee drinks with skim milk – and skip the whip***

Many people treat themselves to a daily frothy coffee drink in the fall and winter, and when the days turn warmer, they trade

in their lattes in for an iced or blended coffee drinks. Ordering your daily coffee treat with skim milk instead of whole lets you keep what's nutritionally great about milk (good-quality protein, calcium and vitamin B-12) while cutting calories and fat grams. Skip the "whip" the baristas squirt generously on top, and you'll save even more calories and fat.

A typical 16-ounce mocha latte contains about 360 calories and 19 grams fat, 10 of which are saturated fat. Order it with skim milk and no whip and it's down to about 220 calories, 2.5 grams fat and .5 grams saturated fat.

***Switch your sugary breakfast cereal to a whole grain, lower-sugar type***

If you routinely eat cereal for breakfast, switching to a higher-fiber, lower-sugar variety could have a huge effect on your health.

If you have cereal 5 times a week, choosing a cereal like Post Grape-Nuts Flakes (3.4 grams of fiber and 19% calories from sugar) or Quaker Oatmeal Squares (5 grams of fiber and 19% calories from sugar) instead of a sugary cereal like Froot Loops will give you 17 extra grams of fiber while cutting more than 6 teaspoons of sugar each week.

**Components of Balanced Diet**

***Carbohydrates:*** Carbohydrates are the most important source of energy. They contain the elements Carbon, Hydrogen and Oxygen. The first part of the name "carbo-" means that they contain Carbon. The second part of the name "-hydr-" means that they contain Hydrogen. The third part of the name "-ate-" means that they contain Oxygen. In all carbohydrates the ratio of Hydrogen atoms to Oxygen atoms is 2:1 just like water.

We obtain most of our carbohydrate in the form of starch. This is found in potato, rice, spaghetti, yams, bread and cereals. Our digestive system turns all this starch into another carbohydrate called glucose. Glucose is carried around the body in the blood and is used by our tissues as a source of energy. (See my pages on respiration and balanced chemical equations.) Any glucose in



our food is absorbed without the need for digestion. We also get some of our carbohydrate in the form of sucrose; this is the sugar which we put in our tea and coffee (three heaped spoonfuls for me!). Both sucrose and glucose are sugars, but sucrose molecules are too big to get into the blood, so the digestive system turns it into glucose. When we use glucose in tissue respiration we need Oxygen. This process produces Carbon Dioxide and water and releases energy for other processes.

### ***Proteins***

Proteins are required for growth and repair. Proteins contain Carbon, Hydrogen, Oxygen, Nitrogen and sometimes Sulphur. Proteins are very large molecules, so they cannot get directly into our blood; they must be turned into amino-acids by the digestive system.

There are over 20 different amino-acids. Our bodies can turn the amino-acids back into protein. When our cells do this they have to put the amino-acids together in the correct order. There are many millions of possible combinations or sequences of amino-acids; it is our DNA which contains the information about how to make proteins. Our cells get their amino-acids from the blood. Now try my Biuret test in the Virtual Laboratory.

Proteins can also be used as a source of energy. When excess amino-acids are removed from the body the Nitrogen is excreted as a chemical called urea. The liver makes urea and the kidney puts the urea into our urine.

### ***Fats***

Like carbohydrates, fats contain the elements Carbon, Hydrogen and Oxygen. Fats are used as a source of energy: they are also stored beneath the skin helping to insulate us against the cold. Do not think that by avoiding fat in your diet you will stay thin and elegant! If you eat too much carbohydrate and protein, you will convert some of it into fat, so you will put on weight. You must balance the amount of energy containing foods with the amount of energy that you use when you take exercise.

You must have some fat in your diet because it contains fat soluble vitamins.

### ***Vitamins***

Vitamins are only required in very small quantities. There is no chemical similarity between these chemicals; the similarity between them is entirely biological.

*Vitamin A*: good for your eyes.

*Vitamin B*: about 12 different chemicals.

*Vitamin C*: needed for your body to repair itself.

*Vitamin D*: can be made in your skin, needed for absorption of Calcium.

*Vitamin E*: the nice one-reproduction?

### ***Mineral Salts***

These are also needed in small quantities, but we need more of these than we need of vitamins.

*Iron*: required to make haemoglobin.

*Calcium*: required for healthy teeth, bones and muscles.

*Sodium*: all cells need this, especially nerve cells.

*Iodine*: used to make a hormone called thyroxine.

### ***Fibre***

We do not // can not digest cellulose. This is a carbohydrate used by plants to make their cell walls. It is also called roughage. If you do not eat foods materials which contain fibre you might end up with problems of the colon and rectum. The muscles of your digestive system mix food with the digestive juices and push food along the intestines by peristalsis; if there is no fibre in your diet these movements cannot work properly.

### ***A Balanced Diet***

You must have carbohydrate, protein, fat, vitamins, minerals salts and fibre in the correct proportions. If there is not enough protein, you will not be able to grow properly and you will not be able to repair yourself i.e. wounds will not heal properly. If you

do not have enough energy containing foods you will feel very tired, you will not have enough energy. If you have too much energy containing foods you will become overweight. If you think that you are overweight you might try taking more exercise to “burn off” some of the excess food which you ate at you last meal.

### **Role of Balanced Diet in Sports Performance**

Most often, being underweight is a sign of an accompanying disorder.

This disorder must first be dealt with in order to bring your weight back to normal. In addition, to this treatment, physical activity may need to be modified and psychological counseling may be required. After the treatment of the primary disorder is successful, nutritional support may be provided along with dietary changes.

### ***Dietary Management***

The objectives of dietary modification are to restore the body to its normal weight, rebuild tissue and store nutrients, and maintain the desirable body weight.

**Energy:** A nutritious high energy diet providing calories over and above the body's requirement will result in weight gain. An increase of about 500-1000 Cal per day can result in a weight gain of approximately one kilogram per week.

**Protein:** A liberal intake of high quality protein will help in building up of muscle tissue. A daily protein intake of two grams per kilogram of body weight will be required. For example, if your body weight is 60 kg, you require 75-120 g protein.

**Carbohydrates:** A high carbohydrate intake is also necessary to meet the energy requirements of a malnourished body. The bulk of the diet, however, should not be increased as it cuts down food intake. Avoid taking more fiber than is necessary for regular bowel movement.

**Fats:** Fats aid in the weight gain process, but they should only be used in amounts that can be tolerated. Emulsified fats like butter, cream etc. are better tolerated by the body.

**Minerals and Vitamins:** These must be provided in sufficient amounts in order to counter for nutritional deficiencies.

**Diet and Feeding Pattern:** The amount of food intake cannot be substantially increased all of a sudden. The amount of food at each meal and the frequency of meals should be increased gradually. The calorie density of the foods can be increased, without increasing bulk, by using more sugar, jam, butter, cream, oil, and nuts. To increase the protein content of the diet, milk powder, cheese, cottage cheese, and protein concentrates can be added to liquid milk, and other beverages and soups.

***Obesity-overeating-weight loss Diets-other Weight Issues...***

Weight loss diets that work? Let's see ... "I can't stand women who can't get back to their original figure after having children." That seemed like a ridiculous thing to say but somehow this throw-away comment fell onto fertile ground. Six months later – a starvation diet. It was easy enough. A week later, and 10 pounds were gone.

Then, a few years later, another innocuous remark, by another person. Another man, to be precise – quite likely, that's important: "125 pounds? Well, you don't need to weigh more." It was probably forgotten the moment he turned back to his newspaper. And so it went, for years and years. Weight gain, weight loss, diets, exercising – a decade-long spiral.

Moments of emotional upheaval suggested food (and weight gain) just as those male voices suggested weight loss. And the food tasted good, the fullness in the stomach was reassuring, the slightly drugged feeling was a wonderful escape, the heaviness gave the feeling of groundedness that seemed otherwise so elusive. Then there were the occasional fantastic weight loss experiences!

But the spiral went up and up. This is what happens with yoyo dieting. Lose 10 pounds, gain 15. Lose 20 pounds, gain 30. Lose 30 pounds ... you get the picture. It's not just about losing weight but how to lose weight and keep it off.

When we analyze this little story, we see a number of things. Of course, they are not the only elements, and many of these

elements are intricately intertwined. At any rate, looking at these elements can help untangle the web of obesity.

**Expectations.** Our culture is obsessed with weight and how much a person “should” weigh. Here’s a question. If you are reasonably healthy and fit, how much does your weight matter? There is a saying, “scales are for fish”. Let’s not let the scales dictate how we feel about our bodies.

**Self esteem/self worth.** So much of our self worth is tied up in what other people say about us (or worse yet, what we imagine they say about us). Even unimportant little comments can throw us for a loop if we already feel insecure in a certain area.

For example, if I already feel insecure in my femininity or sexuality, a comment about my body shape by an important man in my life can inflict a wound that may fester for a long time.

**Dieting:** Weight loss diets don’t work for yoyo dieters. Dieting certainly works for some people, for example for the person who overdoes it a bit on Christmas and then goes on a diet to lose five pounds – and those five pounds stay off. Diets don’t work for most people with chronic weight problems. They need a lifestyle change.

**Emotional Eating:** Being angry or lonely can trigger the desire to eat. Sadness, excitement, boredom, fear, resentments add to the list of triggers. Literally any feeling at all can be the reason to grab those chips, a couple of donuts, the bag of cookies, a chocolate bar, or bring on yet another trip to the fridge. Eating can simply be a response to emotions – a sort of companion – or it can be used to mask those feelings. Food can be a drug, a form of self medication.

**The Physical Experience of Eating:** What can I say – food just tastes and feels good, and if something tastes and feels good, it’s natural to want more of it. Pretty much everyone knows the experience of eating more than necessary. But for the overeater, it just doesn’t stop. There is often an actual inability – learned or “wired in the brain” – to understand and react to the cues of hunger and fullness. It’s like a car alarm that never goes off, or one that can’t be turned off.

**The Weight:** The experience of being a “weighty person” is

more reassuring than most people would think. One feels like a “person of substance”, someone who can’t be pushed around. The weight feels like insulation – it’s harder to get hurt when there is an armour for protection.

So .... if you recognize yourself in any of this and you want a change in your life, what are some of your options?

**Another Weight Loss Diet:** There is a slim possibility that you haven’t tried the right diet yet. If you need to try that again, make sure you use one that you can see yourself following for a long time. The more variety that diet has, the greater the chance it’ll work. Says diet expert M.L. Dansiger, “The key to success is finding a diet plan that you can stick to”.

**Psychotherapy/counselling:** As mentioned above, overeating may be connected to psychological issues such as low self esteem. Many people with weight problems have suffered abuse as children. A good counsellor can help sort out these problems. Just having someone listen to some things that have been kept hidden for a long time can be the beginning of weight release. If you feel that counselling might help, get in touch with me and we’ll see what we can do. You can also go to the American Psychological Association for more information.

**Overeaters Anonymous:** Similar to Alcoholics Anonymous, these are support groups of peers who “have been there, done that, got the t-shirt”. You can find people there who have struggled with their weight and successfully kept it off for many years. Many people find that underneath their eating problem is a “living problem”. While by no means religious, Overeaters Anonymous is a spiritual approach.

*... and, last not least: men and weight issues. We seem to think that women are the only ones who struggle with weight. There are lots of men who have weight issues, too. Because of cultural factors, these tend to be hidden—with the result that usually, men are very isolated around their weight issues. First of all, there are probably more women who are overweight, and second, men find it much, much harder to come together for support around such problems. Stay tuned for a section on men and weight issues.*

### ***Weight Gain Diets***

It is not a good idea of Increasing intake of junk foods and fatty foods to gain weight. You should be eating calorie dense yet nutritious food. Your calorie intake should come from foods that are healthy for you. The weight gaining diet should include high protein foods, high carbohydrate foods and healthy fats. Include these in your diet.

### ***Example of Weight Gain Diet***

**Breakfast:** Banana and milk or banana shake or smoothie, whole-grain toast, fruits, granola, nuts. Eat more fruit and drink less juice. Do not give milk mixed with ghee to your child. It is not healthy.

**Lunch:** Roti/chapatti/wholegrain bread, rice, green vegetables, paneer (cottage cheese), dal, chickpeas (chole), black-eyed beans (lobia), rajma, whole wheat pudding (dalia), etc.

**Dinner:** Similar to lunch

**In-between Meals:** fruit, sandwich, yogurt (curd), milk, cheese, salad.

Avoid deep fried snacks like samosa, pakodas, bhujia etc.

Avoid fast foods including donut.

## **NUTRITION AND LIFE PROSPECTS IN THE DEVELOPED WORLD**

### **Nutrition in developing countries**

The prevalence of malnutrition worldwide is staggering. Globally, over 2.3 billion people suffer from malnutrition in one form or another. Of these over 2.3 billion people, it is estimated that:

- 928 million people do not consume enough food
- 2 billion people do not consume enough vitamins and minerals
- 149 million children under five are too short for their age (stunted)

- 45 million children under five do not weigh enough for their height (wasted)
- 39 million children under the age of five weigh too much for their height
- 29.9 percent of women aged 15-49 years are affected by anemia
- 40% of all men and women are overweight or obese

Women and girls are at higher risk of being affected by malnutrition—60% of the world's hungry are women according to the World Food Program. Women and girls are at heightened risk of malnutrition due to systematic discrimination; women and girls typically eat the least and eat last.

Nearly half of the children who die before they reach the age of five suffer from undernutrition. They do not have enough nutritious food and essential vitamins and minerals to grow, develop and fight off disease.

Millions of kids become permanently mentally and physically disabled because of inadequate nutrition. Undernourished children show stunted growth patterns by the age of three and have poorer cognitive skills than their well-fed peers.

Beyond these human tragedies, there are also economic implications. Researchers believe that these preventable deaths and disabilities also reduce a country's economic potential by at least 10% due to lost productivity.

### ***Ending malnutrition is essential to improving and saving lives***

At the root of all forms of malnutrition are many common causes, notably poor diet quality. Contemporary food systems are unable to deliver nutritious, safe, affordable, inclusive and sustainable diets, which became starkly apparent during the COVID-19 pandemic. Malnutrition is caused not just by the lack of adequate, nutritious food, but also by frequent illness, poor care practices, and lack of access to health and other social services.

The changing nutrition landscape, the COVID-19 pandemic, contemporary agricultural production, demographic changes, and



climate change have all highlighted the need to take a broader, “multi-sectoral food systems approach” to ending malnutrition, in order to build strong food systems that have positive nutrition and health outcomes. Double duty interventions – or actions, which simultaneously prevent or reduce the risk of undernutrition and obesity or non-communicable diseases, with the same intervention, program, or policy – are critical to tackling malnutrition.

***Micronutrients and why they are important***

Micronutrients such as vitamin A, iron, folic acid, zinc and iodine offer one, high-impact and cost effective way to improve birth outcomes for mother and child. Babies born to women with inadequate nutrition may have many complications including birth defects, premature birth, and death. Vitamin A is a critical micronutrient for children under 5 years to ensure sustained growth and development, including vision and immune system strengthening.

Children who receive adequate nutrition are not as likely to die from diseases like diarrhea, malaria, pneumonia, measles and HIV. Children who receive adequate nutrition in the first 1,000 days are more likely to stay in school, contribute to the needs of their family and reach their full potential.

Micronutrient requirements are high in adolescents. Adolescence is seen as the “catch-up” period for growth, which presents a critical “second window” of opportunity to improve nutritional status. Adequate nutrition has a formative role in the timing of puberty while lack of nutritious foods and infections make it difficult for women and girls, in particular, to grow and have healthy babies.

***Every dollar spent on nutrition has great return***

Experts around the world recognize that investing in the delivery of nutrients has tremendous benefits. It is estimated that every dollar spent on nutrition for a child sees an average return of \$30 over their adult life.

Through global nutrition investments children will live longer, healthier lives and contribute to the development of their countries.

As one of the world's largest donors to nutrition programs, Canada has brought international attention to the issue of under-nutrition. We support critical nutrition programs that reduce child and maternal mortality, empower women and girls, and promote health development through the lifecycle.

### **Nutrition priorities**

Canada recognizes that too many women and girls, particularly adolescent girls, continue to be denied access to the full range of health and nutrition services.

Canada is a strong believer that good nutrition is a key component of empowering women and girls. Women play an important role in food production and household food consumption decision-making. The quality of care and feeding offered to children, which is an important factor in preventing malnutrition, is critically dependent on women's education, social status, and workload.

Canada works to improve gender-sensitive nutrition for the poorest and most marginalized by enhancing access to nutritious food, micronutrients and comprehensive nutrition services, and supporting nutrition-sensitive food systems throughout the lifecycle, with a focus on women, young children, and adolescent girls.

Canada takes a "twin tracked" approach to food security and nutrition that supports targeted policy, programming, and advocacy efforts with the greatest potential to close gender gaps. This includes direct action to immediately tackle hunger and micronutrient deficiencies for the most vulnerable, alongside long-term nutrition-sensitive interventions, that address the root causes of hunger, malnutrition and poverty.

As a strong supporter of the Scaling Up Nutrition (SUN) movement Canada's Minister of International Development has specified three nutrition priorities that Canada will bring forward as part of the SUN Movement strategy from 2022-2025:

1. To promote a comprehensive approach to the empowerment of women and girls.
2. To advocate for increased international investment in key gap areas, such as nutrition.
3. To reach the most vulnerable with effective nutrition interventions.

## **Nutrition**

Nutrition is a critical part of health and development. Better nutrition is related to improved infant, child and maternal health, stronger immune systems, safer pregnancy and childbirth, lower risk of non-communicable diseases (such as diabetes and cardiovascular disease), and longevity.

Healthy children learn better. People with adequate nutrition are more productive and can create opportunities to gradually break the cycles of poverty and hunger.

Malnutrition, in every form, presents significant threats to human health. Today the world faces a double burden of malnutrition that includes both undernutrition and overweight, especially in low- and middle-income countries.

WHO is providing scientific advice and decision-making tools that can help countries take action to address all forms of malnutrition to support health and wellbeing for all, at all ages.

This fact file explores the risks posed by all forms of malnutrition, starting from the earliest stages of development, and the responses that the health system can give directly and through its influence on other sectors, particularly the food system.

## **Nutritional Supplements**

In an attempt to enhance performance through ergogenic aids, without contravening IOC doping control regulations, many athletes have turned to 'natural' products and nutritional supplements. Unlike therapeutic drugs, nutritional supplements are not required to have strong scientific and clinical evidence that they are effective before being allowed to be sold to the public.

They are not subject to the same independent, scientific scrutiny as that for regulated medicines. Manufacturers may therefore make exaggerated claims regarding the ergogenic properties of their products. It is a widely held view by athletes that by using such supplements, performance will be enhanced through replacement of the body's biochemical stores or by modification of the processes involved in weight control and energy function.

Nutritional supplements include vitamins, minerals, carbohydrate, protein and various extracts from plant sources. There is a commonly held view that 'natural' products are, by definition, free of toxic side-effects. This is clearly a misconception, particularly when it is remembered that in the early days of pharmacological science all drugs were derived from plant and animal sources and that many of these derivatives are amongst the most toxic chemicals known to man. Indeed, some nutritional supplements have the potential for harm.

Many of these products are promoted as having ergogenic properties. Such claims are rarely substantiated by sound scientific data in peer-reviewed journals. In recent times, there have been a number of high profile cases involving athletes who have tested positive for the anabolic steroid, nandrolone, where the athlete had claimed that they had ingested the steroid in a 'contaminated' nutritional supplement, an assertion which may be based on truth.

Whether the IOC should revise its doping control regulations, to include nutritional supplements, is debatable.

### ***Vitamins***

Vitamins are frequently taken by athletes on the supposition that they are experiencing a vitamin deficiency due to exercise and training regimes. However, Cotter has suggested that there is little evidence to suggest that exercise would necessitate vitamin supplementation.

In terms of using vitamin supplements as ergogenic aids, the B-complex vitamins have been taken because they are co-enzymes in the processes of red blood cell production and in the metabolism of fats and carbohydrates. Vitamin C is reputed to aid in the wound

healing process and vitamin E has been claimed to increase aerobic capacity. All these claims for ergogenic properties of vitamins, in general, there is little evidence available to substantiate these claims. Vitamins, taken in excess, are toxic. This applies particularly to the fatsoluble vitamins (A, D, E and K) which are stored in the body and which can therefore accumulate. Even the water-soluble vitamins (B and C) can produce toxic effects when taken in excess. In general, a balanced diet will provide the necessary nutritional requirements of vitamins. Vitamin supplements are only of benefit where there is a clear deficiency, such as occurs with an exceptional nutritional intake.

### ***Proteins and Amino Acids***

Protein and amino acid supplements are frequently used by athletes, particularly where muscle development is of prime importance. Protein is obviously an essential component of a balanced diet but there is no experimental evidence to show that protein supplementation enhances metabolic activity or leads to increased muscle mass.

Excessive intake of protein can produce toxic effects, due to overproduction of urea with a concomitant loss of water, leading to dehydration with a risk to the competitor of muscle cramp and an impairment of body temperature regulation. Manipulation of diet, to induce metabolic acidosis by reducing carbohydrate intake or increasing fat and protein intake, has shown impaired performance.

The amino acids, arginine and ornithine have been shown to stimulate the release of growth hormone. Such an effect requires intravenous infusion of the amino acids. A similar effect following oral administration of arginine or ornithine has not been established. Furthermore, the literature does not support the idea that growth hormone releasers have an ergogenic effect. In general, it is considered that amino acids do not improve endurance performance and that physically active individuals are advised to obtain necessary amino acids through consumption of natural, high quality protein foods, rather than through supplements.

***Carbohydrate***

Sports drinks, used to replace fluid, carbohydrate and electrolytes are widely used by athletes. During endurance exercise, suitable intake of such products has been shown to be beneficial for glycogen-depleted muscles and to enhance performance.

***Ginseng***

Ginseng is a herbal preparation comprising a complex mixture of glycosides, known as ginsenosides. There are many varieties of plant from which ginsenosides are extracted and multiple preparations within which they are presented. No two preparations will therefore contain the same combination and dose of ginsenosides. Ginseng has been used for thousands of years, particularly by the Chinese, and many claims have been made as to its therapeutic value. Few scientific experiments have been reported with regard to its performance-enhancing properties failed to find any statistically significant difference in maximum aerobic capacity, heart rate or time to exhaustion during a comparative controlled trial on a small group of marathon runners.

**CHALLENGES IN THE DEVELOPING WORLD**

Today malnutrition is one of the biggest challenges plaguing our society which makes our next generation weak and fragile.

In developing countries, the health and nutrition of females throughout their entire life is affected by complex and highly interrelated biological, social, cultural, and health service-related factors. Rather than focusing exclusively on the prenatal period, we describe a life cycle approach to improving maternal nutrition, which goes beyond the traditional provision of nutrition services during pregnancy, by addressing risk factors that are present well before pregnancy, even before childbearing age.

**Worrying global prevalence trends of malnutrition**

According to 2019 statistics from the World Health Organization and UNICEF, malnutrition is cosmopolitan, and its prevalence remains unacceptably high, consequently impacting negatively on the lives of the affected children. Approximately

one third of women of reproductive age had anemia, while obesity affected a slightly higher proportion (39%) of the world's adult population. Underweight babies constitute a further 20 million, despite a noted slow decline in stunted growth. In 2018, just over a fifth (21.9%) of the world's children aged five had stunted growth, despite its overall global prevalence decline from 32.5% during the period between the years 2000 and 2018. During the same period, the population of stunted children decreased in terms of millions (from 198.2 to 149.0). Of this proportion, nearly 40% lived in South Asia, and a similar proportion lived in Africa south of Sahara (SSA), although an alarming proportional increase has been noted from west and central Africa (22.4 million to 28.9 million).

Earlier in 2010, 49 million children aged five and below were wasted, while a further 17 million suffered from severe wasting thus translating to 7.3 and 2.4%, respectively. One worrying global trend is the fact that about 45% of mortality among children aged five and below is linked to malnutrition, the bulk of these occurring in low- and middle-income countries.

A further global trend is that 528 million (29%) of reproductive-age women are vulnerable to anemia occasioned by inadequate dietary iron supplementation. In the low and middle - income Countries, the rates of childhood obesity and overweight were on the rise, estimated to nearly threefold rise in prevalence during the period between the years 2000 and 2018 alone, in Eastern Europe, Central Asia, the Middle East, and Northern Africa. The prevalence in these regions ranges between 8.8 and 11.2%, respectively.

Eastern and south-east Asia, the Pacific, and northern Africa account for more than a third of the world's overweight children. The gender distribution of these statistics tends to show higher stunting rates among boys than girls. This is thought to be due to the fact that boys have relatively higher risk of low birth weight and preterm birth than girls. These disparities were noted to be prevalent in Latin America, South-east Asia, and the Caribbean. More attention should then be placed on these regions by those

dealing with intervention measures. WHO report also cites that those who are at risk of malnutrition include infants, children, women, and adolescents and that optimization of nutrition early in life (specifically within the first 1000 days of life) will ensure the child gets the best possible start in life with its life-long benefits. Unfortunately, the nonadherence to the recommended prevalence of breastfeeding practices among many societies of the world remains relatively low and worrying, since only 41% (hence 59% non-compliance) of infants aged 6 months or less were exclusively breastfed and only 45% were continually breastfed for at most 2 years in 2017.

### **Factors contributing to good nutrition**

Before we consider the factors that predispose to malnutrition, let us first discuss the factors that contribute to good nutrition. These factors play an important role, especially in places where the resources are inadequate for the affected society and/or families. Many of these factors are intertwined, especially in developing countries, where small-scale subsistence farming is practiced. The most notable of these are good agricultural practices, good and vibrant economy, healthy enabling environment, healthy social and family life, good antenatal and perinatal care, and early screening and control of preventable diseases. We shall now revisit each of these factors.

#### ***Good agricultural practices***

Parents and household heads need to take responsibility in ensuring good agricultural practices (especially clearing farm land at the right time, planting sufficient good crops, using irrigation and fertilizer where necessary, getting appropriate advice from agricultural extension workers, harvesting at the right time, and safe storing the food to avoid losses through pests, a good transport and distribution system to get enough good food to all regions) are done appropriately. Chronic and irresponsible alcoholism by those charged with providing for the family, for example, may lead to poor (or inadequately productive) agricultural practices that will lead to loss of family income, poverty, and family neglect



and may lead to malnutrition, among other health challenges in the family. Improvement of nutrition and prevention of malnutrition require energetic and cooperative efforts directed toward all these factors.

***Good and vibrant economy***

Those in influential leadership and governance of societies should on priority basis ensure there is a good economy in place. This should guarantee sufficient resources allocated to support adequate food and fuel/energy, health and education, and good education, among other society needs. Unfortunately, this is not always the case in many parts of the world, especially in developing countries.

***Healthy enabling environment***

Each country should ensure there is equitable availability and distribution of safe and sufficient water for drinking, cooking, cleaning, and other uses. Environmental sanitation and sewage treatment and management should also be appropriate. If this kind of environment is lacking, then the affected society will be vulnerable to many health problems, including related nutrition challenges.

***Good education***

Provision of appropriate and adequate knowledge on good nutrition and child health to the societies is critical. In most developing countries, this can effectively be done by those charged with the responsibility of disseminating such knowledge to schools, families, and any other modes of communication to large populations. Through good health education, the right attitudes and practices that promote good nutrition to the most vulnerable groups (especially children and mothers) will be guaranteed.

***Healthy social and family life***

Dissemination of adequate knowledge on family planning matters, at the right time to the right audience, is important. The right size of and the availability of adequate resources to the family and the presence of a health social environment in a family

are paramount. This will ensure adequacy of food and attention to the whole family, especially younger children who usually need more care. Arrangements to ensure adequate resources for food, shelter, and other needs are maintained even if either or both parents have to work and a caretaker has to look after the children in their absence. Good supervision to ensure children get adequate and appropriate food should be in place at all times (at home, in day-care centers, and other such places); otherwise, some children might become malnourished. Care for children from broken or incomplete families directly affects nutritional status, especially if the social integration and communal care are lacking.

#### ***Good antenatal and perinatal care***

Pregnant mothers require good antenatal care, especially to ensure good nutrition during pregnancy in order to avoid giving birth to low birth weight babies and to prevent intrauterine growth retardation and prematurity.

#### ***Early screening and control of preventable diseases***

Immunization and vaccinations done appropriately at the right time to the right people will ensure early detection and prevention of diseases. Early screening for congenital malformations that interfere with child's eating or food utilization (such as cleft lip/palate, congenital hypertrophic pyloric stenosis) can alleviate related health problems and their management.

#### **Our challenges now and forthcoming time**

Besides these aforementioned facts, the nutritional problems from the viewpoint of science need to cover other "real scientific problems" namely characteristics of the different foods and food preparations: toxicological approach, clinical nutrition behaviors (chemical constituents, their stabilities utilization, physical-chemical properties, food preparation forms, etc.).

Sorry to say, the toxicological problems of the different food or food components are not sufficiently studied in over the world.

In our previous studies, we deeply analyzed the capsaicin problems and were very surprised that no human clinical

toxicological examination was found independently in the literature during the human population of the last 7000–9000 years by the international authorities asked different toxicological data and by the measurements given internationally accredited institutes. We received these data from the different authorities, and Hungarian authorities gave permission to carry out observations with capsaicin for 1 month period (Phase I). However, we would like to use capsaicin for human therapy we need to give farther toxicological data (two species of animals—rats and Beagle dogs for 6 months, and thereafter in human beings).

From this book, the changes of different physical-chemical properties of the food produced by different preparation are absolutely absent; meanwhile, these data are important in the utilization of different foods or food preparations.

For the objective analysis of the foods, we need to use objective methods as we did during drug therapy.

In case of drug preparation, we need to give the international authorities so-called Drug Master File (DMF). In case of capsaicin, the DMF has to be present in the following details: (1) specification of the capsicum species, (2) climatic regulations in places of capsicum cultivation, (3) chemical treatments of capsicum plants during their cultivation, (4) detailed treatment of capsicum plants (their collection, drying, extraction storages, etc.), (5) analytical results supporting the chemical composition of the plant origin of capsaicinoids extract, (6) chemical stability of natural capsaicin (capsaicinoids), (7) analytical results showing the possible contamination of natural compounds with organic phosphates, pesticides, fusarium, and aflatoxins, and (8) international certification (including the Food and Drug Administration, FDA) on the capsaicin (capsaicinoids) content of the natural preparation. Aforementioned data need to be given by internationally accredited laboratories. These data are collected in the DMF.

Sorry to say, similar qualification systems do not exist in case of foods regardless of using much higher portions in the everyday life (Food Master File, FMF). These are in under discussion by the international organizations.

The qualification of the foods would be necessary to be done firstly in human beings, of course, with respect to the actual physiological (pathophysiological) parameters of the human organs.

Our challenges now and in the forthcoming decades are the solutions of these aforementioned problems. Our biggest challenge is that although the number of human population increases exponentially, increase of food supply does not happen exponentially.

## The Health Effects of Globalization

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Globalization describes how nations, peoples, and economies are becoming increasingly interconnected and interdependent. Globalization has contributed to health improvements through diffusion of new health knowledge, low-cost health technologies, and human rights. Economic globalization based upon a neoliberal model of liberalized trade and investment and minimal government regulation, however, has brought many health risks.

Some historians date the ‘modern’ era of (Western) globalization with European colonial expansion and the Westphalia formation of nation states in the late seventeenth century. Mercantilism dominated globalization’s policies and practices over the next two centuries, as governments supported their local merchant class in competition for an expanding global trade facilitated by technological advances in maritime navigation. A series of late nineteenth-century economic recessions, rising social inequalities, staggering inflation, and nationalist protectionism became the fertile ground from which the Great War emerged, which devastation and lessons failed to find a sufficiently firm political foothold to avoid a recurrence in the Second World War. This foothold became more secure in the 30 years following the Second World War, which saw a new pattern in globalization emerge with the creation of stronger multilateral governance bodies. The United Nations (UN) replaced the League of Nations.

The International Monetary Fund (IMF) was created to maintain macroeconomic stability and avoid the recessionary crises underpinning both world wars. The World Bank (WB) was founded to finance reconstruction of war-torn Europe (and later, developing country economies and social infrastructure). The General Agreement on Tariffs and Trade provided a negotiating platform intended to interconnect national economies (at that time, of the high-income developed countries only) in mutually beneficial ways, with the expectation that this would also provide economic disincentives to future war.

### **Contemporary Globalization**

A new 'contemporary' globalization began to emerge in the 1970s. More economic recessions, two oil price shocks, profligate international bank lending, an end to fixed currency exchange rates, and a 'stagflation' leading to sharp interest rate spikes in the world's (then) major economies combined to create a developing world debt crisis. This crisis provided an opportunity for neoliberal economic theories first advanced by Friedrich Hayek in the 1920s to become policy practice, in the form of structural adjustment programs imposed largely on the heavily foreign indebted countries of Africa and Latin America, which needed financial assistance from the IMF and WB to avoid government default and bankruptcy. The key elements of these programs, later codified as the Washington Consensus, are well known and included such requirements as:

- privatization of state assets to generate revenue,
- deregulation of economic markets to promote private sector growth,
- lower corporate and individual taxes to attract foreign direct investment,
- reduced government spending and increased cost recovery (user pay for public services), and
- increased trade and financial liberalization.

These policy prescriptions were intended to increase economic growth and the ability of governments both to service their foreign

debt obligations and to reduce their debt burden. Evidence of their effectiveness in doing so is mixed, with other regions of the world not adopting these policies (notably Southeast (SE) Asian countries) performing much better over this period (Chang, 2005). The policies also resulted in a number of health-negative impacts, first documented with respect to children's health in the landmark United Nations International Children Emergency Fund publication, *Adjustment with a Human Face* (Cornia et al., 1987). Subsequent studies similarly found singularly negative health impacts of structural adjustment programs, attributed to user fees that created barriers to health and education services, labor market adjustments from trade liberalization that led to unemployment or insecure informal work, and tax reductions and the loss of tariffs revenues that reduced government health and social protection spending (Bremner and Shelton, 2001). But even as evidence and argument over the economic and health impacts of structural adjustment continued, the neoliberal policy context shaping contemporary globalization became firmly embedded.

### ***Globalization's Positive Health***

Even as this neoliberal model of global market integration strengthened its grip on countries' economic policies, civil society movements, the foreign aid arms of governments, and several UN agencies were emphasizing the social dimensions of global health development. Key innovations at this time included the 'child health revolution' of the 1980s, with its emphasis on low-cost health interventions: GOBI (Growth monitoring, Oral rehydration, Breastfeeding, Immunization), later followed by the triple FFF (Family planning, Female education, and Food supplementation). Some have argued that much of the improvement in global health during the last half of the twentieth century arose not from economic growth in developing countries, but from health technologies and knowledge transfers between wealthier (developed) and poorer (developing) countries (Deaton, 2003): one indication of globalization's health beneficence.

Ratification by most of the world's countries of international human rights conventions is seen as another health-positive facet

of contemporary globalization. Several of these conventions make specific reference to the right to health, and most others deal with rights associated with access to social determinants of health. Though sometimes critiqued for a perceived Western bias (emphasizing individual rather than collective rights) and for their lack of enforcement (apart from 'naming and shaming' states that fail to fulfill their obligations under these treaties), international human rights have become a set of global tools used in the struggle for better health throughout much of the world (Chapman, 2002). A global diffusion of concerns for gender equity has also been attributed to globalization, from increased funding to improve conditions for maternal/child health, to new employment opportunities in export-oriented industries allowing women to earn income outside patriarchal social structures. That the poor working conditions in these outsourced factories have become a focus of international and civil society activism attests to another distinguishing quality of contemporary globalization: the breadth and reach of digital communication technologies. These technologies enable not only the more exploitative elements of open markets but also the platforms for oppositional civil society mobilizations.

The past 15 years have also seen global attention to health rise considerably. Health concerns directly informed three of the UN Millennium Development Goals, have been central in bilateral and multilateral development aid policies, and have led to the creation of over 100 global public-private partnerships for health. International financing for health followed suit, increasing substantially over this period, partly on the accumulating evidence that health should be considered an investment in economic growth, rather than a cost (World Bank, 1993; CMH, 2001).

### ***Globalization's Negative Health***

The emphasis on health as an investment relates to one of the more contentious positive health claims made for globalization: that of the contribution of liberalized markets to economic growth. This argument holds that trade and investment liberalization improves growth, which generates wealth that reduces poverty.



Poverty reduction, in turn, improves health (poverty being the single greatest risk condition for disease), creating more productive and skilled workers, which spur the economy to even greater growth and more trickle-down health. It is by interrogating the links in this 'virtuous circle,' however, that globalization's health risks begin to emerge.

Most econometric studies do find that trade liberalization is associated with better growth, but this positive relationship is neither automatic nor always observed (Thorbecke and Nissanke, 2006). There also remains doubt about the direction of causality in these studies: does openness lead to growth, or does growth give rise to openness? Many development economists are critical of the assumption that liberalization is inevitably a 'global public good' for the economic growth it is presumed to engender. Some argue that trade liberalization rules are 'kicking away the ladder' of development policies successfully used by high-income countries in the past, and by middle-income SE Asian economies in the two decades prior to the birth of the World Trade Organization (WTO) in 1995 (Chang, 2005). Others point to evidence that trade and investment liberalization disproportionately benefits larger, wealthier nations with greater factor endowments and the political strength to set the terms of liberalization rules in their favor (Birdsall, 2006). One study of four different scenarios of a completed 'Doha Development Round' of WTO negotiations (so named as it was intended to give more attention to the economic interests of developing countries) showed net income gains for wealthy countries but net income losses for the world's poorest countries (Polaski, 2006). While the number of people living in extreme poverty (US \$1.25 day<sup>-1</sup>) has decreased since liberalized trade began its acceleration in the 1980s, the 'rising tide' of global economic growth has not lifted people very far with poverty at the US \$2.50 day<sup>-1</sup> level increasing by almost the same number (Chen and Ravallion, 2008). Expanding external trade has not been a powerful force for poverty reduction in developing countries.

There are three other ways in which trade liberalization and global market integration poses specific health risks: spread of

disease, loss of government policy space and capacity, and increased labor market insecurity.

### ***Spread of Disease***

Infectious diseases such as the plague, smallpox, and cholera have long followed trade and military routes; it was a freighter's dumping of infected bilge waters that caused the Latin American cholera pandemic of the 1990s, and the deployment of UN Nepalese peace keepers that introduced cholera into Haiti in 2010. Trade has also been responsible for the movements of insect or animal species destructive to natural resources essential for health (food, water, and biomass). Modern transportation allows such pathogens and pests to spread faster and farther, with the severe acute respiratory syndrome outbreak in the early 2000s shaking public health systems out of their recent complacency. New International Health Regulations monitored by the World Health Organization (WHO) followed quickly, as did ongoing 'pandemic preparedness' within and between countries and the 'securitization' of health within global governance structures (the WHO and the UN), wherein pandemic disease is viewed as a risk to national and international security (OUNHCHR, 2000). The global trade in fake medicines alongside the misuse of antibiotics in many countries, especially those that lack well-regulated public health systems, is heightening concern over the spread of multiple or extremely drug-resistant infections.

While increased research and policy attention is being paid to the globalization of infectious diseases, chronic noncommunicable diseases (NCDs) such as cancer, cardiovascular disease, and diabetes have been steadily growing in prevalence and now account for the largest proportion of the global burden of disease, outpacing infectious diseases in all developing countries except for those in sub-Saharan Africa. The rise in NCDs, particularly problematic in many low- and middle-income countries still coping with infectious epidemics, is partly attributable to international trade and investment policies that are globalizing 'Western' lifestyles, including increased consumption of unhealthy products. The nutrition transition in many of these

countries toward a low-nutrient, high-energy diet is occurring much faster and at earlier stages of development than it did in high-income countries (Popkin, 2009). Increased trade in tobacco and alcohol products, in turn, is associated with higher levels of consumption and health-related problems (Labonté et al., 2011), at the same time that trade and investment treaties are being used by transnational companies (or governments on their behalf) to challenge public health restrictions on advertising, points of sale, taxation, and other measures now widely accepted as essential tools in health promotion.

### ***Loss of Government Policy Space and Capacity***

Another aspect of trade and investment liberalization with indirect health outcome is the loss of governments' 'policy space' and 'policy capacity.' 'Policy space' describes "the freedom, scope, and mechanisms that governments have to choose, design and implement public policies to fulfill their aims" (Koivusalo et al., 2009: p. 105). Policy capacity refers to the fiscal ability of states to enact those policies or regulations, which depends upon their ability to capture sufficient revenue through taxation for this purpose. The increasing 'behind-the-border' reach of an ever larger number of multilateral, regional, and bilateral trade and investment treaties is shrinking policy space by prohibiting a range of domestic regulatory options that could be used to promote more equitable population health outcomes. Although governments retain substantial policy flexibilities within existing trade treaties, these flexibilities continue to be eroded through ongoing negotiations, notably the shift to bilateral and regional treaty negotiations, which are often 'WTO+,' limiting policy space to a much greater extent than current WTO rules. Of particular concern is the proliferation of investor state dispute settlement provisions in bilateral and regional treaties, which allow corporations to sue governments for regulations that result in expropriation of their investments, with expropriation often defined in very broad terms. Anticipating the cost of such disputes can lead governments to choose not to exercise the health flexibilities that might still exist within these treaties: a 'regulatory chill.'

Policy capacity, in turn, can be affected by liberalization's requirements for progressive reductions in tariffs. Many low- and middle-income countries rely much more upon tariffs for their tax revenue than do high-income nations. These tariff rates have come under intense trade negotiation pressures from high-income countries to be 'locked in' and rapidly reduced. In theory, governments should be able to shift their tax base from tariffs to sales or income taxes, assuming their economies grow with increased liberalization. In reality, most low- and middle-income countries subject to tariff reductions under structural adjustment loans from the IMF and WB were unable to do so (Baunsgaard and Keen, 2010), partly the result of inadequate institutions to implement alternate tax regimes. For a majority of these countries, there was a net decline in overall public revenues – a loss in policy capacity – with implications for spending in health, education, or public regulations that can affect primary and secondary prevention of disease.

### ***Turmoil in Labor Markets***

At the same time that many countries saw their policy space and capacity erode under structural adjustment, a global reorganization of production was unfolding through the creation of 'export processing zones' (EPZs) in low- and middle-income countries. Industrial manufacturing previously centered in high-income countries began to outsource production to EPZs, which are tax-free and provide a low-paid and often minimally regulated workforce (Martinez, 2004). Most of the world's trade no longer occurs between nations, but between multiple subsidiaries of transnational companies. Much of the value added (and the profit) is captured by the firm at the top of the chain, often in offshore financial centers ('tax havens'), and often by way of relentless pressure on competing suppliers to bear most of the risk associated with investments in plant and equipment and to contain labor and other production costs. Corporations' ability to relocate production to lower cost jurisdictions limits the ability of workers to negotiate better wages and working conditions, and to expand social provision through the political process that was at the core of the

postwar compromise between workers and capital in the high-income world. The result: 'most workers are being squeezed' (Woodall, 2006). This is occurring in all countries of the world. Even those in low- and middle-income countries who have seen their incomes rise as a result of the growth in global production chains live in conditions variously described as 'vulnerable' or 'precarious,' where their employment is often informal, temporary, part-time, or generally lacking in adequate remuneration, security, or benefits (Standing, 2011). Social protection programs can compensate, at least in part, for job and labor income losses that result from trade liberalization. However, given the extent of global market liberalization in capital, goods, and services, most of the world's governments find themselves converging on a policy model in which they strive to make their own geographic location as competitive as possible in international markets. Both labor market 'flexibilization,' with its stress-related health risks, and limits on the taxes that could finance improved health and social protection policies constitute important elements of competition state policies.

## **CHANGING LIFE, CHANGING DANGERS**

### **Globalization's New Challenges To Public Health**

Although many SDH exist, in the global context "the most devastating problems that plague the daily lives of billions of people...emerge from a single, fundamental source: the consequences of poverty and inequality". Over the long term and with considerable variation at any given income level, richer societies are healthier, whereas poverty, however defined, remains one of the most important contributing conditions to ill health. Thus, if globalization could be shown to be reliable and effective in increasing growth rates and reducing poverty, setting aside for the moment the health-negative environmental impacts of such growth, then measures to promote globalization, such as trade liberalization, should be embraced for their health benefits. The evidence that globalization contributes either to economic growth or to poverty reduction, however, is at best equivocal, depending *inter alia* on how one assesses the extent to which national economies

have been integrated into the global marketplace, how poverty is defined, and how many uncertainties about data quality one is willing to live with or overlook. Even globalization's enthusiasts concede that there may be substantial numbers of losers within national economies, notably as a consequence of changes in labor markets.

In the past quarter-century of rapid economic integration, although the size of the global work force doubled as India, China, and the transition economies opened their borders to trade and investment, progress toward poverty reduction in low- and middle-income countries was modest. According to World Bank analyses, between 1981 and 2005 the number of people living in extreme poverty declined by 505 million. This decline is accounted for entirely by economic growth in China, where half of the poverty reduction occurred before that country embraced domestic or global market reforms. Excluding China, extreme poverty increased by 123 million between 1981 and 2005, with decreases in poverty in some countries offset by greater increases in others. Nor did economic growth necessarily lift people very far: The number of people living on incomes below a less extreme definition of poverty rose by 402 million—745 million excluding China—over the same period to 3.2 billion, or roughly half the world's population. As one senior World Bank development economist concluded, "it is hard to maintain the view that expanding external trade is...a powerful force for poverty reduction in developing countries". It is also worth noting that poverty-reducing growth in China—and in some other countries such as Vietnam—coincided with the rapid marketization of health care provision, leading to dramatic declines in access and affordability, and much of the progress in development and poverty reduction that occurred over the period in question may have been undone by the recession that began in 2008 as a direct consequence of the interconnectedness of global financial markets.

Economic growth and poverty reduction are not the whole global health story. The global diffusion of new health knowledge and technologies may have done more to improve health status in developing countries in the last half of the past century than

did economic growth per se. Many of these innovations originated in wealthy countries, and “in this sense, the first world has been responsible for producing the global public goods of medical and health-related research and development from which everyone has benefited, in poor and now-rich countries alike”. This transfer of knowledge is now compromised by the extension of intellectual property rights held mostly by firms based in high-income countries. Newly available employment opportunities for women in export-oriented industries provide opportunities for them to earn income outside patriarchal social structures and are another claimed, if indirect, health benefit of globalization. But employment conditions in such industries are often so directly destructive of health, partly because of retailers’ relentless pressure to cut costs and deliver new products quickly, that—in the case of Bangladeshi garment factories, for instance—“it would not be possible to undertake such work for an extended period of time”.

An innovative econometric exercise carried out as background research for the Commission on Social Determinants of Health, using data from 136 countries, helps in assessing the overall impact of globalization. Cornia and colleagues described five main influences on mortality: material deprivation, psychological stress, unhealthy lifestyles, inequality and lack of social cohesion, and technical (i.e., medical) progress. They then identified a range of variables that affect these influences, classifying the variables as (a) related to policy choices made in the context of globalization (e.g., income inequality, immunization rates); (b) endogenous, and therefore unrelated to globalization for purposes of the analysis (medical progress); or (c) describable as “shocks” (e.g., wars and natural disasters, HIV/AIDS). The final stage of analysis was a simulation that compared trends in life expectancy at birth (LEB) over the period 1980–2000 with those that would be predicted based on a counterfactual in which trends in all the relevant variables remained at the 1980 value or continued the trend they followed over the pre-1980 period. Thus, investigators assumed in the counterfactual (for instance) not only that income distribution within countries, one of the globalization-related variables, did not change over the period 1980–2000, but also that no progress

occurred in medical technology and that HIV incidence remained at its 1980 level.

## **Effects of Globalization on Population Health**

### ***Demographic Changes***

Population growth is often overlooked in the discourse on global change, including its relation to the mitigation (abatement) of climate change, to which the contribution of global emissions is obvious. The projections by the United Nations that today's population of 7 billion will increase to 9.3 billion by 2050 should reactivate the debate about whether we can succeed in pursuing realistic objectives for a healthy climate without curtailing the actual number of humans pressing on the environment. Furthermore, the negative-feedback loop of excessive population pressure on regional environments (involving soil exhaustion, water depletion, and the loss of various wild animal and plant food species) not only exacerbates various ongoing worldwide environmental and ecologic changes but also entrenches conditions of poverty and disadvantage. In these latter circumstances, fertility rates tend to remain high.

Some additional increase in the world population is inevitable in countries with high fertility rates, given the demographic flywheel momentum of populations weighted toward the young. Meanwhile, moderate gains have been made in facilitating education for girls, although progress in this, as well as in the provision of adequate education about reproduction and reproductive choice, remains slow in many low-income countries. Where unplanned pregnancy rates remain high (e.g., Timor-Leste and Nigeria), so do risks to maternal and child health.

### ***Social Changes And Economic Activity***

Many other aspects of globalization influence population health, including the accelerated emergence of new infectious diseases, the near-ubiquitous rise in the rates of obesity and associated noncommunicable diseases as daily bodily energy budgets (food energy input vs. physical energy output) shift into surplus, the spread of cigarette marketing, the effects of climate



change, increases in resistance to antimicrobial agents, and health risks in the workplace due to the deregulation of international labor markets. Looming large in the background as additional determinants of health are the persistent, even increasing, disparities in wealth, education, autonomy, and social inclusion. There are, of course, certain aspects of globalization that are beneficial to health, such as the enhanced flow of information, improvements in internationally coordinated vaccination programs and systems to respond to infectious diseases, and a greater capacity for long-distance responses to disasters.

Adverse global influences on health, such as rising food prices and extended ranges of some infectious diseases, have also impeded attainment of the United Nations Millennium Development Goals. Future global health goals must be better integrated with the fundamental influences of poverty, inequity, illiteracy, climate change, land-use patterns, and food insecurity on health. After the Rio+20 Conference (2012), the Millennium Development Goals are to be replaced by Sustainable Development Goals in 2016, reflecting the principle set forth at the original Rio Declaration on Environment and Development (1992) that concern for humans must be at the center of sustainable development. Nevertheless, concern for human health is not yet near that center. This reflects the continuing misperception of what health means and the dominance of a narrow, clinically based view that seemingly does not take into account the fundamental need, in improving population health, to address the poor fit between environmental and sociocultural conditions and basic human biologic and psychological needs.

### ***Environmental And Ecologic Changes***

The deep-seated, essentially ecologic risks to population health cannot be countered effectively at the local level alone. Climate change induced by human activities, for example, is due to the globally aggregated excess of greenhouse emissions. Primary prevention of health problems arising from such global environmental and sociodemographic changes therefore requires coordinated international policy, supplemented by more local policy-making and action. For example, the World Trade

Organization should give greater priority to averting the adverse health and environmental effects of international free trade. There is also a need for instruments similar to the WHO Framework Convention on Tobacco Control and the WHO Global Outbreak Alert and Response Network, in relation to the emergence of infectious diseases, as well as the United Nations Environmental Programme Montreal Protocol to protect the ozone layer.

The following four examples describe other environmental and ecologic changes on a global scale that will increasingly influence the world's health. First, the probability that new strains of influenza virus will emerge is increasing, particularly in the rural villages of Southeast Asia and East Asia. The risk increases with population growth; the juxtaposition of traditional backyard pig, chicken, and duck farming with intensified commercial poultry production; and environmental changes that affect the flight paths of migrating wild birds.

Second, the decline in available seafood protein (which is important for many low-income coastal populations) is a threat to health and reflects the unprecedented combination of ocean warming, acidification (due to increased uptake of carbon dioxide), deoxygenation, destruction of coastal fish nurseries, and overfishing.

Third, diverse health risks are posed by the deprivation, displacement, and conflict that result from shortages of fresh water. Many populations, such as those in Bangladesh, Vietnam, Egypt, and Iraq, live downstream on great rivers that traverse several countries. In many cases, river flows are threatened by the loss of glacier mass and snowpack due to global warming and by the increased diversion of flow by neighbors upstream.

Finally, the need to maintain food supplies and adequate nutrition for the increasing world population presents a major challenge. Global food production also faces pressures as a result of reduced yield due to land degradation, water shortages, and climate change and the rising demand for animal foods among middle-income populations. Furthermore, agriculture (especially livestock production) accounts for around one fourth of global greenhouse-gas emissions. Thus, there are growing pressures to

transform food production (e.g., more mixed cropping and inclusion of acceptable genetically modified crops), distribution, and consumption. Since the environmental, particularly climatic, effects of producing red meat from methane-producing ruminants (e.g., cattle, sheep, and goats) are so great, thought needs to be given to the question of whether production of this protein source will need to be curtailed — while allowing a sufficient increase to ensure safe childhood nutrition in the many poorer populations, which currently consume levels of red meat that are lower than those in the overconsuming rich populations by a factor of 10. The global food security issue is further complicated by the ongoing land grab in eastern Africa and elsewhere by richer countries seeking investment opportunities and self-insurance against future land, food, and biofuel shortages (e.g., Middle Eastern oil-producing states, China, and South Korea).

These four examples also confirm that, in a world of global and systemic changes, these individual changes for the most part do not impinge on population health in isolation; instead, they typically act jointly and often interact. Specific examples are discussed in the next section, which reviews the health risks posed by climate change.

### **The pros and cons of the globalization of healthcare**



Globalization has also affected the healthcare industry to an extent. The *globalization of healthcare* services has led to an increase in medical tourism, with many individuals traveling to developing countries for medical treatments and procedures for just a fraction of the costs they would incur back home.

The pros and cons of the globalization of healthcare

- Analysis of pros and cons of the globalization of healthcare
- Economic Impact
- Competitive Education
- Better access to high quality medicines
- Creating health awareness through online programs
- Improved lifestyle changes
- Infrastructure development
- Circulation of Medical Personnel
- Competitive Insurance
- Uneven healthcare distribution
- Rising global travel increasing pathogen transmission
- Social, Ethical and Cultural Impacts

Analysis of pros and cons of the globalization of healthcare:

### ***Economic Impact***



While many argue that globalization of healthcare can help underdeveloped countries better their economies, some indicate that the social and ethical issues that accompany healthcare globalization could have detrimental effects on these countries. However, the pros of globalization outweigh the cons in this regard. For instance, developing countries can adopt processes, standards and languages from developed countries via trade and outsourcing. These outsourced services can provide some economic benefits for these developing countries.

### ***Competitive Education***

Healthcare globalization has led to the lesser developed countries are coming up with internationally recognized medical curricula that allow international students enjoy a higher level of financially competitive education for students from developed nations.

### ***Better access to high quality medicines:***



Check the life expectancy rates just a few decades back or so. It was very low. Owing to the unavailability of medicines, treatments of many of the serious diseases were not possible. Globalization of healthcare has helped interconnection between the countries facilitating a convenient export and import of life saving drugs.

***Creating health awareness through online programs:***

Globalization has broken the communication barrier. Medical professionals from less developed countries can easily communicate with global experts seeking necessary advice and guidance. Globalization has facilitated the emergence of online health awareness programs to democratize healthcare access.

***Improved lifestyle changes***

Improved access to knowledge and information has greatly impacted the lifestyle. People have become more aware of lifestyle diseases and the pains associated with them. They have become conscious of healthcare and lifestyle choices showing an inclination towards preventive measures. In spite of few negative impacts

like growing tendency of consuming junk foods, the positive impacts are much higher.

***Infrastructure development***

Healthcare globalization has surely impacted the infrastructure development. Healthcare organizations are eager to establish the standards of developed countries by providing improved infrastructure and state-of-the-art facilities. Although, it may pinch the pockets of low income groups, but uplifting the healthcare standards at par with the developed world is a great benefit of globalization.

***Circulation of Medical Personnel***



Globalization of healthcare has led to medical personnel moving to more developed countries, leaving the poorer countries starved of qualified doctors to treat locals. Young professionals tend to settle down in the countries from where they got their degrees, refusing to return home. Developed countries that lack medical personnel also tend to recruit professionals from poorer countries; thereby leaving the latter's healthcare system in tatters.

***Competitive Insurance***

As more and more patients and doctors cross-national boundaries insurance companies would tend to offer cheaper

premiums for the facilities in those countries that are considered as competitive medical tourism destinations, and are accredited by international organizations. This would make these destinations more popular among tourists, while others remain in the background.

#### ***Uneven healthcare distribution***



One of the major concerns of healthcare globalization is that weaker sections are likely to be left out from the benefits. Advancements in healthcare are mostly funded by the private sector where treatment costs are reasonably high. Best medical talents would crowd private healthcare organizations causing tremendous sufferance to public healthcare institutions. Even if globalization ushers in betterment of healthcare, the benefits may not percolate to the economically weaker sections.

#### ***Rising global travel increasing pathogen transmission***

Let us take the case of medical tourism that is providing immense benefits for those in dire need of medical assistance. People from developing countries are travelling to tropical developing countries where the chance of pathogen transmission is pretty high. Patients may contact drug resistant infections which are troublesome to treat in the patient's home country.



***Social, Ethical and Cultural Impacts***



Globalization of healthcare would indeed improve the quality of healthcare in several countries around the world. However, there is no denying the fact that this would not be applicable for countries with social, economic and cultural differences.

While some may argue that simply following international standards would improve the quality of healthcare, it remains to be seen as to what extent the standards accepted in one country would be accepted by others, or whether it would provide adequate quality in these destinations. Then, there is the problem of several destinations excluding the local population from the healthcare benefits provided for rich medical tourists visiting their facilities.

**THE HEALTH EFFECTS OF THE ACCELERATED LIFESTYLE**

Aging is a continuous process that affects all the systems and tissues without sparing single cell in the body. Some people live longer with a very good physical and mental health, while others live with mild to moderate or even severe cognitive and physical disorders by the age of 60 or even before. In the latter condition, one's aging process is accelerated than the expected nature of the chronological age. It is a matter of fact to think why a person's biological age is more rapid than their chronological age. More

researches are being carried out on the physiological and pathological aspects of aging and the means by which aging could be slowed.

Aging has been defined as a progressive and generalized impairment of function resulting in a loss of adaptive response to stress and in a growing risk of age-associated disease. There is no United Nations standard to the age from which aging begins, but the UN agreed cutoff is 60+ years to refer to the older population. Charaka considers that old age starts at 60 years of age, while Sushruta demarcates old age starts at 70. It is important to distinguish normal aging that is universal biological changes that occur with advancing age and are unaffected by disease and environmental influences which is known as chronological aging and according to Ayurveda *kalaja jara* (natural aging). Some western bio-gerontologists also accept that aging is a disease. In contrast, the accelerated aging is strongly affected by environmental, lifestyle, and some disease conditions that are related to aging but not due to aging itself. This condition is accordingly known as *akalaja jara*. The *tridosha* (body humors), *saptadhatu* (basic tissues), *indriya* (organs), *srotas* (body channels), and *agni* (digestive and metabolic capacity) are affected in aging process according to Ayurvedic fundamentals, manifesting signs and symptoms physical as well as functional levels.

Aging does not take place simultaneously in all tissues. *Ashthanga Samgraha* was the first to mention how aging proceeds, whether it starts simultaneously in all tissues or from particular part of the body. According to this view, some qualities are being deteriorated in each decade of life beginning from, for instance at the end of first, second, third, fourth, fifth, sixth, seventh, eighth, ninth, and tenth decade; the childhood, growth, complexion, intellect, skin luster, reproductive capacity, vision, hearing, mind, and functions of sense organs are lost, respectively, and the maximum life span is 100 years.

*Sharangadhara* has had similar view with mild modification considering maximal life span of 120 years dividing into 12 decades. According to him, chronological deteriorations that take place in

each decade are *balya* (childhood), *vridhhi* (growth), *chavi* (complexion or body's glow), *medha* (intellect), *tvak* (skin properties), *drishti* (vision), *shukra* (reproduction), *vikrama* (valour), *buddhi* (reasoning capacity), *karmendriya* (state of motor organs), *cheta* (mind), and finally *jivita* (life). It is obvious from the foregoing that aging is gradual and continuous process that affects various bodily tissues at different times. In this way, the process of aging definitely begins in the fourth decade of life. The effect of aging is more obvious in the fifth decade when the properties of skin elude or wrinkles.

*Akalaja jara* or premature aging is strongly influenced by the effects of environmental, lifestyle, and disease states that, in turn, are related to or change with aging but are not due to aging itself. This is an accelerated aging due to many reasons, in which biological aging is more intense irrespective of chronological age. Although, the rate of aging is genetically predetermined; lifestyle, dietary habits, addictions, mental makeup, social and family life, medication, and many other environmental factors may influence the aging process, and their unfavorable effects cause premature aging. Among hundreds of theories of aging, free radical theory has remained rational over time as it provides many realistic explanations for the process of aging. The changes induced by free radicals are believed to be the key cause of aging, disease, and death. Diet, active, and stress-free living play an unparallel role in neutralizing free radicals thereby retarding aging and age-related disease as well.

## URBAN CHALLENGES

### Urban health

The rising noncommunicable disease burden, the persistent threat of infectious disease outbreaks and an increased risk of violence and injuries are key public health concerns in urban areas. This triple threat includes:

Noncommunicable diseases like heart disease, asthma, cancer and diabetes are made worse by unhealthy living and working conditions, inadequate green space, pollution such as noise, water

and soil contamination, urban heat islands and a lack of space for walking, cycling and active living. Diabetes is linked to obesity and physical inactivity in cities lacking good transit and walking/cycling infrastructure. Urbanization is also linked to high rates of depression, anxiety and mental ill health.

Injuries (including road traffic injury) and interpersonal violence particularly affect children, young adults, older people and the most marginalized groups as a result of poor working and living conditions and a lack of safe transport and infrastructure.

Infectious diseases like COVID-19, tuberculosis, dengue and diarrhoea thrive in poor and overcrowded environments and are closely related to unhealthy housing and poor sanitation and waste management. Poor urban waste management fuels transmission of diseases such as the Zika and Ebola viruses.

### ***Health inequities in urban areas***

While urbanization can bring health and economic benefits, rapid and unplanned urbanization can have many negative social and environmental health impacts, which hit the poorest and most vulnerable the hardest. Health inequities are perhaps most stark in urban areas, sometimes varying from street to street. Migrants and other disadvantaged groups tend to be clustered in the most deprived and environmentally degraded neighbourhoods with the fewest mobility, work and educational opportunities, the poorest access to health services and below average health outcomes.

### ***Urban health and climate change***

Cities consume over two-thirds of the world's energy and are responsible for over 60% of greenhouse gas emissions. Urban populations are among the most vulnerable to climate change: inland cities may experience temperatures 3–5°C higher than surrounding rural areas due to the so-called heat island effect of large concrete expanses and lack of green cover.

### ***Urban health and COVID-19***

The COVID-19 pandemic has shown that cities often bear the

brunt of emergencies. Citizens frequently have high exposure to the virus and have no space or the means to protect themselves. Overcrowding and lack of clean sanitation services increase the risk of contagion, limit residents' ability to adhere to public health measures and increase the likelihood of interpersonal violence. Around the globe, COVID-19 has spread quickly in areas with other existing health inequities, such as the unfair and preventable differences in people's health, well-being and access to quality health services. COVID-19 cases and deaths in deprived areas are double those of more advantaged areas.

***WHO response***

Urban health is a growing priority for WHO and the scale of the challenges to urban health means that approaches to deal with them must be strategic, multisectoral and coordinated. WHO addresses urban health in multiple cross-cutting ways, focusing on better air quality, water and sanitation and other environmental determinants; healthy urban planning; healthier and smoke-free environments; safe and healthy mobility; prevention of violence and injuries; healthy food systems and diets; environmental management of vector-borne diseases; emergency preparedness and responses in urban settings. Addressing risks and needs of specific population groups, such as children and older people and migrants, is also a priority. The interlinked nature of urban health challenges means that action in one sector can have benefits for many other sectors.

To help Member States address the above priorities, WHO supports the strengthening of the evidence base to allow policy-makers to make informed decisions when addressing health risks. It provides tools and guidance on what works and supports monitoring of key health-related indicators. WHO leads and engages in partnership activities fostering city-to-city exchanges and helps develop institutional and policy frameworks for good urban governance for health and well-being in cities.

**Urban Health Challenges**

The health of the urban poor is considerably worse off than

the urban middle and high income groups and is maybe even worse than the rural population. In the National Family Health Survey (NFHS)-3, the under-five mortality rate was 73 for every 1000 live births among the urban poor, compared to the average of 48 among all city dwellers in India. A re-analysis of the third National Family Health Survey showed that one in 10 children born in the slums did not live to see their fifth birthday; only 40 percent of the slum children received all the recommended vaccinations; of the 2.25 million births each year among the urban poor, more than half were at home; 54 percent of the children under five years were stunted; and 47 per cent were underweight. One in ten children in slums did not live to see their fifth birthday. Malnutrition among the urban poor children was worse than in the rural areas. Only 42 percent of the slum children received all the recommended vaccinations. Over half (56 percent) of the child births occurred at home, in slums, putting the life of both the mother and new born to serious risk.

There are thousands of easily preventable maternal, child, and adult deaths each year, and millions of days of productivity lost each year. Poor sanitary conditions in slums contribute to the high burden of disease here. Two-thirds of the urban poor households do not have access to toilets and nearly 40 percent do not have piped water supply at home. High concentrations of suspended particulates in the urban areas adversely affect human health, provoking a wide range of respiratory diseases and exacerbating heart disease and other conditions. The urban population suffers a significantly higher burden of non-communicable disease risk factors. As per NFHS 3, 24 percent of the urban women are overweight / obese as compared to only seven percent of the women in rural areas.

The public sector urban health delivery system, especially for the poor, has so far been sporadic, far from adequate, and limited in its reach. Although urban areas have a greater number of doctors per a thousand population as compared to rural areas (80 percent of the doctors serve in urban areas) and do not face the transport bottleneck as compared to rural areas, yet doctors are functionally inaccessible to a majority of the urban poor population. Cost,

timings, distance, attitude of health providers, and other factors put the secondary care and private sector facilities out of reach of most of the poor urban residents. When the urban poor access private facilities, the significant cost incurred leads to severe debt. Other factors contributing to the inadequate reach of services are illegality, social exclusion of slums, hidden slum pockets, weak social fabric, lack of coordination among various stakeholders, and neglected political consciousness. All the above-mentioned factors lead to a rapid proliferation of what is called an 'informal private health sector' in urban slums. This sector is dominated by practitioners who are either untrained in any system of medicine or trained in one system and practice another or those who are less than qualified. The findings of a study conducted by the Center for Community Medicine, All India Institute of Medical Sciences, on the role of private practitioners in urban slums, highlights the grim picture.. With the exponential growth of population, there is pressure on an already unresponsive public sector. Moreover, the undeterred growth of the private sector without appropriate regulations means that the poor and the vulnerable are rendered even more vulnerable. Choices that the urban poor make for health care have implications not only for the individuals treated, but also for disease transmission and the development of drug resistance. With recent outbreaks of dengue, Chikungunya, and HINI influenza one cannot and should not ignore the public health challenges of the dismal health status of the urban poor. For these communicable diseases, all the population is at risk, irrespective of the socioeconomic status.

### **The impact of urbanisation on health**

It is generally accepted that urbanisation has been instrumental in bringing about greater economic prosperity to nations. Cities, however, have certain negative fallouts and one of these is the rise of a class of human health issues that could be categorised as 'city ailments'. These are spawned by the specific urban environment of the urban settlement and the quality of life that it stimulates. The city gives rise to big human populations, large geographic size, high human and built density, and a bewildering variety of

economic activities. These, in turn, engender issues of transportation, air and noise pollution, time management, a variety of stress and such other urban manifestations that are peculiar to the urban locale. Unfortunately, they seem to severely impact the health of city dwellers and give rise to health issues that call for a customised strategy.



These health issues can broadly be trisected — diseases that are primarily related to slums and the urban poor, diseases that afflict the class of people who have sedentary jobs and odd hours of work and diseases that go beyond socio-economic boundaries and afflict all city dwellers. It must, however, be added that these boundaries are getting blurred as diseases are crossing socio-economic limits, as has been witnessed in the case of the ongoing COVID-19 outbreak.

These health issues can broadly be trisected — diseases that are primarily related to slums and the urban poor, diseases that afflict the class of people who have sedentary jobs and odd hours of work and diseases that go beyond socio-economic boundaries and afflict all city dwellers.

The habitat that the urban poor are for the most part forced to occupy are run down zones. Since they are largely unplanned,



they develop into slums that could be termed as environmentally deprived. Their numbers rise as cities grow in size. These are areas of high human density and have limited access to potable water, sanitation and other basic services. As a consequence, many times, their health indicators are worse than those in rural areas. High human densities and lack of ventilation make them prone to communicable diseases such as tuberculosis. It was a disease that was considered comprehensively tackled, but it has reappeared in slums with worrisome force. Waterborne and vector-borne diseases such as dengue are linked to unsafe water storage and poor waste management, especially seen among urban poor settlements. Additionally, they also are susceptible to acute respiratory diseases from indoor air pollution and diarrhoeal diseases from unsafe drinking water and sanitation.

Surprisingly, slums in many parts of India have started revealing symptoms of lifestyle diseases such as obesity, hypertension and diabetes. These were considered 'diseases of affluence' that were not visible among the urban poor. However, these assumptions now need to be revisited in the light of evidence emanating from slum dwellers. Some studies indicate that about one-fourth of the adult population in slums suffers from hypertension, diabetes or obesity.

The habitat that the urban poor are for the most part forced to occupy are run down zones.

Among the middle classes, their current lifestyle includes fast-paced life with sedentary duties. Many of the jobs require odd hours of work and promote a stressful environment and unhealthy food habits. Indian cities, in general, have more people living per square kilometre of space than other cities around the world, leading to under-provision of public open spaces for recreation and exercise. These factors in totality predispose them to diseases such as obesity, diabetes, and hypertension. Work stress, unhealthy lifestyle, and polluted food intake also lead to different kinds of cancer. Different varieties of cancer, in particular, seem to be tightening their grip on India, and about a million new cases of cancer are being reported every year. A worrying factor is that a five-fold increase is predicted by 2025.

Urbanisation also brings about profound changes in social organisation and in the pattern of family life. A key outcome is reduced social support so readily available in villages. The rise of nuclear families especially makes urbanites vulnerable to psychological trauma and to mental disorders. These include dementia, depression, substance abuse, alcoholism and family disintegration. A report by World Health Organisation (WHO) titled *The Mental Health Context*, has enumerated that mental disorders account for nearly 12 percent of the global burden of disease. By 2020, these will account for nearly 15 percent of disability-adjusted life-years (DALYs) lost to illness. The incident of mental disorders is highest in young adults, the most productive age of the population. It is estimated that about 150 million people in India are in need of active psychiatric intervention. Given the fertile conditions, Indian cities are likely to have a very large share of this global health challenge in the coming decades.

The rise of nuclear families especially makes urbanites vulnerable to psychological trauma and to mental disorders.

There is rising incidence of air pollution across many Indian cities. In 2016, the World Health Organisation (WHO) listed 14 Indian cities among the world's 20 most polluted. Air pollution has given rise to a diverse group of respiratory diseases. As people breathe, microscopic particles get drawn into lungs and to the bloodstream causing asthma, chronic obstructive pulmonary disease, lung cancer and heart disease. They have a negative impact on the development of children and even affect the brain. Air pollution indeed has acquired teeth to become an occult killer in India's highly polluted cities and remains one of the most relevant and intimidating challenges of urban health.

In India, there has been an accelerated spread of dengue and chikungunya, both transmitted by the *Aedes* mosquito, which is particularly well adapted to urban areas. Recent estimates indicate that India has the highest prevalence of these two diseases. There are about 33 million apparent cases and 100 million asymptomatic cases of dengue occurring annually. Studies indicate, for instance, that nearly 40 percent of the population in the national capital have been infected by the dengue virus at least once in their

lifetime. Because all parts of the city are now hyper-connected, emerging diseases such as dengue affect both privileged and the deprived. The incidence of chikungunya is much lower — 64,057 cases of chikungunya were reported in 2016, up from 27,553 in 2015.

Recent estimates indicate that India has the highest prevalence of dengue and chikungunya.

Urban health, as is true of many other urban sectors, has traditionally attracted less governmental attention. This has resulted in the past of some neglect in systematic planning for health care infrastructure and delivery of comprehensive healthcare services for the urban population. There were sporadic and scanty efforts such as World Bank-funded India Population Projects. These yielded limited results, more so as the urban population continued to rise. It is true that the tepid governmental response did not have an impact on the more affluent class, since Indian cities with only about one-third of the total country's population, have cornered 75 percent of dispensaries, 60 percent of hospitals and 80 percent of doctors. These are for the most part available to one-third of urban population. However, in view of rising urbanisation of poverty and the peculiar nature of some of the diseases that have a purely urban profile, there is an urgent need to separately address urban health issues. To control these diseases in a more sustainable manner, the health of the inhabitants has to become a key factor of urban development.

The National Health Policy (NHP) 2002 acknowledged this need to focus on the urban population and a National Urban Health Mission (NUHM) was launched in 2013. The pace of this programme, however, has been sluggish. While there is a case for scaling up NUHM with a strong focus on the urban poor, cities themselves need to recalibrate their local health programmes to respond to these health challenges. These renewed efforts would evidently necessitate a larger public funding for urban health. Given the state of municipal finances, however, that appears to be a tall order. It is obvious that the Centre and the States would have to play the major part.

## Epidemics at the Beginning of the 21st century

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The current epidemic of Ebola virus disease is an important wake-up call for all countries. The world urgently needs to improve its preparedness for outbreaks of emerging and epidemic-prone diseases.

All experts agree: changes in the way humanity inhabits the planet make the emergence of more new diseases inevitable. Constant mutation and adaptation are the survival mechanisms of the microbial world.

These microscopic agents, some of which copy themselves more than a million times a day – in sloppy ways, with no proofreading mechanism to correct mistakes – will always find a way to exploit any weaknesses in systems set up for protection or defence.

Recent large outbreaks, just since the start of this century, have shattered a number of myths about the world's vulnerability to threats arising from new pathogens and epidemic-prone diseases like Ebola.

### **Not just diseases for poor people**

As the century began, most experts believed that the exotic pathogens that cause so much misery in Africa and densely-populated parts of South-East Asia would never become a problem in wealthy countries, with their high standards of living and well-

developed health systems. Then came severe acute respiratory syndrome (SARS) in 2003, a disease that took its heaviest toll on wealthy urban areas. SARS spread most efficiently in sophisticated hospital settings. That was one myth gone.

The 2009 H1N1 influenza pandemic, the first of the 21st century, proved how very quickly a new virus can spread to every corner of the globe. It showed how, with all eyes focused on H5N1 in Asia, something bubbling up on the other side of the world can be the event that actually explodes.

But the biggest surprise delivered by the H1N1 virus was a fortunate one: the pandemic was much milder than many had feared.

### ***All kinds of animals***

The Middle East Respiratory Syndrome, or MERS, broke yet another widely held assumption. Prior to that outbreak, the exotic jungles and forests of Africa, and the teeming cities of Asia, where people live crowded together with chickens, ducks and pigs, were considered the two most important geographical birthplaces for new human pathogens.

Not after MERS. Camels in an arid desert setting can also breed surprises.

### ***Threat to global security***

And now the world is confronted by Ebola, in five West African countries and in an unrelated outbreak in the Democratic Republic of Congo.

Prior to the current epidemic, Ebola was regarded as a distant and geographically confined threat, a remote disease of poor African countries. After all, several Ebola outbreaks have occurred in central Africa since the start of this century. The rest of the world barely noticed or felt a thing.

Last week, an emergency session of the United Nations Security Council adopted a resolution that affirmed the threat this outbreak poses to peace and security, shattering yet another myth. The resolution had 134 co-sponsors, by far the most for any resolution

in the Security Council's history. This was also the first time in the Security Council's history that an emergency session was called to address a public health issue.

## **21<sup>st</sup> century pandemics**

### ***Ebola***

This particularly contagious virus had raged between 2013 and 2016 in West Africa before reappearing in 2018. Nearly 11 300 deaths have been reported so far.

Ebola was first reported in 1976. Between the end of 2013 and 2016, it caused an epidemic of fever followed by hemorrhages in several countries of West Africa in particular in Guinea, Sierra Leone and Liberia. Not as contagious as other viral diseases, Ebola is considered very dangerous due to a mortality rate of around 40%.

The virus reappeared in the summer of 2018 in the Democratic Republic of Congo, where more than 2 200 people had been killed.

### ***A(H1N1) Influenza***

H1N1 appeared in Mexico in early spring 2009. First designated as "swine" flu, before being declared pandemic in June of the same year. The virus is ultimately much less dangerous than expected and many vaccination campaigns blocked its development.

The consequences of influenza linked to the H1N1 virus are subject to conflicting views. According to WHO figures, the flu wave carried by this virus has caused the death of 18 500 people whereas the medical magazine "The Lancet" reported between 151 700 and 575 400 deaths.

### ***SARS***

Severe acute respiratory syndrome, known as SARS, appeared at the end of 2002 in southern China. It is transmitted from the bat to the civet then from the civet to humans. The civet is a mammal valued for its meat and sold alive on Chinese markets. SARS is particularly contagious; it triggers pneumonia which can

prove fatal. The virus has affected more than thirty countries where 440 people lost their lives. China and Hong Kong were the hardest hit with 80% of the victims. The mortality rate reported amounted to 9.5%.

### ***Bird Flu***

Avian influenza first decimated poultry industry in Hong Kong and China before being transmitted to humans, creating a global psychosis. The toll ultimately turned out to be limited since there 400 people killed.

## **EPIDEMIOLOGICAL TERMS, DEFINITIONS AND INDEXES**

### **Epidemiology**

Epidemiology is the study and analysis of the distribution (who, when, and where), patterns and determinants of health and disease conditions in defined population.

It is a cornerstone of public health, and shapes policy decisions and evidence-based practice by identifying risk factors for disease and targets for preventive healthcare. Epidemiologists help with study design, collection, and statistical analysis of data, amend interpretation and dissemination of results (including peer review and occasional systematic review). Epidemiology has helped develop methodology used in clinical research, public health studies, and, to a lesser extent, basic research in the biological sciences.

Major areas of epidemiological study include disease causation, transmission, outbreak investigation, disease surveillance, environmental epidemiology, forensic epidemiology, occupational epidemiology, screening, biomonitoring, and comparisons of treatment effects such as in clinical trials. Epidemiologists rely on other scientific disciplines like biology to better understand disease processes, statistics to make efficient use of the data and draw appropriate conclusions, social sciences to better understand proximate and distal causes, and engineering for exposure assessment.

*Epidemiology*, literally meaning “the study of what is upon the people”, is derived from Greek *epi* ‘upon, among’, *demos* ‘people, district’, and *logos* ‘study, word, discourse’, suggesting that it applies only to human populations. However, the term is widely used in studies of zoological populations (veterinary epidemiology), although the term “epizootology” is available, and it has also been applied to studies of plant populations (botanical or plant disease epidemiology).

The distinction between “epidemic” and “endemic” was first drawn by Hippocrates, to distinguish between diseases that are “visited upon” a population (epidemic) from those that “reside within” a population (endemic). The term “epidemiology” appears to have first been used to describe the study of epidemics in 1802 by the Spanish physician Villalba in *Epidemiología Española*. Epidemiologists also study the interaction of diseases in a population, a condition known as a syndemic.

The term epidemiology is now widely applied to cover the description and causation of not only epidemic, infectious disease, but of disease in general, including related conditions. Some examples of topics examined through epidemiology include as high blood pressure, mental illness and obesity. Therefore, this epidemiology is based upon how the pattern of the disease causes change in the function of human beings.

### **Bradford Hill criteria**

In 1965, Austin Bradford Hill proposed a series of considerations to help assess evidence of causation, which have come to be commonly known as the “Bradford Hill criteria”. In contrast to the explicit intentions of their author, Hill’s considerations are now sometimes taught as a checklist to be implemented for assessing causality. Hill himself said “None of my nine viewpoints can bring indisputable evidence for or against the cause-and-effect hypothesis and none can be required *sine qua non*.”

1. Strength of Association: A small association does not mean that there is not a causal effect, though the larger the association, the more likely that it is causal.



2. Consistency of Data: Consistent findings observed by different persons in different places with different samples strengthens the likelihood of an effect.
3. Specificity: Causation is likely if a very specific population at a specific site and disease with no other likely explanation. The more specific an association between a factor and an effect is, the bigger the probability of a causal relationship.
4. Temporality: The effect has to occur after the cause (and if there is an expected delay between the cause and expected effect, then the effect must occur after that delay).
5. Biological gradient: Greater exposure should generally lead to greater incidence of the effect. However, in some cases, the mere presence of the factor can trigger the effect. In other cases, an inverse proportion is observed: greater exposure leads to lower incidence.
6. Plausibility: A plausible mechanism between cause and effect is helpful (but Hill noted that knowledge of the mechanism is limited by current knowledge).
7. Coherence: Coherence between epidemiological and laboratory findings increases the likelihood of an effect. However, Hill noted that "... lack of such [laboratory] evidence cannot nullify the epidemiological effect on associations".
8. Experiment: "Occasionally it is possible to appeal to experimental evidence".
9. Analogy: The effect of similar factors may be considered.

***Legal interpretation***

Epidemiological studies can only go to prove that an agent could have caused, but not that it did cause, an effect in any particular case:

Epidemiology is concerned with the incidence of disease in populations and does not address the question of the cause of an individual's disease. This question, sometimes referred to as specific

causation, is beyond the domain of the science of epidemiology. Epidemiology has its limits at the point where an inference is made that the relationship between an agent and a disease is causal (general causation) and where the magnitude of excess risk attributed to the agent has been determined; that is, epidemiology addresses whether an agent can cause disease, not whether an agent did cause a specific plaintiff's disease.

In United States law, epidemiology alone cannot prove that a causal association does not exist in general. Conversely, it can be (and is in some circumstances) taken by US courts, in an individual case, to justify an inference that a causal association does exist, based upon a balance of probability.

The subdiscipline of forensic epidemiology is directed at the investigation of specific causation of disease or injury in individuals or groups of individuals in instances in which causation is disputed or is unclear, for presentation in legal settings.

### ***Applied field epidemiology***

Applied epidemiology is the practice of using epidemiological methods to protect or improve the health of a population. Applied field epidemiology can include investigating communicable and non-communicable disease outbreaks, mortality and morbidity rates, and nutritional status, among other indicators of health, with the purpose of communicating the results to those who can implement appropriate policies or disease control measures.

### ***Humanitarian context***

As the surveillance and reporting of diseases and other health factors become increasingly difficult in humanitarian crisis situations, the methodologies used to report the data are compromised. One study found that less than half (42.4%) of nutrition surveys sampled from humanitarian contexts correctly calculated the prevalence of malnutrition and only one-third (35.3%) of the surveys met the criteria for quality. Among the mortality surveys, only 3.2% met the criteria for quality. As nutritional status and mortality rates help indicate the severity of a crisis, the tracking and reporting of these health factors is crucial.

Vital registries are usually the most effective ways to collect data, but in humanitarian contexts these registries can be non-existent, unreliable, or inaccessible. As such, mortality is often inaccurately measured using either prospective demographic surveillance or retrospective mortality surveys. Prospective demographic surveillance requires much manpower and is difficult to implement in a spread-out population. Retrospective mortality surveys are prone to selection and reporting biases. Other methods are being developed, but are not common practice yet.

***Validity: precision and bias***

Different fields in epidemiology have different levels of validity. One way to assess the validity of findings is the ratio of false-positives (claimed effects that are not correct) to false-negatives (studies which fail to support a true effect). To take the field of genetic epidemiology, candidate-gene studies produced over 100 false-positive findings for each false-negative. By contrast genome-wide association appear close to the reverse, with only one false positive for every 100 or more false-negatives. This ratio has improved over time in genetic epidemiology as the field has adopted stringent criteria. By contrast, other epidemiological fields have not required such rigorous reporting and are much less reliable as a result.

***Random error***

Random error is the result of fluctuations around a true value because of sampling variability. Random error is just that: random. It can occur during data collection, coding, transfer, or analysis. Examples of random errors include poorly worded questions, a misunderstanding in interpreting an individual answer from a particular respondent, or a typographical error during coding. Random error affects measurement in a transient, inconsistent manner and it is impossible to correct for random error. There is a random error in all sampling procedures. This is called sampling error.

Precision in epidemiological variables is a measure of random error. Precision is also inversely related to random error, so that to reduce random error is to increase precision. Confidence intervals

are computed to demonstrate the precision of relative risk estimates. The narrower the confidence interval, the more precise the relative risk estimate.

There are two basic ways to reduce random error in an epidemiological study. The first is to increase the sample size of the study. In other words, add more subjects to your study. The second is to reduce the variability in measurement in the study. This might be accomplished by using a more precise measuring device or by increasing the number of measurements.

Note, that if sample size or number of measurements are increased, or a more precise measuring tool is purchased, the costs of the study are usually increased. There is usually an uneasy balance between the need for adequate precision and the practical issue of study cost.

### ***Systematic error***

A systematic error or bias occurs when there is a difference between the true value (in the population) and the observed value (in the study) from any cause other than sampling variability. An example of systematic error is if, unknown to you, the pulse oximeter you are using is set incorrectly and adds two points to the true value each time a measurement is taken. The measuring device could be precise but not accurate. Because the error happens in every instance, it is systematic. Conclusions you draw based on that data will still be incorrect. But the error can be reproduced in the future (e.g., by using the same mis-set instrument).

A mistake in coding that affects *all* responses for that particular question is another example of a systematic error.

The validity of a study is dependent on the degree of systematic error. Validity is usually separated into two components:

- Internal validity is dependent on the amount of error in measurements, including exposure, disease, and the associations between these variables. Good internal validity implies a lack of error in measurement and suggests that inferences may be drawn at least as they pertain to the subjects under study.

- External validity pertains to the process of generalizing the findings of the study to the population from which the sample was drawn (or even beyond that population to a more universal statement). This requires an understanding of which conditions are relevant (or irrelevant) to the generalization. Internal validity is clearly a prerequisite for external validity.

***Selection bias***

Selection bias occurs when study subjects are selected or become part of the study as a result of a third, unmeasured variable which is associated with both the exposure and outcome of interest. For instance, it has repeatedly been noted that cigarette smokers and non smokers tend to differ in their study participation rates. (Sackett D cites the example of Seltzer et al., in which 85% of non smokers and 67% of smokers returned mailed questionnaires.) It is important to note that such a difference in response will not lead to bias if it is not also associated with a systematic difference in outcome between the two response groups.

***Information bias***

Information bias is bias arising from systematic error in the assessment of a variable. An example of this is recall bias. A typical example is again provided by Sackett in his discussion of a study examining the effect of specific exposures on fetal health: "in questioning mothers whose recent pregnancies had ended in fetal death or malformation (cases) and a matched group of mothers whose pregnancies ended normally (controls) it was found that 28% of the former, but only 20% of the latter, reported exposure to drugs which could not be substantiated either in earlier prospective interviews or in other health records". In this example, recall bias probably occurred as a result of women who had had miscarriages having an apparent tendency to better recall and therefore report previous exposures.

***Confounding***

Confounding has traditionally been defined as bias arising from the co-occurrence or mixing of effects of extraneous factors,

referred to as confounders, with the main effect(s) of interest. A more recent definition of confounding invokes the notion of *counterfactual* effects. According to this view, when one observes an outcome of interest, say  $Y=1$  (as opposed to  $Y=0$ ), in a given population A which is entirely exposed (i.e. exposure  $X = 1$  for every unit of the population) the risk of this event will be  $R_{A1}$ . The counterfactual or unobserved risk  $R_{A0}$  corresponds to the risk which would have been observed if these same individuals had been unexposed (i.e.  $X = 0$  for every unit of the population). The true effect of exposure therefore is:  $R_{A1} - R_{A0}$  (if one is interested in risk differences) or  $R_{A1}/R_{A0}$  (if one is interested in relative risk). Since the counterfactual risk  $R_{A0}$  is unobservable we approximate it using a second population B and we actually measure the following relations:  $R_{A1} - R_{B0}$  or  $R_{A1}/R_{B0}$ . In this situation, confounding occurs when  $R_{A0} \neq R_{B0}$ . (NB: Example assumes binary outcome and exposure variables.)

Some epidemiologists prefer to think of confounding separately from common categorizations of bias since, unlike selection and information bias, confounding stems from real causal effects.

### Index case

The index case or patient zero is the first documented patient in a disease epidemic within a population, or the first documented patient included in an epidemiological study. It can also refer to the first case of a condition or syndrome (not necessarily contagious) to be described in the medical literature, whether or not the patient is thought to be the first person affected. An index case can achieve the status of a "classic" case study in the literature, as did Phineas Gage, the first known person to exhibit a definitive personality change as a result of a brain injury.

### Term

The index case may or may not indicate the source of the disease, the possible spread, or which reservoir holds the disease in between outbreaks, but may bring awareness of an emerging outbreak. Earlier cases may or may not be found and are labeled primary or coprimary, secondary, tertiary, etc. The term primary

case can only apply to infectious diseases that spread from human to human, and refers to the person who first brings a disease into a group of people. In epidemiology, the term is often used by both scientists and journalists alike to refer to the individual known or believed to have been the first infected or source of the resulting outbreak in a population as the index case, but such would technically refer to the primary case.

### ***Origin of Patient Zero***

“Patient zero” was used to refer to the supposed source of HIV outbreak in the United States, flight attendant Gaëtan Dugas in the popular press, but the term’s use was based on a misunderstanding (and Dugas was not the index case). In the 1984 study of Centers for Disease Control and Prevention (CDC), one of the earliest recorded HIV-patients was code-named “patient O”, which stands for “patient out of California”. The letter O, however, was interpreted by some readers of the report as the numeral 0. The designation *patient zero* (for Gaëtan Dugas) was subsequently propagated by the *San Francisco Chronicle* journalist Randy Shilts in his book *And the Band Played On* in 1987. William Darrow, behavioral scientist of CDC responsible to figure out why gay men in Los Angeles were dying of a strange illness, said: “That’s correct. I never labeled him Patient Zero”.

The term has been expanded into general usage to refer to an individual identified as the first carrier of a communicable disease in a population (the primary case), or the first incident in the onset of a catastrophic trend. In some cases, a known or suspected patient zero may be informally referred to as an index case for the purpose of a scientific study, such as the two-year-old boy in a remote village in Guinea who was thought to be the source of the largest Ebola virus outbreak in history.

In genetics, the index case is the case of the original patient (i.e. *propositus* or *proband*) that stimulates investigation of other members of the family to discover a possible genetic factor.

The term can also be used in non-medical fields to describe the first individual affected by something negative that since

propagated to others, such as the first user on a network infected by malware.

### ***Gaëtan Dugas***

In the early years of the AIDS epidemic, a *patient zero* transmission scenario was compiled by Dr. William Darrow and colleagues at the United States Centers for Disease Control and Prevention (CDC). This epidemiological study showed how patient zero had infected multiple partners with HIV, and they, in turn, transmitted it to others causing rapid spread of the virus to locations all over the world (Auerbach et al., 1984). The CDC identified Gaëtan Dugas as a carrier of the virus from Europe to the United States, who spread it to other men he had intimate relations with at gay bathhouses.

Journalist Randy Shilts subsequently wrote about patient zero, based on Darrow's findings, in his 1987 book *And the Band Played On*, which identified patient zero as being Gaëtan Dugas. Dugas was a flight attendant who was sexually promiscuous in several North American cities, according to Shilts' book. He was vilified for several years as a "mass spreader" of HIV, and was seen as the original source of the HIV epidemic among homosexual men. Four years later, Darrow repudiated the study's methodology and how Shilts had represented its conclusions.

A 2007 study by Michael Worobey and Dr. Arthur Pitchenik published in the *Proceedings of the National Academy of Sciences of the United States of America* claimed that, based on the results of genetic analysis, current North American strains of HIV probably moved from Africa to Haiti before entering the United States around 1969, probably through a single immigrant. However, a teenager named Robert Rayford died in St. Louis, Missouri, possibly of complications from AIDS in 1969, having most likely become infected with the virus *before* 1966. This would imply that there were prior carriers of HIV-strains in North America.

The phrase patient zero is now used in the media to refer to the primary case for infectious disease outbreaks, as well as for computer virus outbreaks, and more broadly, as the source of ideas or actions that have far-reaching consequences.



David Heymann, professor of Infectious Disease Epidemiology at the London School of Hygiene & Tropical Medicine, and formerly with the World Health Organization (WHO), has questioned the importance of finding patient zero, stating, "Finding patient zero may be important in some instances, but only if they are still alive and spreading the disease; and more often than not, especially in large disease outbreaks, they're not."

### ***Others***

- Mary Mallon ("Typhoid Mary") was an index case of a typhoid outbreak in the early 1900s. An apparently healthy carrier, she infected 47 people while working as a cook. She eventually was isolated to prevent her from spreading the disease to others.
- The first recorded victim of Ebola was a 44-year-old schoolteacher named Mabalo Lokela, who died on 8 September 1976, 14 days after symptom onset.
- 64-year-old Liu Jianlun, a Guangdong doctor, transmitted SARS internationally by infecting other super-spreaders during a stay in the Hong Kong Metropole Hotel in 2003.
- A baby in the Lewis House at 40 Broad Street is considered the index patient in the 1854 cholera outbreak in the Soho neighborhood of London. (*The Ghost Map*, Steven Johnson, 2005.)
- Édgar Enrique Hernández may be patient zero of the 2009 flu pandemic. He recovered, and a bronze statue has been erected in his honor. Maria Adela Gutierrez, who contracted the virus about the same time as Hernández, became the first officially confirmed fatality.
- One-year-old Emile Ouamouno is believed to be patient zero in the 2014 Ebola epidemic in Guinea and West Africa.
- 51-year-old Jesus Lujan was the index case of the 1924 Los Angeles pneumonic plague outbreak which killed 33.
- Sgt. Albert M. Gitchell is commonly believed to be the index patient of the Spanish flu, which killed 50,000,000 from 1918 to 1920. Gitchell survived and died in 1968.

- As for the COVID-19 pandemic, there are many known “patient zeros” across the world known for different symptoms and stories. Out of Los Angeles, patient zero Gregg Garfield spent 64 days in the hospital, including 30 days of coma-state after contracting the virus on a ski trip. Doctors said he had a 1% chance to live. He now is back on the slopes, although with fingers and toes amputated.
- Another patient zero of the COVID-19 pandemic includes an elderly man who was diagnosed on 1 December 2019, someone who had no contact with the Huanan Seafood Wholesale Market. Three other people experienced symptoms in the following days who also did not have contact with the Market.

### **CONTAGIOUS DISEASES AT THE BEGINNING OF THE 21ST CENTURY**

Seven agents that have made a significant appearance, particularly in the 21st century, are reviewed, including: Ebola and Marburg hemorrhagic fevers, human monkeypox, bovine spongiform encephalopathy, severe acute respiratory syndrome (SARS), West Nile virus, and avian influenza.

#### **The Scope of the Problem**

Infectious diseases are the second leading cause of death and the leading cause of disability-adjusted life years worldwide (1 disability-adjusted life year is 1 lost year of healthy life) and the third leading cause of death in the United States. Among these infectious diseases causing death worldwide, acute lower respiratory tract infections, HIV/AIDS, diarrheal diseases, tuberculosis, and malaria predominate. Clearly, despite earlier predictions to the contrary, infectious diseases remain a dominant feature of domestic and international public health considerations for the 21st century. In fact, the continual evolution of emerging and reemerging diseases, particularly the acceleration of the HIV/AIDS pandemic in developing countries, will heighten the global impact of infectious diseases in this century.

***Emerging and Reemerging Infections***

The extent of the global burden of infectious diseases depends on the already established incidences and prevalences of known infections together with the constant, but uneven, flow of emerging and reemerging infections. Emerging infections are those that have not been previously recognized. The AIDS pandemic is a prototypical example of a truly new and emerging infectious disease whose public health impact had not been previously experienced. Reemerging infections have been experienced previously but have reappeared in a more virulent form or in a new epidemiological setting. The influenza A pandemics of 1918, 1957, and 1968 are prototypical examples of reemerging infections.

*HIV/AIDS.* Despite the fact that the HIV/AIDS pandemic exacted a terrible toll in deaths and human suffering in the last 2 decades of the 20th century, the full impact of this disease will be realized in the 21st century. As of the end of 2000, there were 36 million people worldwide living with HIV infection; >90% of them live in developing countries, and 70% live in southern Africa. There have been <22 million cumulative deaths due to AIDS. In certain countries in Africa, such as Botswana, Zimbabwe, and Swaziland, 25%–35% of the adult population (ages 15–49 years) are infected with HIV. In South Africa, it is estimated that there are >4 million people infected with HIV, <10% of the entire population and 20% of the adult population. The life expectancy in several southern African countries has decreased dramatically because of the HIV/AIDS pandemic, negating the impressive gains that had been made over the previous few decades.

India and other southern and southeastern Asian countries will be the next epicenters of the HIV/AIDS pandemic; the cultural and socioeconomic conditions in those countries are unfortunately well-suited to explosive spread of this infection. Indeed, it is estimated that <4 million people in India are already infected with HIV. The potential for catastrophic spread in this country of >1 billion people is enormous, as it is for China, the most populous nation in the world. Aggressive and sustained AIDS prevention programs are critical to contain the epidemic in these Asian countries.

*The continual evolution of infectious diseases.* In addition to HIV/AIDS and pandemic influenza, which have had an extraordinary impact on global health, there is a continual evolution of a wide range of emerging and reemerging infectious diseases with varying potentials for global spread. Some salient examples of emerging and reemerging infections throughout the world in recent years. Some, such as Ebola virus and Nipah virus, have been highly virulent but have involved relatively small numbers of people, have remained tightly restricted in their spread, and so have been more medical curiosities than global public health threats. Others, such as multidrug-resistant malaria, have involved large numbers of people but have, because of the demography of the infection, remained for the most part geographically restricted. This has resulted in a serious situation in the region involved but not a global public health threat. Multidrug-resistant tuberculosis and vancomycin-resistant *Staphylococcus aureus* and enterococci are examples of emerging infections that do not immediately involve large numbers of persons but that will ultimately have a serious impact on public health throughout the world.

Range and recognized site(s) of origin of variety of emerging and reemerging infections. v-CJD, variant Creutzfeldt-Jakob disease; *E. coli*, *Escherichia coli*.

Two examples of recently reemerging infections that are currently causing considerable concern in the United States are dengue and West Nile fever. Dengue has posed an extraordinary problem in Brazil, with >530,000 cases reported in 1998. In addition, other nations in South and Central America and the Caribbean have varying degrees of problems with dengue. Dengue has appeared infrequently in the United States since the 1940s. However, it remains a threat because the mosquito vectors for dengue are widely dispersed in the United States, particularly in the states bordering the Gulf of Mexico. Indeed, in 1999, 17 locally acquired cases of dengue were reported in Texas (Gubler D, Centers for Disease Control and Prevention, personal communication). In contrast, West Nile fever had never been seen in the United States before 1999, when there were 62 cases and 7 deaths identified in the New York City area. West Nile fever is caused by a flavivirus

that is transmitted by mosquitoes, with a variety of birds serving as intermediate hosts. It is indigenous to the region of the West Nile River (hence its name) and is seen commonly in Middle Eastern countries such as Israel. The virus survived the winter of 1999–2000 in the United States; in 2000, 18 human cases (including 1 death) and numerous infections in various avian and mammalian species were reported in the summer and early fall. Infected birds were identified along the eastern seaboard as far south as North Carolina. Here again, the major vector for this virus (the *Culex pipiens* mosquito) is widely dispersed throughout the eastern part of the country. It is unclear how serious West Nile fever will turn out to be in the United States; however, it is clearly a new infectious diseases problem that must be dealt with, and it illustrates the constant threat of reemergence of old diseases in new epidemiological settings.

No discussion of the threat of reemerging infectious diseases in the 21st century would be complete without mention of the threat of yet another catastrophic influenza A epidemic. In an average year, influenza A is responsible for <20,000 excess deaths in the United States. During the influenza A pandemic of 1918, there were at least 20 million deaths worldwide and >500,000 deaths in the United States. In 1957, the second most deadly influenza A epidemic occurred, accounting for <70,000 deaths in the United States. In 1968, the third most important influenza epidemic occurred, accounting for <35,000–40,000 deaths. Thus, serious influenza epidemics occur about every 20–40 years. The appearance of bird-to-human transmission of H5N1 influenza A virus in Hong Kong in the winter of 1997–1998 was a cogent reminder of the ever-present threat of a new strain of influenza A virus entering a population that is relatively naïve for the microbe in question. Most public health experts agree that it is only a matter of time before another catastrophic influenza epidemic occurs, and it certainly will occur in the 21st century.

*Antimicrobial resistance.* The development of resistance of microbes to antimicrobial drugs has been a problem in medicine since the use of the very first antimicrobial agents. Unfortunately,

this problem has worsened, in part because of the widespread and often inappropriate use of antimicrobials. In this first decade of the 21st century, we are faced with this continuing threat on a wider scale than ever before, with the emergence of resistant strains of a number of important microbes, including pneumococci, enterococci, staphylococci, *Plasmodium falciparum*, and *Mycobacterium tuberculosis*. Furthermore, despite the extraordinary success of antiretroviral drugs in the treatment of HIV/AIDS, the development of viral resistance is a major problem in the management of HIV-infected persons. Strategies to contain antimicrobial resistance in these early years of the 21st century should include heightened surveillance; appropriate infection control programs, particularly in hospitals; promotion of the rational use of antimicrobials; and accelerated basic and applied research in the areas of microbial pathogenesis, improved diagnostics, and vaccine and drug development. The recent sequencing of the genomes of important pathogens will provide novel opportunities to delineate more precisely the genetic basis for resistance, as has been accomplished with *P. falciparum* and chloroquine resistance. Such information will greatly facilitate the development of alternative therapies against resistant strains of microbes.

### **Emerging Infectious Diseases at the Beginning of the 21 Century**

Worldwide, infectious diseases place a considerable burden on individuals and health care. In general, infectious diseases exact a greater toll from infants, young children and the elderly, and disproportionately affect disadvantaged populations in developed countries. With the coming of the golden age of antibiotics and other antimicrobial agents, many health care practitioners anticipated that infectious diseases could be conquered or controlled. This view proved overly optimistic. Microbes and their hosts exist in a relationship influenced by their environment. This relationship, precariously balanced and continuously evolving, contributes to the emergent nature of threats from infectious diseases.

***Contributing Factors to Emergence of Infectious Diseases***

The 2003 IOM report (Smolinski, Hamburg & Lederberg, 2003) divided factors of emergence into 13 basic categories. These categories are listed below, with an example of each in parentheses. Further discussion on contributing factors may be found in “Emerging Infectious Diseases: Vulnerabilities, Contributing Factors, and Approaches” (Lashley, 2004).

- Microbial adaptation and change (e.g., the O157:H7 strain of *E. coli*, which is more virulent).
- Human susceptibility to infection (e.g., persons who are homozygous for methionine on codon 129 of the prion protein gene [*PRNP*] are more susceptible to development of Creutzfeldt-Jakob disease).
- Climate and weather (e.g., heavy rains can result in increased breeding sites for mosquito vectors and increases in mosquito-borne infectious diseases).
- Changing ecosystems (e.g., dam building has resulted in changing vector ecology and the emergence of Rift Valley hemorrhagic fever in Egypt).
- Human demographics and behavior (e.g., body piercing and potential hepatitis C infection).
- Economic development and land use (e.g., clearing forests in Venezuela has resulted in an increased cane mouse population, the probable reservoir host of the Guanarito virus and an outbreak of Venezuelan hemorrhagic fever).
- International travel and commerce (e.g., importation of Guatemalan raspberries and outbreaks of cyclosporiasis in the United States).
- Technology and industry (e.g., use of mass treatment with fluoroquinolones to treat *E. coli* infections in chickens, resulting in antimicrobial resistance in humans to other organisms).
- Breakdown of public health measures (e.g., breakdown in vector control, leading to increased abundance and distribution of *Aedes aegyptii*, the mosquito vector of dengue,

and hence a spread of dengue hemorrhagic fever to the Americas).

- Poverty and social inequality (e.g., poverty can result in the eating of animals who have died from disease, resulting in human infections such as in the case of gastrointestinal anthrax in humans).
- War and famine (e.g., civil unrest and natural disasters). Any mass disruption and violence can result in disruption of public health services, especially preventive services, such as immunizations and vector controls.
- Lack of political will (e.g., the lack of reporting of global infectious diseases of interest for political and economic reasons, such as with SARS in China).
- Intent to harm (e.g., the intentional distribution of *Bacillus anthracis*, the etiologic agent of anthrax in the United States in 2001).

Many of these contributing factors are interrelated. For example, war creates crowded conditions leading to contaminated drinking water, unsanitary facilities, disruption of basic health services, and easier spread of infectious agents. War can also result in lack of food for those who are politically disenfranchised and in famine. Famine results in malnutrition, which then alters human susceptibility to infection. Victims of war are also prey for violence and sexual predators resulting in the spread of sexually-transmitted diseases, such as HIV. The interrelated nature of these contributing factors is also evident in the following section in the discussion of seven agents that have made a significant appearance as EIDs.

### ***Selected Specific Emerging Infectious Diseases***

Among the newer emerging infectious agents and diseases, many have already had great impact, while others show potential for impact in the near future. Agents that have made a significant appearance, particularly in the 21st century, are considered in more depth below. These agents include: Ebola and Marburg hemorrhagic fevers, human monkeypox, BSE, SARS, West Nile virus, and avian influenza.



***Hemorrhagic Fevers: The Ebola and Marburg Viruses***

The Ebola and Marburg viruses are the only known members of the filovirus family. They can cause severe hemorrhagic fever with high fatality rates. There is no specific treatment. Ebola virus is better known to the public as a result of discussion in the popular media, such as in the book by Richard Preston, "The Hot Zone: A Terrifying True Story," (1994), and the movie "Outbreak," starring Dustin Hoffman (Warner Brothers Pictures, 1995). The natural animal reservoir of both is still unknown.

*Ebola Hemorrhagic Fever.* Ebola virus infection was first recognized during a human outbreak in 1976 with almost simultaneous outbreaks in both the Sudan and Zaire (now the Democratic Republic of the Congo). It was named after a river in the Democratic Republic of the Congo (Peters & LeDuc, 1999). The Ebola virus is now known to have four subtypes: Zaire, Sudan, Reston, and Ivory Coast (Pourrut et al., 2005). After an outbreak in 1979 in the Sudan, Ebola appeared relatively quiescent until it appeared among macaque monkeys imported from the Philippines and housed at a primate facility in Reston, Virginia (Peters & LeDuc). In late 1994, a single case in a researcher who performed a necropsy on an ill chimpanzee led to the identification of a new subtype, Ebola-Ivory Coast (Arthur, 2002).

In Gabon, Africa, outbreaks of Ebola virus infection occurred from 1994 to 1997 (Georges et al., 1999). Another appearance was in 2000-2001 with an Ebola outbreak in Uganda that resulted in 425 cases with 224 deaths by January 2001 (CDC, 2001). In this outbreak, events and conditions associated with acquired disease were: funeral attendance for those who died with Ebola hemorrhagic fever, intrafamilial contact, and nosocomial infections. Schools were closed and a ban against funerals was enacted (World Health Organization [WHO], 2001).

In November, 2001, an Ebola outbreak again occurred in Gabon, and in the Democratic Republic of the Congo, and multiple outbreaks occurred in 2000-2004 in Gabon, the Congo, Sudan, and Uganda. Outbreaks continue in the Congo in 2005. At the same time, it was noted that Ebola outbreaks occurred in large mammals,

mainly chimpanzees, duikers (a type of antelope), and gorillas, and that human outbreaks tended to follow those observed in animals. Airborne transmission of the Ebola Zaire strain to monkeys by aerosol has been demonstrated (Johnson, Jaax, White, & Jahrling, 1995) but is not known to occur from human-to-human. To date, no animal reservoir for Ebola virus has been identified (Pourrut et al., 2005).

*Marburg Hemorrhagic Fever.* Marburg virus infection was identified in 1967, when laboratory workers in a pharmaceutical company in Marburg, Germany who were processing tissue from imported African green monkeys began to fall ill. The workers were admitted to the hospital with severe illness. The virus isolated was unrelated to any other known at that time. Other cases occurred at virtually the same time in Frankfurt, Germany and in what was then Belgrade, Yugoslavia (now Serbia) (Peters & LeDuc, 1999). It was determined that the monkeys in all three sites were from the same imported batch from Uganda. The full investigation ultimately led to the recognition of a new family of viruses, the Filoviridae, of which Marburg virus was the first to be identified (Feldmann & Kiley, 2000).

Marburg virus was not recognized again until 1975 when three cases were reported from Johannesburg, South Africa. The index case (initial patient) was a young Australian man who had been on vacation doing a walkabout in what was then Rhodesia (now Zimbabwe) with a female companion. He died, but his companion, and the nurse caring for both of them, recovered (WHO, 2005a). In 1980, Marburg virus infection was next recognized when an index patient became ill in western Kenya, followed by secondary illness of the physician who tried to resuscitate him (Smith et al., 1982). From 1980 until 1998, outbreaks of Marburg virus infection were relatively few and involved a single or a few primary cases. In 1982, another single case was identified in South Africa. In late 1998, an outbreak of Marburg virus hemorrhagic fever occurred in Durba, in the Democratic Republic of the Congo. Many affected were illegal gold miners in abandoned mines. The remote location and local warfare prevented arrival of experts from the CDC and WHO for months. In October

2004, a very large outbreak began in Angola and was declared over in November 2005. As of November 2005, 374 cases of Marburg hemorrhagic fever were reported, and 329 were fatal (WHO, 2005b; 2005c).

Marburg hemorrhagic fever has affected many fewer persons than Ebola virus. Thus, the recent large outbreak that was declared over in November 2005 is of particular interest, especially since before this outbreak, cases in children were rare, and in this outbreak, children account for a high proportion of those affected. Transmission of these viruses occurs by direct contact with infected body fluids from animals and humans, such as blood, saliva, vomitus, respiratory droplets, urine and stool, and contact with virus-contaminated objects (e.g., needles, syringes). Persons who prepare, cook, and eat contaminated animals may become infected. Person-to-person transmission occurs, as does infection from direct inoculation. Transmission via semen may occur weeks after recovery (CDC, 2005a; WHO, 2001).

It is extremely important to use proper barrier nursing techniques to prevent secondary cases of Ebola and Marburg virus hemorrhagic fevers to caretakers and families, including use of standard, contact, and airborne isolation precautions. Updated information for infection control for patients with viral hemorrhagic fevers in U.S. hospitals may be found on the CDC website (2005a). There is also concern about use of the filoviruses as bioterror agents, especially if the viruses could be modified to efficiently spread via aerosol from person-to-person.

### ***Monkeypox***

Monkeypox results from an orthopoxvirus which has some similarities to the smallpox virus, variola. It is considered to be the most important orthopoxvirus infection in humans outside of smallpox, which has been eradicated in its natural state. Monkeypox was first identified in laboratory monkeys in 1958, and the first human case was reported in 1970 in a child in the Democratic Republic of the Congo. It is now considered endemic in parts of central and western Africa (DiGiulio & Eckburg, 2004a, 2004b).

In May of 2003, the first cases in the United States of what was later found to be monkeypox were reported among members of a family in Wisconsin (a woman and man in their early 30s and their young daughter). The family had bought two prairie dogs as pets 11 days before the mother developed fever, headache, sore throat, dyspnea, and malaise along with a small papule. The mother subsequently developed a more severe rash with more than 200 lesions. The outbreak was initially misdiagnosed as a possible staphylococcal infection (CDC, 2003a; Sejvar et al., 2004). The daughter presented with more severe illness that included rash, lymphadenopathy, malaise, enlarged tonsils, and fever. She eventually developed encephalitis, became unresponsive, and required intensive care. Initially it was believed that she might have contracted a viral encephalitis (such as from varicella or herpes simplex virus), but the diagnosis of monkeypox was confirmed. A fourth case was diagnosed in the distributor of exotic animals who had sold the two prairie dogs to the family first affected, thus establishing an epidemiological link between them (Reed et al., 2004).

Epidemiological investigation revealed that those two prairie dogs and others were co-housed with an infected Gambian giant rat from Ghana and other exotic rodent species. Additional infected prairie dogs had been sold at swap meets in Illinois, Indiana, and Ohio. In at least one case of monkeypox in this outbreak, an infected prairie dog at an animal clinic transmitted infection to a rabbit, who was the source of primary infection (CDC, 2003a). In this outbreak, 72 cases of monkeypox were reported to the CDC from Illinois, Wisconsin, Indiana, Kansas, Missouri, and Ohio. No specific treatment is known, but supportive and symptomatic care, use of antiviral medications such as cidofovir, and (potentially) vaccinia immune globulin may be useful (Frey & Belshe, 2004). No deaths occurred in this outbreak, and smallpox vaccine was administered both pre-exposure and post-exposure to persons at occupational risk (CDC, 2003b; DiGiulio & Eckburg, 2004b).

This outbreak is an example of how easily a microbe can traverse great distances. It also illustrates a challenge to public health protection, the import of live animals across borders as

exotic pets without the necessary oversight (Lashley, 2004). In this outbreak of monkeypox, an embargo on the import, sale, and transport of rodents from Africa and on the sale or movement of prairie dogs was announced on June 11, 2003. However, there is a large illegal trade in animals brought into the United States, and this poses a danger for further instances of transmission of zoonotic diseases (animal diseases that can be transmitted to humans). Another concern is whether or not monkeypox virus has established a reservoir in North America (DiGiulio & Eckburg, 2004a).

In Africa, the mortality rate for monkeypox virus infection is between 1% and 10%, and can be higher in children or those who are immunosuppressed (CDC, 2003a). The usual mode of transmission is through the bite of or close contact with an infected animal. Acquisition of monkeypox in Africa is associated with preparation and eating of infected rodents and monkeys (Fleischauer et al., 2005). Person-to-person transmission has been previously documented by direct contact and respiratory droplet spread, and there is a theoretical risk for airborne transmission (CDC, 2003d). The risk for person-to-person transmission, while considered rare, is of particular concern to health care workers (Fleischauer et al., 2005).

One lesson learned is that when a clinician observes patients with atypical rashes, with or without encephalitis, monkeypox may need to be considered in the differential diagnosis. This is especially true if they have had recent travel to Africa or have exposure to exotic animals or pets (Sejvar et al., 2004). Another lesson is the need for appropriate use of effective infection control. Because severe illness, with no specific treatment, can result from monkeypox virus infection, it is also considered to be a possible agent for use by bioterrorists.

### ***Bovine Spongiform Encephalopathy (BSE)***

BSE is a transmissible spongiform encephalopathy (TSE). TSEs are progressively fatal, incurable neurodegenerative diseases that are considered to be prion diseases. Prion proteins that are altered, usually through conformational changes such as misfolding, cause three categories of disease in humans: sporadic, infectious/

iatrogenic, and genetic/familial (Glatzel, Stoeck, Seeger, Lühns, & Azguzzi, 2005). Prion diseases include:

- Bovine spongiform encephalopathy (BSE), commonly referred to as “mad cow” disease.
- Kuru, which was spread horizontally among the Fore people of New Guinea who practiced ritualistic cannibalism, often in conjunction with certain death rituals. Kuru has died out in the Fores born since cannibalism has been banned.
- Scrapie, a neurological disease in sheep and goats.
- Creutzfeldt-Jakob disease (CJD) (sporadic, familial or variant), in humans.
- Chronic wasting disease of certain animals such as elk and mink.
- Certain genetically determined or familial disorders (e.g., fatal familial insomnia and Gerstmann-Sträussler-Scheinker syndrome).

Variant Creutzfeldt-Jakob disease (vCJD) is considered to be causally linked to eating beef products contaminated with the prions that cause BSE (Belay et al., 2005). Classic CJD and vCJD are similar but vCJD occurs in younger persons, particularly under 50 years of age. Patients tend to present with behavioral changes or progressive neuropsychiatric symptoms, such as cerebellar ataxia, cognitive impairment, incontinence, dementia, and progression to mutism. The incubation period is long, usually years. Death is inevitable.

Most publicity and lay public concern about the TSEs has related to potential BSE transmission to humans from eating infected meat or meat products. Another area of concern, especially among health care professionals, is the actual and potential transmission through blood transfusions; transmission via corneal, dura mater, and other transplants; or other iatrogenic means (Lashley, 2002a). Concern has also arisen over potential transmission of prion diseases through inadequately sterilized instruments or devices.

The current BSE epidemic in the United Kingdom emerged in the 1980s, and epidemics have been reported in many other countries. Linkage to vCJD was first noted in a 1996 report (Will et al., 1996). In the United States, no identified cases of BSE occurred in cows until 2003, when it was identified in a dairy cow in Washington that had been imported from Canada. In June, 2005, BSE was confirmed in a 12 year old cow in Texas that was born in the United States (Belay et al., 2005). In late July, 2005, a third cow was detected in the United States (BSE Update, 2005).

The 2003 case of BSE resulted in a number of economic sanctions against U.S. beef. Another result was the implementation of precautions and preventive activities to protect the food supply and enhance surveillance for clinical features of variant Creutzfeldt-Jakob disease (CDC, 2004). As of June 2005, 156 vCJD patients have been reported from the United Kingdom, 13 from France, 3 from Ireland, and one each from Canada, Italy, Japan, Portugal, and the Netherlands (Belay et al., 2005). One vCJD case has been identified in the U.S. This case was in a Florida woman who died in 2004, and who most likely acquired the disease when she lived in Great Britain (Belay et al., 2005).

### ***Severe Acute Respiratory Syndrome (SARS)***

Another example of the rapid emergence of a newly recognized human disease agent is the human coronavirus that causes SARS. SARS has been called the first pandemic of the 21st century (Skowronski et al., 2005). In late 2002, reports began to circulate about an “unusual” respiratory disease in southern China, first thought to possibly be an unusual strain of influenza. In February 2003, a physician who was incubating SARS traveled from Guangdong province to Hong Kong. He apparently transmitted SARS to local residents and other travelers, who then returned to their countries of Vietnam, Singapore, Canada, and Taiwan (Breiman et al., 2003). The WHO first reported an outbreak of “acute respiratory syndrome” in China in the February 14, 2003 issue of the *Weekly Epidemiological Record*, but a period of time passed before international notification occurred (WHO, 2003). The number of reported cases escalated worldwide through May

2003 and then began to decelerate. By mid-July, just under 8,500 cases had been identified (CDC, 2003c). On July 5, the WHO announced containment of the SARS global outbreak; however, it also warned that SARS was not gone.

Rapid scientific attention resulted in the identification of a “novel” coronavirus as the causative agent (Drosten et al., 2003; Ksiazek, Erdman, & Goldsmith, 2003; Peiris et al., 2003). During the SARS outbreak, various definitions of the disease emerged, and a range of infectivity estimates were made.

Isolation was deemed important, and it was noted that there was a very high attack rate among health care workers, as well as clustering of cases in community settings such as apartment buildings in Hong Kong.

This demonstrated that SARS was highly contagious through close person-to-person contact. Airborne transmission was postulated as possible; SARS was also rapidly spread through air travel.

Containment was difficult and it was uncertain whether a seasonal pattern would develop, much like that of influenza. It was believed that the SARS virus may have originated from wildlife, who are often in crowded markets and may be eaten.

Effects of this outbreak included uncertainties and fear that, in some cases, resulted in debates and policies against students returning to their U.S. universities from Asia after spring break, and travel restrictions to Hong Kong, parts of China (such as Beijing), Toronto, Canada, and Taiwan.

Restrictions had political and economic consequences. Even Asian merchants in unaffected areas experienced a decrease in business, and in other areas, conventions and similar activities were canceled.

Identification of SARS cases in Singapore in September 2003 led to concerns about a possible resurgence in the upcoming winter. This concern proved valid. In early January 2004, China announced a case of SARS from Guangdong; reports of other cases soon followed (WHO, 2004). In response, Chinese health officials



slaughtered 10,000 civet cats and other mammals and started a campaign against rats and cockroaches to prevent spread (Normile, 2004; Watts, 2004). On retrospective study, SARS-related virus antibodies were found in serum samples collected in May 2001, indicating that some persons were exposed prior to the 2003 outbreak (Senior, 2004; Zheng, Guan, & Wong, 2004).

### ***West Nile Virus***

West Nile virus is a single-stranded RNA flavivirus (Higgs, Schneider, Vanlandingham, Lingler, & Gould, 2005). The most frequent means of transmission is from the bite of an infected mosquito, especially *Culex* mosquitoes.

Mosquitoes may be involved in a complex cycle when they acquire the virus from viremic wild bird reservoirs or other infected vertebrates, including horses and humans. Transmission may also occur through blood transfusion, tissue and organ transplantation, transplacentally from mother to child, and probably through breastfeeding.

West Nile virus infection may also occur through direct inoculation, (e.g., among laboratory workers, or those who handle infected animals) (CDC, 2002). A disturbing report also indicates that nonviremic transmission with horizontal transfer of the virus can occur (Higgs, Schneider, Vanlandingham, Lingler, & Gould, 2005). Clinically, there are three basic outcomes following infection with West Nile virus, as follows:

1. No discernable symptoms. This outcome occurs in about 80% of those infected;
2. Development of West Nile fever, a mild illness with flu-like symptoms that is self-limited in immunocompetent individuals. This occurs in approximately 20% of those infected; and
3. Development of central nervous system infection, usually manifested as encephalitis or meningitis. Signs and symptoms include: fever, headache, gastrointestinal symptoms, stiff neck, alterations in consciousness and mental status such as lethargy, seizures, weakness, focal neurological deficits, movement disorders, and others. This outcome occurs in less than 1% of those

infected, most frequently in those who are over the age of 50 years. West Nile virus was first identified in 1937 from a person in the West Nile district of Uganda. Outbreaks were infrequent until 1996 when more significant outbreaks, with hundreds of persons manifesting neurological signs and symptoms, occurred in countries such as Romania, Russia, and Israel (Lashley, 2002b; Smithburn, Hughes, Burke, & Paul, 1940).

North America has only really been aware of West Nile virus since 1999, when a cluster of unusual cases of encephalitis in New York City heralded the arrival of West Nile virus in North America (CDC, 1999a; Lashley, 2002b). That year, 62 human cases were identified (CDC, 1999b).

This introduction has been called the “perfect microbial storm” because certain factors were present at that point in time (Glaser, 2004, p.557). These factors included large, non-immune animal and human populations; multiple vectors; and a favorable environment for transmission and dissemination.

West Nile virus spread quickly across the continent, and within 5 years established itself as endemic in the United States (Glaser, 2004). As of June 21, 2005, the number of human cases of West Nile Virus reported to the CDC was 2,539, with at least one case reported in each state. This is likely an under report, since West Nile virus infection is not a nationally notifiable disease (CDC, 2005b).

No specific treatment for West Nile virus is available. Prevention methods center around minimizing the opportunity for mosquito bites through the use of environmental controls, personal protection, surveillance, and reporting activities. “Emerging Infectious Diseases: Trends and Issues,” by Lashley and Durham (2002), provides additional details about preventive methods. Personal protective behaviors associated with decreased risk of mosquito bites include wearing long sleeves and long pants, using insect repellent, avoiding exposure to mosquitoes, and avoiding outside leisure activities at dawn and dusk (Loeb et al., 2005). Health care providers should be able to educate consumers about protective measures. They should also be alert

to the possibility of an outbreak of West Nile virus anywhere across North America, in eastern Europe, Israel, Africa, and elsewhere.

### ***Avian Influenza***

On the possibility of an avian influenza pandemic arising, Michael Osterholm, director of the Center for Infectious Disease Research at the University of Minnesota, has said "We're screwed" if it hits soon (Querna, 2005).

To some extent, the influenza virus has excited the imagination to a lesser degree than many other emerging viral diseases. However, it indeed fits into this category because of its ability to genetically change often and rapidly. This ability to mutate is one of the reasons that each year there are seasonal epidemics, and the necessity to produce vaccines targeted for the appropriate strain(s) in the upcoming influenza season.

Influenza virus types A and B infect humans and can cause widespread outbreaks. Type A tends to be the most severe. Influenza virus subtypes are referred to by their hemagglutinen (H) and neuraminidase subtypes (N) which are surface glycoproteins of the virus, such as the avian influenza virus subtype H5N1 (Moorman, 2003).

The influenza virus is considered to have the potential for use as an agent for bioterrorism, most probably by alteration to a mutated form with greater infectivity, greater virulence, more efficient human-to-human transmission, and antiviral resistance.

There have been several great influenza pandemics, notably in the years:

- 1918-19: "Spanish flu" (caused 20 to 40 million deaths worldwide; a large proportion of deaths occurred in healthy adults 15 to 35 years of age)
- 1957: "Asian flu"
- 1968: "Hong Kong flu"
- 1977: "Russian flu"

In the United States each year, approximately 100,000 people are hospitalized with influenza, and about 36,000 die. Thomas Abraham warned of “a biological tsunami” brewing in regard to avian influenza (Abraham, 2005). There is fear that avian influenza could become pandemic in the very near future.

Avian influenza viruses are those carried by birds (usually wild birds) who then shed virus in saliva, nasal secretions, and feces. Birds or fowl become infected when they come into contact with secretions or excretions from infected birds, most often through fecal-oral transmission. Transmission also occurs through contact with surfaces or materials such as feed, water, cages, or dirt that are contaminated with the virus. Contaminated cages, for example, can carry the virus from one place to another.

## Health Tourism

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Health tourism has been around for thousands of years since the third millennium B.C. In fact, people in ancient Mesopotamia traveled to the temple of a healing god or goddess in Tell Brak, Syria to heal eye disorders. Greeks and Romans also traveled by foot or boat to spas all over the Mediterranean. And now people are traveling from all corners of the world to the EU to receive medical treatments, creating a market called health tourism.

Let us look at the state of health tourism in the EU, where it is headed, who the key players are, and how it could impact your tour operation.

Health tourism is a form of tourism that consists of patients traveling to other countries to get medical treatment or assistance. It comprises all the services associated with tourism like transport, accommodation, and hospitality. Health tourism consists of medical tourism, wellness tourism (to enhance health), and spa tourism (spas that combine medical and health components). The three components are different but also overlap.

Wellness tourism, in particular, is a broad concept; and its meaning depends on culture and geography in the EU. For example, in southern Europe, wellness tourism is connected to the seaside, the Mediterranean diet, and the slower pace of life. In Scandinavia, the focus of wellness is on outdoor activities like walking and swimming. As you can see, the definition of wellness tourism is diverse across the EU and serves as proof of the overlap between wellness and spa tourism.

All in all, the definition of health tourism is not really clear, making it difficult to include it in tourism statistics. That consequently makes it tricky to measure the importance, growth, and impact of health tourism on the overall tourism industry and economy.

However, we do know that the market for health tourism has grown exponentially in recent years and has led to new forms of health tourism like fertility tourism and dental tourism.

### **Significance of Health and Wellness Tourism for the Medical Institutions**

Health and wellness tourism has several advantages for the medical institutions.

1.Many medical facilities provide high quality medical services, but suffer from un-utilized excess capacity. These institutions are looking for ways to exploit it by attracting other customers from out of town, whether from other cities in the Kingdom or from other countries.

2.Accessing new markets at lower costs: Tour operators can market health and wellness tourism in regions and cities that cannot access medical facilities at a lower cost for an extended period. This can provide more clients for these installations.

3. Ability to control the demand for services: Flexibility in marketing health and wellness tourism programs can intensify or reduce marketing based on the capacity available in the facility services.

4.Accessing clients with greater financial capability or desire to spend on additional services: Health and wellness tourism programs that can provide peace of mind can be attractive to a lot of those wanting to get them and pay for the services they offer.

5.The patient will focus on the medical treatment and services, while another party takes care of his needs such as the transportation, accommodation and related programs, which in return promote the patient desire to receive additional tourist services.

6. Health and wellness tourism programs attract medical cases from outside the perimeter of the facility which supports interaction with new medical conditions that can increase the expertise of the medical staff.

7. The medical facility will focus on its essential work, while the other party – the tour operator – takes care of the additional work.

### **The Significance of Health and Wellness Tourism**

Health and wellness tourism is one of the national tourism patterns stated in the National Tourism Development Strategy adopted by the Council of Minister. The health and wellness Tourism is characterized by a high rate of expenditure for the tourist trip, plus the length of the trip compared to other tourism patterns, the other visitors accompanying the patient, and the related sequent trips.

#### ***The importance of wellness and health tourism***

Health and wellness tourism programs and products have many benefits for the targeted sick and healthy people accompanying the sick. These benefits are as follows their importance for the tourist:

- The reasonable prices: Health and wellness tourism programs and products provide medical and health services at lower prices since a number of medical, health and tourism services are provided with package rates including flat rate and discount in addition to the beneficiary's ability to choose the services at affordable prices from multiple choices in different areas.
- Quality and Quantity: Tour operators look for medical and health institutions with international quality certificates, adopting international and local standards.
- Availability of latest medical technology: Medical facilities participating in the tourism health and wellness programs ensure the availability and use of modern technology in their services as they care to participate in healing and

health tourism to cover excess potential in those services involving high technologies.

- Personal services: The availability of personal services and programs by the participating parties in the program, in addition to allocating specialized staff in these institutions to be responsible for meeting the requirements of the tourists.
- No waiting: The health and wellness programs seek to provide tourism services to the tourists without having to wait, through arranging pre-defined date to be respected by the institutions as part of the contract between them and the tour operators.

Related programs: Health and wellness tourism provides the tourists or their companions with the opportunity to visit the tourist attractions in the region and enjoy the interesting tourism trips during the treatment journey.

### ***Success Factors of the Health and Wellness Tourism Packages***

The success of the health and wellness tourism packages requires the care of the participating medical institution and its adoption to the following criteria:

1. The packages need to be within a comprehensive tourism program, including the treatment and other services such as travel, accommodation, transportation, and tourism programs for the tourists and their companions.
2. Working with licensed tour operators by the SCTH which deals with the marketing and administration issues.
3. The allocation of a person or department in the medical institutions to be responsible for the administration of the tourism program, in cooperation with the tour operator and in coordination with the tour guide, the institution, the patient or tourist and the departments of the participating institutions.
4. Creation of a website for the institution explaining its potential and services.



5. Participation with the tour operator and other parties in the marketing of the tourism programs in specialized exhibitions and events.
6. Providing assessment and monitoring program to improve the tourism services and programs
7. Arranging agreements between the participating parties through obligatory contracts.

### ***Tour Operators' Role***

Tour operators play important roles in the field of health and wellness tourism, some of these are:

1. Designing, developing and promoting the health and wellness tourism programs.
2. Working with the health and medical institutions to design attractive tourism services and programs.
3. Studying the target market needs.
4. Working with medical institutions to develop and improve the provided programs.
5. Increasing the number of trips and programs related to health and wellness tourism.
6. Promoting tourist satisfaction and comfort during his/her trip through predetermined tourism programs and services.
7. Reaching markets that are unreachable by the medical institutions.
8. Providing all the required services in a single package, which is marketable and has greater attraction than the individual services when offered separately.

### **THE DEFINITION OF HEALTH TOURISM AND ITS CHARACTERISTICS**

Health tourism is concept as ancient as prehistory and as up-to-date as tomorrow. While we don't know whether troglodyte innkeepers made any money on such travel, health tourism may be just what the doctor ordered for today's hospitality marketers.

**Definition**

There is no single definition for health tourism, but a simple and succinct description comes from Mary Tabacchi, a registered dietician and Ph.D. who teaches courses in spa management, wellness and business, and healthy cuisine at Cornell University's School of Hotel Administration. According to Tabacchi, health tourism is "any kind of travel to make yourself or a member of your family healthier."

Most health tourism today focuses on two areas: pampering and wellness. Pampering involves offering people an experience that makes them feel good—services such as massages, herbal wraps and exfoliating scrubs. Wellness involves helping healthy people prevent problems so they stay well, both physically and mentally. Sometimes this means offering diagnostic testing to identify potential problems. More often, guests who have self-identified concerns are taught how to relieve stress, change eating habits, reduce the likelihood of sports injuries or improve their sex lives.

There are also enterprises, however, that go beyond Dr. Tabacchi's definition to include services designed for travelers who have special health needs. For example, 160,000 people in the United States need dialysis. Dialysis at Sea is a company that puts the machines on select cruise ships so people with kidney problems can enjoy cruising without compromising their health. Hotel de Health, a beachfront resort in Anguilla, offers island delights such as snorkeling, windsurfing, and fishing as well as eight dialysis stations "with a magnificent view of the Caribbean."

***Impetus for Growth***

Several demographic, economic and lifestyle developments are fueling growth in health tourism. First and foremost is the aging of the Baby Boomers, 78 million of them in the United States alone. Seeing the grim reaper in their rear view mirrors has increased Boomers' interest in and need for travel opportunities that also meet their health needs. Already boomers represent 60 percent of the spa market.

Another factor is America's fascination with fitness and alternative therapies for health maintenance and healing. These statistics tell the story. In 1997, 42 percent of Americans spent \$21 billion on non-traditional medical therapies and products. In the past three years nearly 25 million U.S. travelers fought the battle of bulge by using a fitness center or gym while on the road.

The third element spurring on health tourism is the fact that today's consumers are already well traveled. As a result they seek something new and different in a holiday experience. They often want something educational or experiential and various aspects of health tourism fulfill those requirements.

The fourth reason can be found in the health care system itself. In Canada and Britain, long waiting lists at home are causing some to go abroad to seek medical care. Cost can also be a factor. According to England's Daily Express newspaper, a cataract operation in Britain costs around \$4,500, but only \$2,250 in France. In India, the same cataract removal is only \$345. A hip replacement in London costs as much as \$12,000, but in Siberia a mere \$1,500. If managed care continues to deny U.S. consumers access to certain medical services, Americans too may begin to look abroad for lower-cost options for out-of-pocket procedures.

### ***Background***

The earliest form of health tourism—visiting mineral or hot springs—dates back to the Neolithic and Bronze ages in Europe. Legend says Bath, England was founded by Bladud, father of King Lear, in 863 BC.

By the Middle Ages belief in the curative powers of thermal springs was firmly established. In the 16th Century, Ponce de Leon brought the concept to the New World when he traveled to Florida in search of the fountain of youth. In the 1700s and 1800s, "taking the waters" at spa towns such as Baden-Baden was popular with the upper crust on both sides of the Atlantic. In the late 19th Century, the emerging urban middle class sought the healthful benefits of fresh sea or mountain air as an antidote to the overcrowding and pollution wrought by industrialization. The

early 20th century saw the emergence of “health farms” or “fat farms” where the emphasis was on fitness and good diet. A new era of health tourism began in 1939 when Deborah and Edmond Szekely opened a \$17.50-a-week bring-your-tent spa and healthy-living retreat, which became the renowned Rancho La Puerta fitness resort. In 1958 Deborah moved north to the San Diego area where she created the Golden Door, a luxurious destination spa known for its lavish individual service and successful mind-body programs. In the same vein, Mel and Enid Zuckerman opened Tucson’s Canyon Ranch in 1979. Today it provides pampering, fitness and medically supervised wellness programs to their well-heeled clientele.

The notion of spas for the mass tourism market, however, didn’t take off until the late 1980s. The International Spa Association was not formed until 1991. Since that time, the number of spas has grown geometrically. Most such spas give only a cursory nod to wellness, instead focusing primarily on feel-good services.

Recently, however, some organizations have gone a step further by making hospitals more like spas and spas more like hospitals. Such facilities integrate alternative medical therapies with conventional Western medicine. They perform operations and otherwise treat and rehabilitate people who are sick or injured, but they do so in a more congenial, resort-like atmosphere.

For example, the Bougainvillea Clinic in Tortola, British Virgin Islands, offers plastic, reconstructive and general surgery in a setting replete with gentle Caribbean breezes; tropical gardens; fountains, waterfalls, a swimming pool; and an antique Chinese bar. It also provides recuperating patients with a full range of pampering services such as aromatherapy, seaweed wraps, facials and massages.

Destination spas such as Canyon Ranch and La Quinta Resort and Club have added staffs of doctors, nurses and technicians who can perform and evaluate a variety of medical tests and provide behavioral counseling and physical therapy.

Cornell’s Tabacchi noted, “From the consulting I’ve been doing and the phone calls I’m getting, hospital-spas are a natural match,

a natural marriage. People know what spas are and they expect to be healed at spas. If hospitals can integrate this some way, I think it would be the hottest business you could have.”

### ***U.S. Spas***

Spas for healthy people currently represent the lion's share of the health tourism market.

In November 2000, the International Spa Association released the results of a survey by PricewaterhouseCoopers. The study found 5,689 spas in the U.S. The number of spas grew by 52 percent between 1997 and 1999 and spa visits rose 70 percent during that period.

Nearly three-quarters of the spas in the survey were day spas, sometimes nothing more than glorified beauty salons, that serve a local clientele rather than travelers. In terms of health tourism in the U.S., the important types of spas are:

- Resort/hotel spas, which are located within a resort or hotel and provide spa services, fitness and wellness components, and some spa cuisine menu choices.
- Destination spas where the sole purpose is to provide guests with lifestyle improvement and health enhancement through spa services, physical fitness, a spa cuisine menu, educational programming, and on-site accommodations.

According to Travel & Tourism Analyst, the number of destination spas in the United States actually decreased between 1987 and 1997, while the number of hotel/resort spas increased dramatically.

Victor Lopez, division vice president of Hyatt Resorts, described his company's rationale for adding spas to its properties. “We've certainly found over the years that in the resort business, sun, sand and sea were not enough any more. People were looking not only for adventure and learning activities, but they really wanted to be able to exercise and be pampered.... Where before the beach or the pool or the golf course were fine, now people definitely want a spa. They want a full-service spa as a part of the

amenities a place offers and many of them are making their vacation plans based on whether a property offers a full-service spa or not."

Results of a 1997 consumer survey conducted by Health Fitness Dynamics, Inc., a Florida spa consulting firm, confirms Hyatt's experience. It revealed 81 percent of consumers who went to resort-based spas said they expected a property to offer spa services. These consumers said they actively seek out resorts that offer those services. Hyatt's response to consumer demand mirrors that of the hospitality industry. Lopez said, "Most of our properties had health clubs. Most of them had a room with some bicycles, some Stairmasters, treadmills, etc. We started expanding on that. We built some big beautiful spas—anywhere from 15-25,000 square feet-and offer treatments of all kinds." He added, "And it's not just for the ladies any more. The men are getting not only massages, but facials and manicures and pedicures. It used to be that the ladies were at the spa and the men were on the golf course, but it's really changed. Now we're finding almost as many men using spas as the women."

Another HFD survey found that meeting consumer demand for spa services translates into direct and indirect benefits for hoteliers. According to general managers or directors of operations at 30 resort-based spas, spa facilities generate net operating profit of 15-25 percent. Among the GMs and DOOs surveyed, 97 percent said spas enhance or increase their marketing advantages, 83 percent said they boost revenue per occupied room and 73 percent said having a spa on site increased occupancy.

To maintain the competitive advantage spas give them, hotels and resorts are adding Asian, Native American or "alternative" therapies and approaches to the services they offer. Bernard Burt, publisher of and co-author of the book "100 Best Spas in the World", reported options often include:

- Spiritual encounters such as the Javanese Lulur, a body cleansing based on Balinese wedding rituals;
- Native American traditional healing adapted for exfoliations and wraps;

- Massages with heated stones;
- Grapeseed oil in French and American facials; and
- Whipped cocoa baths (at, where else, but Hotel Hershey).

Some hotel/resort spas also offer physical and mental wellness activities such as yoga, meditation, reflexology and reiki and the water-based therapies popular in Europe and Asia.

The concept of the hospi-spa, the next logical step in the development of the spa business, “hasn’t arrived yet” in the United States, “but many companies are considering it,” said Cornell’s Tabacchi. Who will finally break the barrier and open up the market? Tabacchi said, “My experience with established hospitality organizations and established hospitals are they are not flexible enough. They’re too big, too unwieldy. It takes too much grinding to change their direction.... It would be my guess that it will take an entrepreneurial effort. It won’t come from Ritz-Carlton. It won’t come from Brigham & Women’s.”

### ***Destinations***

Certain destinations have catered to health tourists for centuries. Bath and Baden-Baden were spa destinations since Roman times. The supposedly healing waters put Saratoga Springs, New York, and Hot Springs, Arkansas, on the map. In the late 19th and early 20th centuries, the warm dry climate of the Southwest attracted those with respiratory problems.

Today, once again, promoting the healthful and health-care benefits of a destination is gaining popularity because tourism marketers need ways to differentiate their products. A search of the Internet finds dozens of countries touting their health tourism products, including some most Americans would not associate with healthy conditions or excellent medical care, i.e. Ethiopia, Pakistan, Yemen, Bulgaria, Siberia and El Salvador. According to “Travel & Tourism Analyst,” Germany, with its 330 spa towns, is the number one spa destination in Europe. Britain has 11 spa towns, including Bath where the primary “watering hole” was recently refurbished with \$12 million from the national lottery, one of the country’s Millennium projects.

While some of Canada's citizens are crossing the 49th parallel to seek medical care in the United States, the Canadian Tourism Commission is trying to lure American health tourists to its side of the border. The CTC gave Spa Canada, a national trade association, a grant to create a 40-page "Canadian Spa Escapes" brochure as a direct mail piece targeted at the U.S. market. Spa Canada is also working with the CTC on advertising and media relations efforts to increase the visibility of Canada as a destination for spa travel. Spas are not the only things that draw health tourists to a destination. Promotion of a country's low cost and/or high quality health care and medical innovations have proven very effective in attracting visitors. One percent of all international visitors to the United States come here for medical treatment, that's nearly 247,000 people. According to Costa Rica's Health Tourism Corporation, this tiny Central American nation attracts 150,000 health tourists annually. "U.S. News On Line" reported Cuba earned \$25 million from health tourism in 1997.

Not all health tourism, however, is considered desirable. In Britain, the same government system causing Britons to go abroad for health care is attracting foreigners who want free medical services. Treatment is free in Britain to citizens of 60 countries, with which the U.K. has a reciprocal arrangement, who have been in the U.K. for 12 months or more, are emergency patients, and for people in several other limited categories. One member of Parliament decried this development saying Britain is becoming the "health supermarket for the rest of the world," and the situation is costing "taxpayers millions of pounds a year."

### ***Tour Operators and Cruise Ships***

The appeal of health tourism has not been lost on tour operators or cruise lines. listed a variety of "Aroma Tours," including a "Provence Aromatherapy Retreat," which includes meetings with aroma therapy experts and visits to essential oils distilleries. It also has yoga-for-golfers tours to the Yucatan and Hawaii. offers "High Feminine Healing—A Sacred Women's Tour to Bali," which includes "yoga, meditation and connection," mask making, "a purification ritual at a spring in one of Bali's most sacred temples,"



and two spa treatments. lists tour operators such as Thermalia Travel, which arranges "health and beauty vacations in spas around the world," and Palmland Tours, offering "Ayurvedic health holidays" at a lake resort in southwestern India. Travelers who want a little nip and tuck can book a cosmetic surgery package to Colombia through Surgeries Overseas.

Lacey Gude, owner of Amazon Adventurers and Gerosa Tours in Arlington, Virginia, develops special itineraries to the Brazilian Amazon for individuals and groups interested in the indigenous medicinal herbs and traditional healing practices. Cruise lines also have responded to consumer interest in health and fitness. Today virtually every large cruise ship has a spa, fitness center, and healthy-eating choices on their menus.

And since turnabout is fair play, destination spa Canyon Ranch recently announced plans to build two cruise ships of its own. Mel Zuckerman, Canyon Ranch's founder said, "We're very excited to offer an exotic travel experience consistent with our goal of providing a healthy, life enhancing vacation. Our ships will be like no other cruise ships afloat."

According to the press announcement, each ship will be equipped with amenities such as a 50,000-square-foot, state-of-the-art gym; studios; a rock-climbing wall; a jogging track; 35 spa treatment rooms; and a beauty salon. In addition, they would have a health and healing center staffed by physicians, health educators, nutritionists, exercise physiologists, physical therapists and others.

Those plans, however, may be in permanent dry dock. In late January, Roxanne Housley, vice president of sales, said, "There is a delay in building right now." She also noted, "Obviously there will be components from behavioral and medical when and if we build ships, but at this point that decision has not been made."

## THE MOST IMPORTANT TYPES OF HEALTH TOURISM

### Emergent Paradigms on Health and Medicine

*Preventive Medicine* promotes healthy lifestyles and diets stress management intellectual stimulation and fitness with a focus on wellness assessments versus illness.

*Predictive Medicine* individual health promotion based on diagnostics of genetic and environmental determinants.

*Holistic Medicine* whole-being meaning physical well-being mental awareness and wisdom spiritual harmony and equilibrium.

*Integrative Medicine* brings together orthodox Western medicine/Allopathic and other Eastern holistic medicines Chinese Ayurvedic and Indigenous knowledge and environmental consciousness. Integrative medicine emphasizes wellness wholeness and a preventive approach to health. Western medicine is based on an illness model concerned with treating disease rather than enhancing wellness.

*Anti-Aging* medicine that combines all those preceding paradigms.

***Definition: Health and Wellness Tourism***

Health and wellness tourism includes travelling both nationally and internationally to places and facilities such as hospitals clinics thermae thalasso wellness SPAs and fitness centers and wellness resorts.

In 2012 it was estimated that a million medical tourists travelled around the world for outbound/ inbound medical tourism.

The purpose of health and wellness tourism is medical care and health beauty relaxation recovery and rehabilitation treatments. There are more than a hundred-million health and wellness tourists around the world each year. Health and wellness tourism includes medical tourism elderly age tourism disability tourism thermal tourism and thalasso-therapy tourism.

***Wellness Tourism***

Wellness tourism includes consumers who travel to maintain their well-being and life satisfaction through the experiences of healthy treatments. Wellness has to do with quality of life. In a holistic approach to health (Chinese ayurvedic and integrative medicines) wellness treatments and therapies restore the vital balance among bodies mind and spirit toward equilibrium and health harmony. This harmony re-balances and restores the energy flow bringing about overall well-being.

***Health Tourism***

Health tourism refers to patients who travel nationally or internationally for healing therapies in hospitals and clinics. Health tourism includes medical tourism aesthetical/plastic tourism thermal tourism and thalassotherapy tourism.

***Medical Tourism***

Medical tourism involves travel to hospitals and clinics for medical treatments in different areas including cardiology gynaecology neurology ophthalmology oncology orthopaedic transplants preventive medicine artificial insemination anti-aging medicine and plastic reconstructive medicine.

Medical tourism is also known as medical travel health tourism health travel healthcare tourism healthcare abroad medical overseas and overseas medical. Medical tourism has two components: inbound and outbound. In 2012 it was estimated that a million medical tourists travelled around the world for outbound/inbound medical tourism.

Medical tourism is a \$100 billion global industry. The most important destinations include Argentina Austria Belgium Bolivia Brazil Chile Colombia Costa Rica Cuba Cyprus Czech Republic Dubai El Salvador France Germany Greece Guatemala Hungary India Israel Jordan Malaysia Mexico Philippines Poland Singapore South Africa South Korea Spain Sri Lanka Thailand Tunisia Turkey United Arab Emirates Venezuela and Vietnam.

***Aesthetical Tourism***

Aesthetical tourism includes aesthetic surgery and treatments. In aesthetic/plastic tourism the most important countries are the United States and Brazil. Other destinations are Argentina Austria Belgium Bolivia Costa Rica Cuba France Germany Greece Hungary Italy Poland South Africa Spain Tunisia Turkey United Arab Emirates and Venezuela.

***Quality/Excellence and Safety***

Within the scope of healthcare the quality of procedures and patient/client safety is strongly connected. Quality is the level of

excellence ensured by a continuous managerial system. Safety is the condition/state of being secure from hurt/ injury and aims to prevent accidents and contagious diseases. It includes protective devices to prevent hazardous accidents and nosokomeion diseases.

### ***Quality/Excellence and Main Safety Components***

*Safe Environment* air quality water quality reduced noise and visual pollution free of radiation pollution (magnetic electric nuclear) natural or recreated pleasant landscape - healthy trees bushes and flowers.

*Architectonic Requirements* Modern and pleasant-looking healthcare facilities that enable the fast physical mental and spiritual well-being of patients and that makes their relatives and visitors rest and relax.

The main architectonic requirements are operating rooms located in sterilized areas lounges designed as living rooms and libraries assuring safety patient well-being and reduced time in integrated examination rooms on the same floor special architectural design that allows optimization of patient flow within the hospital and aims to prevent infections floors walls and ceiling materials must be easy to clean and disinfect walls painted with soft colors such as blue green and pink natural lighting and ventilation and healthy plants.

Medical tourism hospitals must have a specialized staff which can speak different languages fluently namely the official voice of the patient's country.

A new generation of healthcare facilities is emerging that is very different from familiar institutional models. Based on patient-centered care and healing the whole person these health centers are spiritual sanctuaries with gardens fountains natural light art and music. Research is learning how human emotions are linked to disease and that healing is promoted by surroundings that reduce stress and engage the senses in therapeutic ways.

### **Hotel Structure and Services**

The hospital (hospital like a hotel) requires healthcare

humanization beautiful lounges several restaurants and cafeterias shops exhibition galleries musical concerts conference halls containing simultaneous translation systems and catering and laundry facilities specializing in the healthcare sector. A hospital is primarily a hotel in which health services are provided.

### ***Technological Accuracy/Modern Technology***

The latest international technology is put into service including accurate diagnosis equipment a fully equipped digital radiology department accurate radiotherapy treatments cyber-knife robotic surgery systems advanced cardiology ophthalmology and orthopaedics diagnosis treatment equipment and organ transplants.

### ***Professional Healthcare Qualifications: Surgeons Doctors and Others***

Professional staff includes a high-qualified board of internationally certified surgeons and doctors specialized in different medical fields highly qualified anaesthesiologists qualified nurses and others health professionals.

### ***Multi-Language Staff Communicating Skills***

Medical tourism hospitals must have a specialized staff which can speak different languages fluently namely the official voice of the patient's country. Good communication is very important to the safety and well-being of patients and their relatives.

### ***Scientific Affiliation***

Hospitals and clinics develop protocols with universities/ colleges and research centers. Turkey Acibadem is affiliated with Harvard Medical International and Anadolu Health Center with John Hopkins Hospital.

### ***Healthcare Humanization***

It is very important that patient-centered healthcare include a warm and tender environment attention to each individual patient's needs respect of cultural roots alimentary traditions and religious beliefs and patient participation in musical and theatrical groups.

***Accreditation and Certification***

In medical/aesthetical tourism it is important to attest to the excellence and safety of healthcare services for clients from other countries. The most important international accreditation institutions are the Joint Commission International (JCI) Canadian Council on Health Services (CCHSA) Deutsche Akkreditierungsstelle Chemie (GMBH) Commission on Laboratory Accreditation of the College of American Pathologists Clinical Laboratory Accreditation Certificate ISO 15189 and ISO 9001:2000 Medical Tourism Association (MTA Certification) International Society for Quality in Healthcare (ISQUA) European Society for Quality in Healthcare (ESQH) International Organization for standardization (ISO) Trent Accreditation Schemes (TAS) King's Fund Health Quality Services (KFHQs) and International Society of Aesthetic Plastic Surgery (ISAPS).

***High Standard of Ethical and Professional Deontology***

In health and wellness tourism quality/excellence safety and ethics are deeply connected. The aesthetical surgeons must avoid making several surgical operations while informing the client/patient of the dangers of multiple aesthetical surgeries.

***Importance of Branding Destinations***

Health and wellness brand destination becomes more important to promote the image of high-quality healthcare in a location (city region country). Seeking to attract international patients from around the world partners and stakeholders should work together to develop network synergies health and wellness clusters. Hotels and resorts become healthcare facilities for prior and post-surgery medical travellers.

***Attractive and Competitive Advantage of a Destination***

The attractiveness and competitive advantage of medical/aesthetical tourism are competitive prices on a global scale international accessibility and proximity international accreditation/certification and excellence.

Excellence is defined as a high-level of holistic quality (several

levels and parameters) which exceed expectations including accredited hospitals qualified doctors certified surgeons qualified anaesthesiologists qualified nurses and others professionals advanced technologies efficacious therapeutic procedures faster medical services affiliation with universities and research centres humanization of healthcare beautiful hospitals hospitality/hotel structure linguistically competent teams healing climate pleasant environment/landscapes healthy gastronomy and partnership with luxury hotels and resorts.

### **THE ROLE OF AYURVEDA IN THE INDIAN HEALTH TOURISM**

The word Ayurveda conjures up images of calm, relaxation, balance and rejuvenation in exotic India. It is, in fact, a complete traditional medicine practice and life philosophy dating back 5000 years. It has also become a significant driver of medical and wellness tourism in India, as the awareness of its benefits has spread, particularly in the western world.

#### **What is Ayurveda?**

The word Ayurveda is a combination of two Sanskrit terms – ‘Ayur’ meaning ‘life’ and ‘Veda’ meaning ‘knowledge.’ This collection of principles of healthy living has been followed in India for centuries, and is one of the world’s oldest healing systems. The fundamental belief of Ayurveda medicine is that health and wellness depend on the balance of mind, body and spirit.

Ayurveda encompasses preventive and curative health, with the ultimate aim being to “attain liberation (Moksha) through healthy living”. It embodies a philosophy of life that is aimed at achieving balance and maintaining stability.

The Ayurvedic aim of healthy living, balance, and stability comprises the following elements:

- Equilibrium of *Tridoshas* (Vata, Pitta, Kapha)
- Proper functioning of *Agni* (13 types)
- Balanced state of *Dhatu*s (7 Body Tissues)

- Proper evacuation of *Trimalas* (Urine, Feces & Sweat)
- Balanced state of Mind – *Indriyas* and *Atma*

### **Ancient healing and living system**

Practicing the system of Ayurveda through a qualified Ayurvedic doctor can lead to benefits ranging from balancing hormones, healthier skin, reduced bloating, curing insomnia and more.

Here are some attributes of the Ayurveda medicine system that typically appeal to wellness tourists:

- Completely natural treatments
- Non-invasive treatments
- Non-toxic
- Promotes the body's capacity for maintenance and balance
- Preventive and curative focus
- Rejuvenating and relaxing
- Physical, mental and spiritual (mind-body medicine)
- It is easily incorporated into western medical treatments and lifestyles.
- Recognized by leading bodies as a traditional system of medicine
- Used for a wide range of conditions including chronic, stress-related and metabolic conditions

### **India's emerging wellness tourism market**

India is an established medical tourism destination, already serving thousands of medical tourists worldwide, including and not limited to Nepal, Afghanistan, Bangladesh, Iran, Iraq, Yemen, Kenya and Nigeria.

More recently, India is being promoted as a cultural and wellness tourism destination to meet the rising demand for wellness tourism from Europe and Asia. India's ancient healing practices, yoga, naturopathy, and Ayurvedic treatments offer attractive options for European tourists seeking a wellness vacation.



Ayurveda has a growing influence on holistic healthcare and wellness tourism. The Global Ayurvedic Market has been growing at an average annual rate of 16.2% since 2015, reflecting the rising demand for alternative medicine and wellness experiences.

This growth is driven by:

- Rising consumer awareness about health and wellness
- Acceptance by mainstream western medicine
- Increasing demand for natural products
- Global shift in medicine towards preventive practices
- Demand for Ayurvedic cosmetics products
- The popularity of anti-ageing and anti-wrinkle creams

In India, Ayurveda is practiced daily and is part of the fabric of the nation. The emergence of Ayurveda Centers with international certifications of quality practice is fueling the growth of medical and wellness tourism in the country.

Several Ayurveda schools established in the late 1940s have trained a large pool of highly qualified doctors.

Ayurveda treatment and massage packages offer great value for money for wellness tourists. They are attracting large numbers of Western and Gulf medical tourists to the country every year.

Celebrities such as Naomi Campbell, actress Ingeborg Schoener, and film director Bernardo Bertolucci (Last Emperor, Last Tango in Paris) have all visited Kerala in India for Ayurvedic treatments. Other enthusiasts include Cheri Blair, Madonna, Demi Moore and former Prime Minister of India, AB Vajpayee.

Ayurveda has established India as a genuinely world-class medical and wellness destination. The country is well positioned to benefit from the expected rise in demand for wellness retreats after the pandemic.

### **Benefits of Yoga for Health and Mind**

Our busy schedules and hectic lifestyles often leave us stressed and tired. Yoga enhances our physical and mental capacity, and prepares the mind and body for long term health. It enhances

endurance, strength and flexibility of our body, and it also aids in improving posture, as well as in toning and strengthening the muscles. It lowers high blood pressure and reduces the risk of heart attack and strokes.

You are truly healthy when you are physically, mentally and emotionally balanced, and yoga helps us to reach that state. Yoga after pregnancy helps if you want a fast recovery and weight loss.

It provides us beautiful glowing skin, peaceful mind, good health, a strong body and also helps reduce weight. Flexibility prevents everyday injury including muscle and disc strains that happen while turning over in or getting out of bed and it reduces back aches caused by long hours of sitting or standing, bending down to pick something up or walking up and down the stairs. Peace of mind is a state of mental and emotional calmness, with no worries, fears or stress, and yoga helps us to achieve this peaceful state of mind.

### **Health Benefits of Yoga**

The health benefits of yoga need no new emphasis; it is a centuries old practice of holistic self-healing that brings forth harmony between body and mind.

### ***Bringing Inner Peace***

Inner peace refers to a specific state of being mentally and spiritually at peace with enough knowledge and understanding to keep oneself strong during phases of stress. Bliss, happiness and contentment are the basic components of a peaceful mind which refers to a disposition free from the effects of stress. Finding inner peace is associated with Hinduism, Buddhism and self-realisation.

Buddhism describes this peace as an experience of knowing oneself which can be achieved through yoga and meditation. Because during yoga we get more air into our lungs with each breath; we don't have to breathe as quickly, and gradually our breathing slows down. This relaxing breathing alters our consciousness and transforms stress into peace.



### ***Improving Overall Health***

There are various types of yoga asanas and benefits of yoga asanas are numerous. It provides us all round fitness, improves your sexual life, stamina and reduces the problems of migraines and insomnia. Migraine is a headache that affects the nerves of the head and is accompanied by sensory warning signs like flashes of light, blind spots, nausea, vomiting and increased sensitivity to light and darkness. Insomnia is a common sleep disorder, and those who have insomnia have trouble falling asleep and staying asleep. Yoga asanas help to stretch out the muscles in your body – provides you strong arms, toned buttocks, a strong back and legs.



***Aiding Weight Loss***

It has been proven that the breathing techniques that are followed during yoga help strengthen our body and mind's connection. It also aids us to deal with emotions that instigate stress and anxiety. Everyone becomes conscious and makes good choices about their health during the practice of yoga.

We come to know from yoga that sun salutations, veerbhadasana, utkatasana, vrksasana, uttanasana, ardha matsyendrasana, Badhakonasana, kumbhakasana, halasana, balasana and kapal bhati are important yoga asanas which help to reduce weight. They also help tone the entire body, boost our metabolic system and help burn fat. Thus, yoga helps obese people to lose weight.

***Boosting the Immune System***

Yoga boosts our immune system by enhancing the circulation of blood cells, decreasing stress hormones and stimulating the lymphatic system that aids to protect our body from the evil effects of toxins. Toxin is an antigenic poison of plant or animal origin, especially one produced by microorganisms and causing disease when present at low concentrations in the body.

Yoga poses improve our breathing technique, strengthen our muscles and organs, stimulate changes in gene expression and improves our immune system. Adho mukha svanasana, urdha mukha svanasana and bhujangasana are important yoga asanas which boost our immunity.

***Improving Posture and Flexibility***

Yoga practice tones our body muscles and also makes them strong which helps improve our body posture when we sit, sleep, stand or walk. Stronger muscles help prevent sports injuries and other injuries caused due to overexertion. It can help us move better and felt less tired. It has been proven that people improved their flexibility up to 35 per cent after only 8 weeks of yoga.

Athletes consider it really effective which help them to avoid injuries over the years. When you become stronger and more flexible, your posture also improves at the same time. The

disturbing pain in the neck or back could result from something like using one side of your body more, and the imbalance can be identified and corrected with the help of yoga.



### ***Improving Heart Health***

Yoga plays a pivotal role in protecting us from different kinds of heart diseases and also improves cardiovascular health. Cardiovascular disease refers to conditions that involve blocked blood vessels that can lead to heart attack, chest pain and stroke.

Yoga asanas help reduce blood pressure, reduce symptoms of heart failure, increase cardiac rehabilitation, lower cholesterol, blood sugar and stress hormones. The deep breathing yoga exercises help slow the breathing rate, which reduces blood pressure and soothes the nervous system that generates stress hormones.

### ***Relieving Depression***

Depression is a mental illness that causes a constant feeling of sadness and lack of interest. It affects one's thinking, behaviour and feelings too. It is accompanied by headache, chest pain, fatigue, irritation, restlessness, anxiety and insomnia and releases harmful free radicals that damage our immune system. Effective postures of yoga for stress include balasana, bhujangasana, anulom vilom, and shavasana. Yoga can be a great way to get rid of depression because it preoccupies our body and mind. Child's pose, bhujangasana, dog pose, warrior pose, reverse warrior pose, bridge pose, supported corpse pose are the important postures of yoga for depression reduction.

***Controlling Diabetes***

Diabetes refers to a condition in which there is too much glucose in the blood, and it damages kidneys, nerves, teeth, eyes, feet and blood vessels which can lead to heart attack and stroke. When you follow a regular yoga schedule, your body commences responding to insulin that helps immensely in the reduction of blood glucose and it is also an excellent way to fight stress.

Effective postures of yoga for diabetes include pranayam, setubandhasana, balasana, vajrasana, sarvangasana, halasana, dhanurasana, chakrasana, paschimotasana and ardha matsyendrasana which also improve blood circulation in the arms and legs where diabetic patients mainly complain of pains.

***Aids in Asthma***

Asthma is a disorder that causes the airways of the lungs to swell and narrow, leading to wheezing, shortness of breath, chest tightness and coughing. A recent research proves that those who follow yoga asanas show a significant improvement in lung function and a reduction in asthma symptoms when compared with those who don't follow the path of yoga.

Yoga is really beneficial to our body as deep breathing provides oxygen to our bodies and its various organs which is essential for our survival and aids the removal of waste products and toxins from the body. Deep breathing can control and sometimes cure asthma and yoga postures help provide enough oxygen to our body.

***Treating Chronic Back Pain***

Lower back pain is considered to be chronic when it has been present for more than three months. Chronic back pain can originate from an injury, disease or stress. This type of pain can be felt as bone pain and nerve pain. Yoga stretches act magically for those whose back pain is directly related to depression.

Yoga breathing techniques are really effective in the circulation of oxygen throughout the body and breathing also provides an opportunity for meditation which many people consider as the key to overcome pain.

Sphinx, pigeon, two-knee twist, spine hamstring stretch, threads the needle and legs up the wall are the important postures of yoga that reduce chronic back pain.



Yoga offers us what we really need, so include yoga practice schedule into your life to lead a healthy beautiful life and don't forget to share your health tips with us.

## Unions for Health

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A union is an organization of workers who are employed by the same employer and who use their collective power to:

- Stop the employer from doing what workers don't want, such as firing employees without justification, discriminating against workers, making changes without workers' input, and cutting staff to increase profits.
- Make the employer do what workers want, like paying fair wages, providing decent benefits, and hiring enough staff to provide quality care.

Individual workers, on their own, just can't match the power of the employer, because the employer has the ability to fire workers. Without a union, the employer can cut pay, eliminate benefits, change working conditions, or fire employees for no reason.

For more than two hundred years workers have learned that they can match the strength of their employer if they stand together as a group.

One common misunderstanding — one that is often encouraged and reinforced by employers — is that a union is an outside entity, a third party that intervenes between management and workers. It's simply not true.

You and your co-workers are the union. Together you set your goals, choose your representatives, and negotiate with the employer. The union consists of the workers, standing together



and speaking with one voice. So when the employer attacks the union, the employer is really attacking you and your co-workers and your right to stand together and use your collective power to make your voice heard.

By joining and participating in a union, you are taking part in a movement that has a long history. As a union member, you benefit not only from the gains won by your union in your workplace, but by all unions in all workplaces, going back decades, even centuries.

Many of the workplace standards we now take for granted were initiated, fought for, and won by unions. The eight-hour work day, the five-day work week, sick pay, vacation pay, maternity and paternity leave, retirement benefits, health care coverage — none of these were willingly offered by benevolent employers eager to improve the lives of their workers. These benefits were demanded and won by workers, by union members who fought, sacrificed, and even died in the struggle for workers' rights.

NUHW and its predecessor unions, SEIU-UHW and Local 250, have been responsible for many of the most significant gains that healthcare workers have made since Local 250's founding in San Francisco in 1934.

By standing together with your fellow workers, you are honoring the efforts and sacrifices of previous generations of workers and helping to ensure better pay and working conditions for future generations.

#### THE MODEL UNION

The National Union of Healthcare Workers, a member-driven movement for democracy, quality patient care, and a stronger voice in the workplace, is committed to building a model union by dedicating itself to the following principles.

Democracy Union members elect union officers, executive board members, stewards, and rank-and-file bargaining team members; negotiate and ratify their contracts; and vote on changes to the union's Constitution and Bylaws.

Workplace Organization The union is strongest when workers

elect a steward from every department and every shift and hold regular steward council meetings.

Training and Development NUHW conducts regular training sessions for stewards to develop their representation skills.

Patient Advocacy NUHW is committed to its watchdog role in the workplace. As the last line of defense for our patients, we must ensure that they receive the care they need and deserve.

New Organizing Not only does organizing the unorganized bring new opportunities to more workers, but raising the wages and benefits of your employer's competitors helps you win higher economic standards from your employer.

Political Action Healthcare is financed and regulated by elected government officials. Healthcare and insurance corporations are heavily involved in the political process, influencing decisions that impact our industry. We need to be involved, too. We need to ensure that the voice of healthcare workers is part of the discussion.

Research By investigating the standards and practices of employers, we equip ourselves with valuable information in negotiating fair, equitable contracts for workers.

Communication A vital element of our work is getting the word out to our members, the public, and the media.

## **THE WHO AND ITS ASPIRATIONS**

The United Nations Sustainable Development Goals (UN SDGs, also known as the Global Goals) are 17 goals with 169 targets that all UN Member States have agreed to work towards achieving by the year 2030.

They set out a vision for a world free from poverty, hunger and disease.

Health has a central place in SDG 3 "Ensure healthy lives and promote well-being for all at all ages", underpinned by 13 targets that cover a wide spectrum of WHO's work.

Almost all of the other 16 goals are related to health or their achievement will contribute to health indirectly.

The SDGs aim to be relevant to all countries – poor, rich and middle-income – to promote prosperity while protecting the environment and tackling climate change. They have a strong focus on improving equity to meet the needs of women, children and disadvantaged populations in particular so that “no one is left behind”.

This agenda builds on the Millennium Development Goals (MDGs) which were 8 goals that UN Member States signed in September 2000 to achieve targets to combat poverty, hunger, disease, illiteracy, environmental degradation and discrimination against women by 2015.

### **WHO estimates cost of reaching global health targets by 2030**

The SDG Health Price Tag, published today in *The Lancet Global Health*, estimates the costs and benefits of progressively expanding health services in order to reach 16 Sustainable Development Goal (SDG) health targets in 67 low- and middle-income countries that account for 75% of the world’s population.

The analysis shows that investments to expand services towards universal health coverage and the other SDG health targets could prevent 97 million premature deaths globally between now and 2030, and add as much as 8.4 years of life expectancy in some countries. While most countries can afford the investments needed, the poorest nations will need assistance to reach the targets.

“Universal health coverage is ultimately a political choice. It is the responsibility of every country and national government to pursue it,” Dr Tedros Adhanom Ghebreyesus, WHO Director-General, wrote in a commentary accompanying the paper in *The Lancet Global Health*.

The SDG Health Price Tag models two scenarios: an “ambitious” scenario in which investments are sufficient for countries to attain the health targets in the SDGs by 2030, and a “progress” scenario in which countries get two thirds or more of the way to the targets.

In both scenarios, health systems investments such as

employing more health workers; building and operating new clinics, hospitals and laboratories; and buying medical equipment account for about 75% of the total. The remaining costs are for medicines, vaccines, syringes and other commodities used to prevent or treat specific diseases, and for activities such as training, health campaigns and outreach to vulnerable communities.

Under the “ambitious” scenario, achieving the SDG health targets would require new investments increasing over time from an initial US\$ 134 billion annually to \$371 billion, or \$58 per person, by 2030.

The analysis shows that 85% of these costs can be met with domestic resources, although as many as 32 of the world’s poorest countries will face an annual gap of up to US\$ 54 billion and will continue to need external assistance. High-income countries were not included in the analysis but other estimates show they can all afford to provide universal health coverage with essential health services to their citizens.

The ambitious scenario includes adding more than 23 million health workers, and building more than 415 000 new health facilities, 91% of which would be primary health care centres.

These investments would boost health spending as a proportion of gross domestic product across all 67 countries from an average of 5.6% to 7.5%. The global average for health spending as a proportion of GDP is 9.9%. Although higher spending does not necessarily translate to improved health, making the right investments at the right time can.

The investments could prevent 97 million premature deaths – one every five seconds over 15 years – including more than 50 million infants and children who are either stillborn or die before their fifth birthday, and 20 million deaths from non-communicable diseases such as cardiovascular disease, diabetes and cancer. Life expectancy would increase by between 3.1 and 8.4 years, and 535 million years of healthy living would be added across the 67 countries.

The “progress” scenario would require new investments increasing from an initial US\$ 104 billion a year to \$274 billion,

or \$41 per person, by 2030. These investments would prevent about 71 million premature deaths and boost health spending as a proportion of GDP to an average of 6.5%. More than 14 million new health workers would be added, and nearly 378 000 new health facilities built, 93% of which would be primary health care centres.

The analysis includes targets in Sustainable Development Goal 3 (health and well-being) as well as targets from Goal 2 (zero hunger), Goal 6 (clean water and sanitation) and Goal 7 (affordable and clean energy). Some targets and diseases were excluded because of the difficulty of estimating their associated costs and health impact, or a lack of robust data.

The SDG Health Price Tag does not prescribe what countries should spend on health, but is intended as a tool to inform further research. It also highlights that achieving universal health coverage and the other health targets requires not only funding but political will and respect for human rights.

WHO plans to update the estimates every five years and will include other health-related targets and diseases as more evidence becomes available.

## **THE INTERNATIONAL AND THE HUNGARIAN COMMITTEE OF THE RED CROSS**

### **Vision of the Hungarian Red Cross**

By mobilizing the power of humanity the Hungarian Red Cross helps to achieve an environment that is free from poverty, violence, and prejudice which promotes a country with more secure living and health conditions that enables us all to live together.

### ***Fundamental Principles***

The Hungarian Red Cross was established in 1881. It was recognized by the International Committee of the Red Cross in 1882. Since 1921 it has been a member of the International Federation of Red Cross and Red Crescent Societies.

It carries out its activities on the basis of the four Geneva Conventions of 1949, "For the protection of the victims of war", to which the Republic of Hungary is party. The activities of the Hungarian Red Cross are based on the Fundamental Principles of the Red Cross and Red Crescent Movement which are the following:

***Humanity***

The International Red Cross and Red Crescent Movement, born of a desire to bring assistance without discrimination to the wounded on the battlefield, endeavors, in its international and national capacity, to prevent and alleviate human suffering wherever it may be found. Its purpose is to protect life and health and to ensure respect for any human being. It promotes mutual understanding, friendship, co-operation and lasting peace amongst all peoples.

***Impartiality***

It makes no discrimination as to nationality, race, religious beliefs, class or political opinions. It endeavours to relieve the suffering of individuals, being guided solely by their needs, and to give priority to the most urgent cases of distress.

***Neutrality***

In order to continue to enjoy the confidence of all, the Movement may not take sides in hostilities or engage at any time in controversies of a political, racial, religious or ideological nature.

***Independence***

The Movement is independent. The National Societies, while auxiliaries in the humanitarian services of their governments and subject to the laws of their respective countries, must always maintain their autonomy so that they may be able at all times to act in accordance with the principles of the Movement.

***Voluntary Service***

It is a voluntary relief movement not prompted in any manner by desire for gain.

***Unity***

There can be only one Red Cross or one Red Crescent Society in any one country. It must be open to all. It must carry on its humanitarian work throughout its territory.

***Universality***

The International Red Cross and Red Crescent Movement, in which all Societies have equal status and share equal responsibilities and duties in helping each other, is worldwide.

**International Committee of the Red Cross**

The International Committee of the Red Cross (ICRC; French: *Comité international de la Croix-Rouge*) is a humanitarian organization based in Geneva, Switzerland, and a three-time Nobel Prize Laureate. State parties (signatories) to the Geneva Convention of 1949 and its Additional Protocols of 1977 (Protocol I, Protocol II) and 2005 have given the ICRC a mandate to protect victims of international and internal armed conflicts. Such victims include war wounded persons, prisoners, refugees, civilians, and other non-combatants.

The ICRC is part of the International Red Cross and Red Crescent Movement, along with the International Federation of Red Cross and Red Crescent Societies (IFRC) and 192 National Societies. It is the oldest and most honoured organization within the movement and one of the most widely recognized organizations in the world, having won three Nobel Peace Prizes (in 1917, 1944, and 1963).

***Organization***

The ICRC is headquartered in the Swiss city of Geneva and has external offices called Delegations (or in rare cases, “missions”) in about eighty countries. Each delegation is under the responsibility of a Head of delegation who is the official representative of the ICRC in the country. Of its 3,000 professional employees, roughly 1,000 work in its Geneva headquarters and 2,000 expatriates work in the field. About half of the field workers serve as delegates managing ICRC operations, while the other half

are specialists such as doctors, agronomists, engineers, or interpreters. In the delegations, the international staff are assisted by some 15,000 national employees, bringing the total staff under the authority of the ICRC to roughly 18,000. Delegations also often work closely with the National Red Cross Societies of the countries where they are based, and thus can call on the volunteers of the National Red Cross to assist in some of the ICRC's operations.

The organizational structure of the ICRC is not well understood by outsiders. This is partly because of organizational secrecy, but also because the structure itself has been prone to frequent change. The Assembly and Presidency are two long-standing institutions, but the Assembly Council and Directorate were created only in the latter part of the twentieth century. Decisions are often made in a collective way, so authority and power relationships are not set in stone. Today, the leading organs are the Directorate and the Assembly.

### ***Directorate***

The Directorate is the executive body of the ICRC. It attends to the daily management of the ICRC, whereas the Assembly sets policy. The Directorate consists of a Director-General and five directors in the areas of "Operations", "Human Resources", "Financial Resources and Logistics", "Communication and Information Management", and "International Law and Cooperation within the Movement". The members of the Directorate are appointed by the Assembly to serve for four years. The Director-General has assumed more personal responsibility in recent years, much like a CEO, where he was formerly more of a first among equals at the Directorate.

### ***Assembly***

The Assembly (also called the Committee) convenes on a regular basis and is responsible for defining aims, guidelines, and strategies and for supervising the financial matters of the committee. The Assembly has a membership of a maximum of twenty-five Swiss citizens. Members must speak the house language of French, but many also speak English and German as well. These



Assembly members are co-opted for a period of four years, and there is no limit to the number of terms an individual member can serve. A three-quarters majority vote from all members is required for re-election after the third term, which acts as a motivation for members to remain active and productive.

In the early years, every Committee member was Genevan, Protestant, white, and male. The first woman, the historian and legal scholar Renée-Marguerite Cramer (1887-1963), was co-opted in 1918, but resigned already in 1922 when she moved to Germany. She was succeeded by the nurse and suffragette Pauline Chaponnière-Chaix (1850-1934). The third female member was the music educator Suzanne Ferrière (1886-1970) in 1925, followed by the nurses Lucie Odier (1886-1984) in 1930 and Renée Bordier (1902-2000) in 1938.

In recent decades, several women have attained the Vice Presidency, and the female proportion after the Cold War has been about 15%. The first non-Genevans were admitted in 1923, and one Jew has served in the Assembly.

While the rest of the Red Cross Movement may be multinational, the Committee believes that its mono-national nature is an asset because the nationality in question is Swiss. Thanks to permanent Swiss neutrality, conflicting parties can be sure that no one from “the enemy” will be setting policy in Geneva. The Franco-Prussian War of 1870–71 showed that even Red Cross actors (in this case National Societies) can be so bound by nationalism that they are unable to sustain neutral humanitarianism.

### ***Assembly Council***

Furthermore, the Assembly elects a five-member Assembly Council that constitutes an especially active core of the Assembly. The Council meets at least ten times per year and has the authority to decide on behalf of the full Assembly in some matters. The council is also responsible for organizing the Assembly meetings and for facilitating communication between the Assembly and the Directorate. The Assembly Council normally includes the President, two Vice Presidents and two elected members. While one of the Vice Presidents is elected for a four-year term, the other is appointed

permanently, his tenure ending by retirement from the vice presidency or from the committee. Currently Olivier Vodoz and Christine Beerli are the Vice Presidents.

In 2019, Christine Beerli retired and Gilles Carbonnier was appointed vice-president.

### ***International relationships***

The ICRC prefers to engage states directly and relies on low-key and confidential negotiations to lobby for access to prisoners of war and improvement in their treatment. Its findings are not available to the general public but are shared only with the relevant government. This is in contrast to related organizations like Doctors Without Borders and Amnesty International who are more willing to expose abuses and apply public pressure to governments. The ICRC reasons that this approach allows it greater access and cooperation from governments in the long run.

When granted only partial access, the ICRC takes what it can get and keeps discreetly lobbying for greater access. In the era of apartheid South Africa, it was granted access to prisoners like Nelson Mandela serving sentences, but not to those under interrogation and awaiting trial. After his release, Mandela publicly praised the Red Cross.

The presence of respectable aid organizations can make weak regimes appear more legitimate, according to Fiona Terry, head of ICRC's operational research centre. Terry contends that "this is particularly true of [the] ICRC, whose mandate, reputation, and discretion imbue its presence with a particularly affirming quality." Recognizing this power, the ICRC can pressure weak governments to change their behaviour by threatening to withdraw. As mentioned above, Nelson Mandela acknowledged that the ICRC compelled better treatment of prisoners and had leverage over his South African captors because "avoiding international condemnation was the authorities' main goal."

### **OTHER HEALTH CARE RELATED ORGANIZATIONS**

Health care organizations are very interested in the quality of care provided to their patients. They are interested in what their

patients perceive to be quality. Correctional health systems are no different. Patient satisfaction surveys have been conducted by health care organizations for quite some time now; however, this is a new concept in corrections and is not widely accepted by correctional administrators. After all, correctional institutions are predicated on having individuals who do not want to be there and who are mistrusted by staff. This distrustful environment does not support surveying techniques. Yet a few correctional institutions are conducting inmate-patient satisfaction surveys. For example, the Oregon Department of Corrections has been conducting patient satisfaction surveys for more than a decade and has found a positive, constructive way to implement change for patient care.

Keep reading to learn about a few of the types of healthcare organizations that can benefit from IT outsourcing.

### **Hospitals**

Hospitals must work hard to stay out of the red ink these days. As insurance companies pay less of the patients' bills and more people are lining up for medical care, it's harder and harder to earn a profit. One way to slash costs without sacrificing anything in terms of patient care is with IT outsourcing. They can handle the massive responsibilities for data storage, backups, security, hardware, software, and other IT costs, while all you do is pay a monthly charge and benefit from those services. If your facilities are getting cramped, you can also benefit from not having to dedicate space to a data center or networking closet.

### **Doctors' Clinics**

Did you know that medical clinics are some of the most highly targeted databases today? Medical information is much more valuable than what hackers can steal from banks and credit card companies. If someone's bank account or credit card number is stolen, they simply close out that account and issue another one. But people can't change the types of information contained in healthcare records — such as their social security numbers and parents' names. IT outsourcing allows your doctor's clinic to hand over that massive responsibility for security to your service

provider. You may specialize in general practice or pediatrics, but those guys specialize in IT security.

### ***Specialists' Offices & Clinics***

If your practice is in a specialized area of medicine like oncology, orthopedic surgery, cardiovascular, or another medical expertise, you can use IT outsourcing to offer your patients more in terms of services without running up their bills. Your IT provider can establish a patient portal where your patients can log in, make appointments, check their appointment times, update their billing information, check on their insurance company's payments, and even make payments — all online without speaking to anyone. For patients who are already battling cancer or recovering from surgery, this privacy and time savings is a tremendous benefit.

### ***Nursing Homes & Assisted Living Facilities***

Keeping the identities of your valued patients and residents secure is just one of the many difficult aspects of running a nursing home and assisted living facility. With IT outsourcing, you can stay 100 percent within HIPAA requirements by having your data stores safe and secure, and shifting the responsibility for regular backups (another important part of HIPAA compliance) over to your IT service provider.

# Bibliography

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- Alka Pareek: *Environment and Nutritional Disorders*, Aavishkar Pub, Delhi, 2003.
- Broach, J.R.: *The Molecular Biology of the Yeast*, Cold Spring Harbor, Cold Spring Harbor Laboratory, 1981.
- Bryant, Bunyan: *Environmental Justice: Issues, Policies, and Solutions*, Washington, DC, Island Press, 1995.
- Dusenbery, David B.: *Life at a Small Scale: the Behavior of Microbes*, New York, Scientific American Library, 1996.
- Fowler, E. P. and D. Siegel : *Urban Policy Issues, Canadian Perspectives*, Toronto, Oxford University Press, 2002.
- Gedicks, Al.: *The New Resource Wars: Native and Environmental Struggles Against Multinational Corporations*, Boston, South End Press, 1993.
- Harrison, D.: *Who Pays for Clean Air: The Cost and Benefit Distribution of Automobile Emission Standards*, Cambridge, Ballinger, 1975.
- Hill, David: *The Quality of Life in America; Pollution, Poverty, Power, and Fear*, New York, Holt, Rinehart and Winston, 1973.
- Kaza, Stephanie, and Kenneth Kraft : *Dharma Rain, Sources of Buddhist Environmentalism*, Shambhala, Boston, 2000.
- Knut A.; Larson, Gerald James: *Theory And Practice of Yoga: Essays in Honour of Gerald James Larson*. BRILL. 2005.
- Kohlberg, L.: *The psychology of moral development: Essays on moral development*. San Francisco, CA: Harper & Row, 1984.
- Kruvant, W.J.: *People, Energy, and Pollution*, Cambridge, Ballinger Publishing, 1975.
- LaBalme, J.: *A Road to Walk, A Struggle for Environmental Justice*, Durham, Regulator Press, 1987.
- Marris, P. : *Community Planning and Conceptions of Change*, London, Boston, Routledge & Kegan Paul, 1982.
- Masci, Joseph R.: *Outpatient Management of HIV Infection*, St. Louis, Mosby, 1996.
- May, Rollo : *Psychology and the Human Dilemma*, Norton, New York, 1996.
- Melissa Gross: *HIV/AIDS Information for Children: a guide to Issues and Resources*, New York, H. W. Wilson Co., 1996.

- Metting, Jr., F.B.: *Soil Microbial Ecology: Applications in Agricultural and Environmental Management*, Marcel Dekker, New York, 1992.
- Michelis, Elizabeth: *A History of Modern Yoga*. London: Continuum. 2004.
- Middleton, Nick: *Atlas of Environmental Issues*, New York, Facts on File, 1989.
- Nyhus, R.E.: *Manual of Surgical Therapeutics*, London: Little, Brown and Company, 1995.
- Paul Mohai: *Race and the Incidence of Environmental Hazards: A Time for Discourse*, Boulder, Westview Press, 1992.
- Rekers, G.: *Handbook of Childhood and Adolescent Sexual Problems*. NY: Lexington Books, 1995.
- Rele, Vasant. G. : *Mysterious Kundalini*, Taraporevala, Bombay, 1927.
- Rose, John : *Environmental health : the impact of pollutants*, New York, Gordon and Breach Science Publishers, 1990.
- Satyananda, Swami: *Asana Pranayama Mudra Bandha*. Munger: Yoga Publications Trust. 2008.
- Schmidt, Toni : *The Eighty-Five Siddhas*, Stat Etnografiska Museum, Stockholm, 1958.
- Seaman, J.A. : *Physical Best and Individuals with Disabilities*, AAHPERD, Reston, VA, 1995.
- Shyam, Radhey and Khan, Azizuddin : *Clinical Child Psychology*, Kalpaz, Delhi, 2009.
- Sujata Mittal: *Experimental Child Psychology*, Isha Books, Delhi, 2005.
- Sushma Kulshreshtha: *Erotics in Kalidasa-III: Experiencing Bliss: Samprayoga*, Eastern Book Linkers, Delhi, 2007.
- Switzer, R.L.: *Experimental Biochemistry*, New York, W.H. Freeman and Company, 1977.
- Tucker, Mary Evelyn, and John Grim: *Worldviews and Ecology: Religion, Philosophy, and the Environment*. Orbis Books, Maryknoll, N.Y. 1994.
- Van der Ryn, S. and P. Calthorpe : *Sustainable Communities, a New Design Synthesis for Cities, Suburbs, and Towns*, San Francisco, Sierra Club Books, 1986.
- Wiseman, D.C. : *Physical Education for Exceptional Students: Theory to Practice*, Albany, NY, Delmar Publishers, 1994.
- Wood, E.J. Ferguson: *Marine Microbial Ecology*, London, Chapman and Hall, 1965.

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