Lesson 12: THE MEDICAL GEOGRAPHY OF ETHIOPIA

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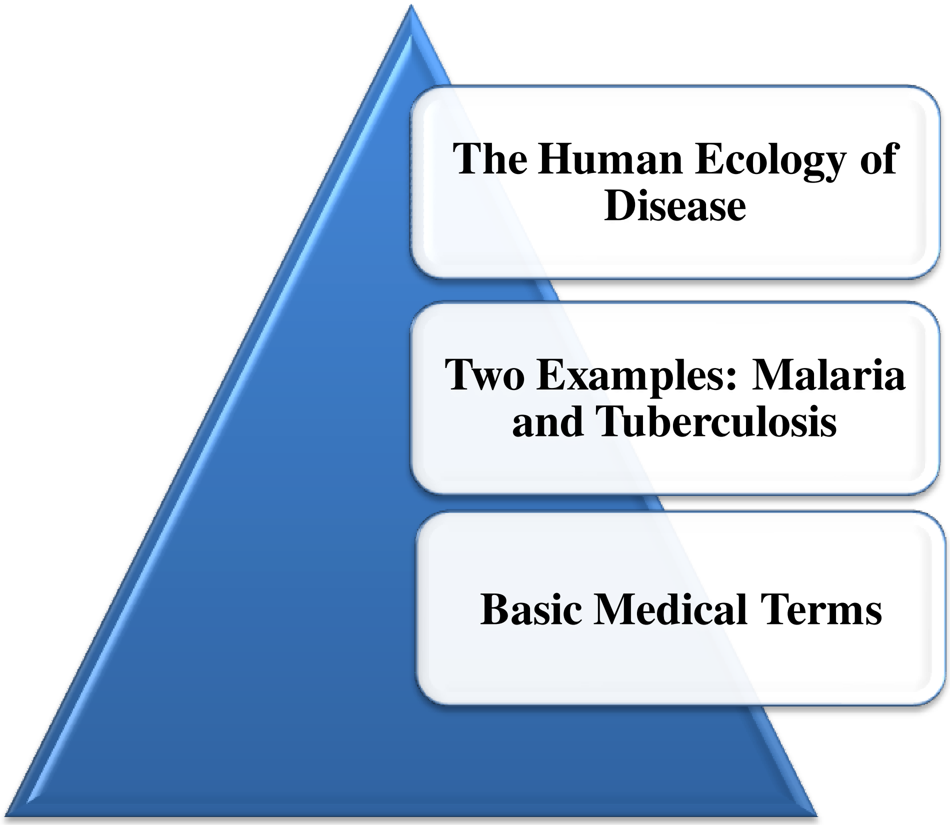


The Medical Geography of Ethiopia

In this section, a spatial approach focusing only on the geographic aspects of health, diseases, and health care in Ethiopia are emphasized. What is a geographical approach? What is Medical Geography? How is it defined?

Medical Geography Defined

"**Medical geography:** 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". [1]

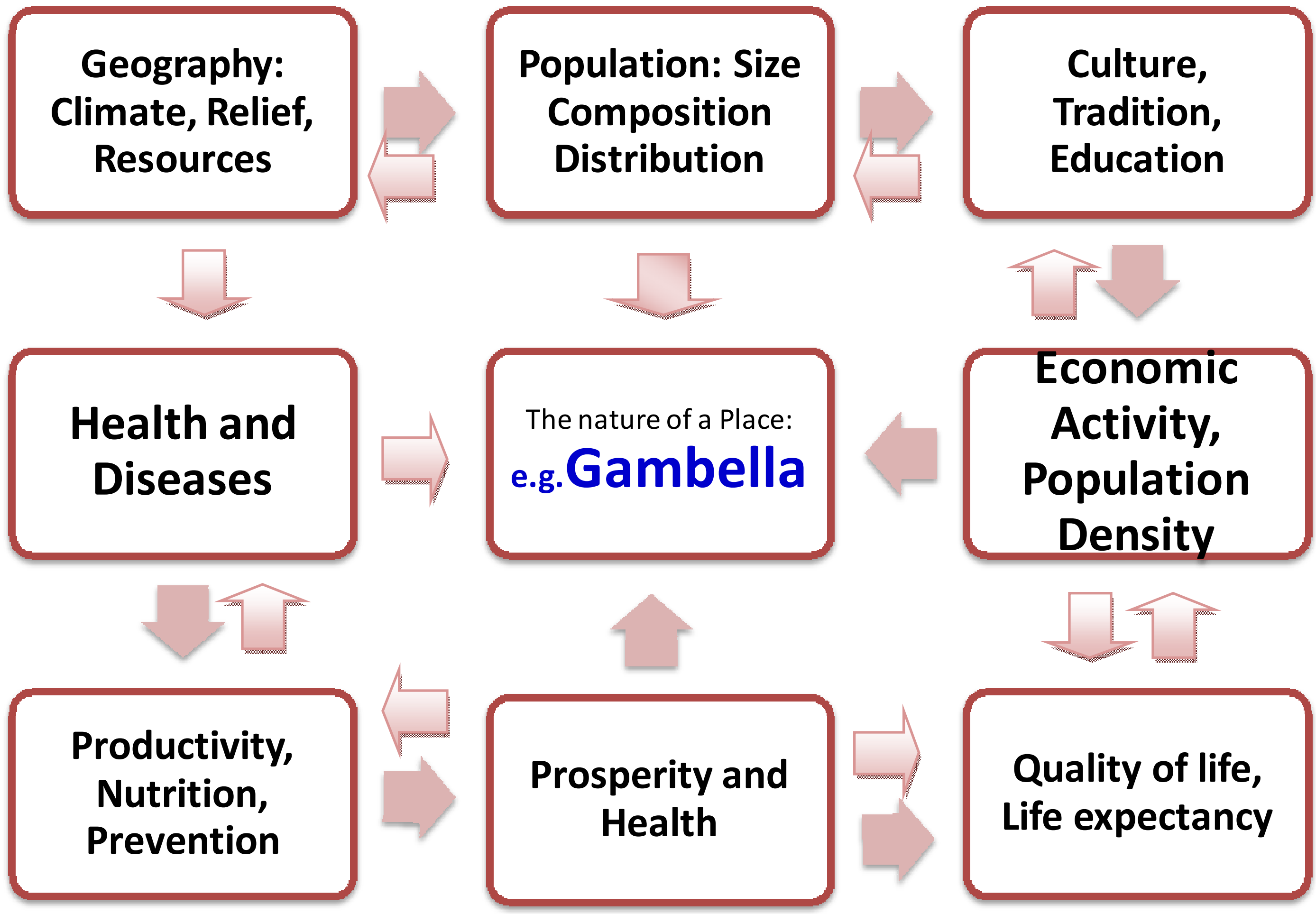
> "Whoever wishes to investigate medicine properly should proceed thus: in the first place to consider the seasons of the year and what effect each of them produces (for they are not at all alike, but differ much from themselves in regard to their changes). Then the winds, the hot and cold, especially such as are common to all countries, and then such are peculiar to each locality. We must also consider the qualities of the waters, for as they differ from one another in taste and weight, so also do they differ much in their qualities. In the same manner when one comes in to a city to which he is a stranger, he ought to consider its situation, how it lies as to the north or the south, to the rising or setting sun. These things one ought to consider most attentively ….." Hippocrtates (c. 400 B.C.) quoted in [2]

The concept that the nature of places may influence the health of living organisms is not exactly new. As far back as the 3rd century BC's it has been known to humans that certain illnesses occur in some places and not others. For example, malaria never existed on mountain tops of the temperate regions of Europe.

> A classic piece of research in medical geography was 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.

Another example comes from early 20th century. Two curious dentists in the state of Colorado USA noticed that in areas with naturally-occurring fluoride in ground water, the children had fewer dental caries; a discovery that showed the link between fluoride and dental health.

The definitions above, when applied to the Ethiopian scenario would lay the ground-work for the forthcoming discussions on the link between health and disease on the one hand, and the nature of paces in various parts of the country, on the other hand. The three-word phrase "nature of places" is a loaded one, and has been summarized in the following simple diagram. We have taken Gambella as an Example:



The simplified model above will be applied at the national level in the examination of the complicated tortuous relationship between Ethiopian geography, demography, and health.

Health Defined:

The World Health Organization defines health as "… a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." [3]. Audry (cited in [2]) defines it as "…a continuing property that could be measured by the individual's ability to rally from a wide range and considerable amplitude of insults, the insults being chemical, physical, infectious, psychological, and social". One can also use the terms "stimuli" and "hazards" in place of insults.

Examples of Insults or Stimuli: [2]

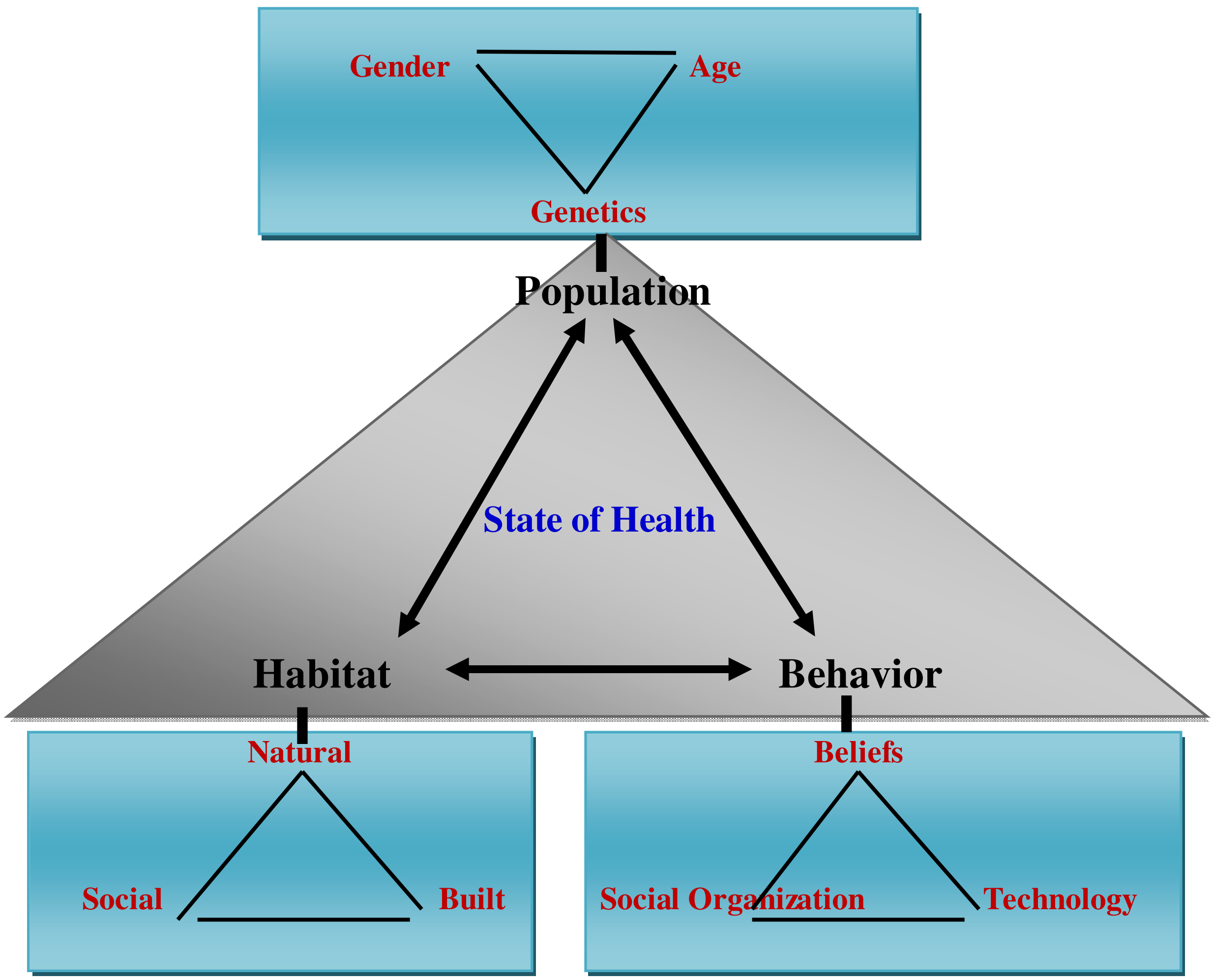
Infectious	**Psychosocial**	**Chemical**	**Physical**
Bacteria	Danger	Drugs	Trauma
Virus	Anxiety	Benzene	Radiation
Rickettsia	Crowds	Micro-nutrient deficiency	Light
Protozoa	Isolation	Paint fumes	Noise
Helminth	Love	Carbon Monoxide	Electricity
Prion	Community	Formaldehyde	Air Pressure

All of these are within the purview of geographical analysis in the Ethiopian context because they could be mapped. “The areas of a town could be mapped based on noise, people’s fear of walking down the street at night, air pollution, visual blight or beauty, mosquito density, or alcohol consumption” [2] Likewise, health risks in Ethiopia such as the type and density of disease carrying mosquitoes, risk factors for Tuberculosis including crowding, risk factors for HIV transmission such as the number and location of shady outlets peddling prostitution in Addis, the percentage of population in Somali with access to clean water and sanitation, the volume of garbage collected weekly in Dire Dawa, the population-physician ratios in Amhara, etc. can all be mapped. The primeval edict “ if you can map it, it is geography” is still true.

The Triangle of Human Ecology

The geographical study of health and diseases in Ethiopia is best conducted by adopting the human ecology approach presented below. In this scheme “habitat, population, and behavior form the vertices of a triangle that encloses the state of human health” [2].

> Habitat is that part of the environment within which people live, that which directly affects them. Houses and work places, settlement patterns, naturally occurring biotic and physical phenomena, health care services, transportation systems, schools, and physical phenomena, health care services, transportation systems, schools, and government are parts of the habitat…Population is concerned with humans as biological organisms, as the potential hosts of disease. The ability of a population to cope with insults of all kinds depends on its genetic susceptibility, or resistance, its nutritional status, its immunological status, and its immediate physiological status with regard to time of day or year….Behavior is the observable aspect of culture. It springs from cultural percepts economic constraints, social norms, and individual psychology. It includes mobility, roles cultural practices, and technological interventions.” [2]



Source: [2]

1. Natural Habitat

Ethiopia has a very diverse natural environment. Its landforms consist of rugged mountains with pointed peaks and valleys, river basins with flood plains and steep escarpments, an expansive desert with scarce vegetation cover and water sources, a section of the Great East African Rift Valley system, dense forests and patchy desert shrubs, major rivers with tributaries, fertile soils and grass lands, diverse animal life both wild and domestic, a variety of species of birds, invertebrates, and amphibians, etc. All of these can facilitate or place limits on the disease agents and vectors, as well as hosts, and thereby determine the level of exposure to illness a given Ethiopian might be facing depending on the nature of his/her micro habitat.

Ethiopia is a country of great geographical diversity. Its main topographic features range from the highest peak at Ras Dejene, 4620m above sea level, down to the Afar depression (Kobar Sink) about 110m below sea level. The Great Rift Valley separates the Western and Northern Highlands from the south Eastern and Eastern highlands. These highlands give way to vast semi-arid lowland areas in the east and west and especially in the south of the country. The country is divided into three major ecological zones, Kolla (arid lowlands below 1,000 meters above sea level), Weina Dega (between 1000 meters and 1500 meters above sea level) and the Dega (between 1500 and 3000 meters above sea level). About 40 percent of the total area of Ethiopia is comprised of highlands, which are found at elevations above 1500m. The highland areas' annual rainfall ranges between 500mm to over 2000 mm. The mean annual temperature in the highlands is below 20oc. The lowland part of Ethiopia covers about 60 percent of the total area of the country. Rainfall in the lowland areas is relatively low, often poorly distributed, and highly erratic. It ranges from 300mm to 700mm annually. The temperature in the lowland areas is greater than 20oc. [4]

Example 1: Malaria

How conducive are the various parts of Ethiopia (described above) as incubators and propagators of infectious disease such as malaria? Do they provide comfort and ideal niches for survival to the agent – ***plasmodium*** – and to the arthropod vector – the anopheles mosquito? "Four types of the plasmodium parasite can infect humans. The most serious forms of the disease are caused by ***Plasmodium falciparum*** and ***Plasmodium vivax*****,** but other related species (***Plasmodium ovale***, ***Plasmodium malariae***) can also affect humans [5]. "Other species infect other animals, including birds, reptiles, and rodents" [6]. We will discuss these in greater detail in lesson 15.

Environmental Factors (Habitat)

1a. *Natural Environment*

In Ethiopia, the mosquito that carries the malaria parasite, also known by its scientific name as ***anopheles arabiensis***, provides the critical link in the spread of the disease from one ***host*** to the next. An environment that is not concussive for the survival and reproduction of this species of mosquitoes cuts off that link and renders the land malaria-free. Three-quarters of Ethiopia is considered malarious. To know which parts of the country can be described as such one needs to consider the nature, developmental stages, and environmental requirements of the anopheles mosquito.

"Of the approximately 430 *Anopheles* species, only 30-40 transmit malaria (i.e., are "vectors") in nature…Like all mosquitoes, anophelines go through four stages in their life cycle: egg, larva, pupa, and adult. The first three stages are aquatic and last 5-14 days, depending on the species and the ambient temperature. The adult stage is when the female *Anopheles* mosquito acts as malaria vector. The adult females can live up to a month (or more in captivity) but most probably do not live more than 1-2 weeks in nature…. The larvae occur in a wide range of habitats but most species prefer clean, unpolluted water. Larvae of *Anopheles* mosquitoes have been found in fresh- or salt-water marshes, mangrove swamps, rice fields, grassy ditches, the edges of streams and rivers, and small, temporary rain pools. Many species prefer habitats with vegetation. Others prefer habitats that have none. Some breed in open, sun-lit pools while others are found only in shaded breeding sites in forests. A few species breed in tree holes or the leaf axils of some plants…. Like all mosquitoes, adult anophelines have slender bodies with 3 sections: head, thorax and abdomen… Males live for about a week, feeding on nectar and other sources of sugar. Females will also feed on sugar sources for energy but usually require a blood meal for the development of eggs. After obtaining a full blood meal, the female will rest for a few days while the blood is digested and eggs are developed. This process depends on the temperature but usually takes 2-3 days in tropical conditions. Once the eggs are fully developed, the female lays them and resumes host seeking.' [8]

1b. *Social Environment*

"The social environment consists of the groups, relations, and societies within which people live". [2] The very diverse social environment in Ethiopia has varying impacts in aiding or curtailing malaria transmissions. The most readily identifiable social factor exposing a given population to malaria infection is mobility. This is a simple case of a population group such as those involved in government resettlement programs moving from malaria-free homelands with no natural immunities to new locations where malaria is endemic. The location of the new settlements vis-à-vis a standing pool of water and local climate, can determine whether or not new sellers with limited immunity or no immunity at all would be in the cross-hairs of the plasmodium parasite transmission enabled by the bite of the anopheles mosquito.

> One of the factors contributing to the reemergence of malaria is human migration. People move for a number of reasons, including environmental deterioration, economic necessity, conflicts, and natural disasters. These factors are most likely to affect the poor, many of whom live in or near malarious areas. Identifying and understanding the influence of these population movements can improve prevention measures and malaria control programs. [9]

The pattern of settlement – clustered or dispersed –, knowledge and attitude of inhabitants about malaria and modes of transmission, existence of malaria control programs – local or national – availability of treated nets or insecticides for prevention and drugs for treatment, are among the many social factors acting as intermediary determinants of the scale of malaria problems in a community.

1c. *Built Environment*

The phrase "built environment" often conjures up the image of sky-scrappers in modern metropolitan cities. It can apply to rural Ethiopia, however. In the context of malaria transmission in Ethiopia's countryside it would apply to the types of traditional huts/tukul. What are the roofs and walls made of? Are there cracks in the walls allowing access to mosquitoes? Do animals spend the night indoors with people? Is the interior heated or cooled? For, example…"it matters to insect ecology (and hence to disease transmission) whether roofs are made out of thatch or corrugated iron, and whether windows are screened". [2]. Globally, the urban built environment has also proved a welcome landscape for malaria-carrying mosquitoes, as the proliferation of pools of accumulating water in pot-holes, tires, urban orchards, abandoned pools, etc., became attractive breeding grounds. " It is estimated that 300 million people currently live in urban areas in Africa and two-thirds of them are at risk of malaria. There is a lack of understanding of the complex interactions between human social structure, the environment and malaria infections." [10]

A recent study of a micro built environment – micro dams – in rural Tigray found a clear connection between human activities and some unintended health consequences. The study sought "to assess the impact of construction of microdams on the incidence of malaria in nearby communities in terms of possibly increasing peak incidence and prolonging transmission". The results were unmistakable: "Overall incidence of malaria for the villages close to dams was 14.0 episodes/1000 child months at risk compared with 1.9 in the control villages—a sevenfold ratio. Incidence was significantly higher in both communities at altitudes below 1900 m." [11]

Behavior

The human animal is a cultural being, and "culture creates social organization, structuring relationships of power, status, and control of resources…[It] creates belief systems, values, [and] perceptions" [2]

The application of these concepts to malaria transmission in Ethiopia would require extensive studies of differences in attitudes and knowledge of malaria as a disease, its causes, transmission mechanisms, and prevention. Such studies are scarce, however. In a recent urban survey in Assosa, 95% of respondents were aware that mosquitoes bite at night, but "knowledge of the role of mosquitoes in malaria transmission and comprehensive knowledge about malaria prevention strategies among the study population were observed to be lower than 50%." [12]. Due, perhaps to better public education, a rural community in Butajira appeared to be much better informed and knowledgeable about malaria. The study conclusion reads as follows:

> Results: Fever, headaches, chills and shivering were the most frequently mentioned symptoms of malaria reported by 89.7%, 87.5% and 81.3% of the study subjects, respectively. About 66% of the study community related the mode of transmission to the bite of infective mosquitoes and 43.7% of them believed that malaria could be transmitted from person to person through the bite of mosquitoes. Mosquitoes are mainly believed to bite human beings at night (73.2%), breed in stagnant water (71%) and rest in dark places inside houses during daytime (44.3%). Malaria was thought to be preventable by 85.7% of the respondents. Of them, 62.4% reported chemoprophylaxis, 39.6% mentioned indoor residual spraying and 25% indicated eliminating breeding sites as preventive methods. The use of modern drugs for malaria was high (92%) including chloroquine (73.5%) and Sulfadoxine-Pyremethamine (60.6%). Chloroquine was believed to be effective for the treatment of malaria by 59% of the respondents, while the remaining replied that it was ineffective. Four hundred two (63.8%) respondents reported Sulfadoxine-Pyremethamine to be the most effective antimalarial drug for the treatment of malaria in contrast to others. [13]

The authors also note that 4 to 5 million Ethiopians fall victim to the disease every year. The results above appear to be a significant improvement over the study results of six randomly selected communities in central Ethiopia in the early 90s where "…only 23% believed that transmission could be prevented" [14]. In a study of the beliefs and traditional treatment of malaria in Kishe settlement area, southwest of Ethiopia, the respondents did worse, in that "eighty three percent of 254 respondents attributed the cause of malaria infection to dirt and rubbish… with 77% prioritizing cleaning dirt and rubbish, while only 36% mentioned drainage of swampy areas" as a method of prevention and control. [15]

Population

In the human triangle of ecology scheme (shown above), "the nature of the population, that is, the characteristics, status, and conditions of individuals as organisms, does much to determine the health consequences of any stimulation". This goes to show that "whether the stimulus is a bacterium, light, drug, sound, or thought, the reaction will differ according to the body's biochemical state”. Furthermore, “this physiology is in part inborn through genetic code, but it is also influenced by weather, nutrition, previous experience, age, and so on” [2]

Genetics

How far has malaria been around? A 2003 study suggested that the global spread of malaria was facilitated by early human migrations and a shift away from a hunter-gatherer life style.

> “This coincides with an expansion of both human and mosquito populations brought about by the advent of agriculture. The shift from small groups of hunter-gatherers to larger settled populations was crucial in sustaining P. falciparum transmission and it is noteworthy that a number of malaria-protective polymorphisms also have origins in this timeframe. The antiquity of other Plasmodium species is more uncertain, but preliminary studies of Plasmodium vivax suggest it is considerably older than its more deadly relative” [16]

No studies exist regarding spatial differences, if any, in genetic predisposition to malaria in Ethiopia. The role of genetics is also significant in its protective effects, in that infected populations and individuals are protected from future attacks by a similar strain of malaria parasite through acquired immunity. Unfortunately, however, “the acquired immune response to malaria is strain-specific and is lost if a person moves away from a malaria endemic area”. [17]. Sickle-cell anemia is an excellent example of how the body’s attempt at defending against malaria leads, at times, to a totally different type of illness.

> Natural defence mechanisms (or innate factors) against malaria are most apparent in populations continually exposed to malaria parasites. For example, inherited conditions such as sickle cell anaemia and beta-thalassaemia, which cause deformities in red blood cells and are common in people from malarious regions, make it more difficult for malaria parasites to infect red blood cells. Some people have red blood cells that lack proteins called Duffy antigens on their surface. These proteins act as receptors for Plasmodium vivax merozoites, so people without Duffy antigens are resistant to infection from this parasite. [17]

Age

Children at a greater risk due to lack of immunity but acquire the ability to survive future bouts of the disease if they are able to survive the first few infections. Many do not. This means that the age structure of the population - whether the population is ageing or “younging” - will determine whether the population of the most vulnerable segment (children) is shrinking or rising. The latter characterized the trend in Ethiopia over many decades in the past, and will continue to do so in the future. The increase in the proportion of children (out of the country’s total) would imply greater numbers are available as vulnerable victims, leading to potentially higher childhood mortality and an increase in childhood mortality levels over time. This in turn could affect fertility through a process known as “replacements fertility” – a case in which parents seek to replace a deceased child, thereby perpetuating the vicious circle.

Gender

A study in Tigray sought to explore whether there was a difference between mothers and fathers in their malaria prevention efforts, resources expended, and priorities given as to which family members should get the care first [18]. There are no studies focusing exclusively on the relationship between gender and malaria to find out whether, or why, there are differences in infection rates between males and females.

> Malaria can impact men and women differently owing to gender norms in society and differing behaviour. Men who work outdoors in forestry, fishing, mining, agriculture or ranching are at a greater occupational risk of contracting malaria if this work occurs during peak biting times. In some pastoral societies, boys and young men leave their homes to watch over livestock as they graze. These boys and young men have very little, if any, protection from malarial mosquitoes and are often far away from treatment facilities should they fall ill. Men from low endemicity regions may also migrate to areas of high endemicity for work, putting them at substantial risk. The division of labour as a result of gender roles may play a significant part in determining exposure to mosquitoes; however few studies have addressed this issue. Women's household responsibilities such as cooking the evening meal outdoors or waking up before sunrise to prepare the household for the day may put them at greater risk of malaria infection than men in their societies. In other cases, men and women are equally at risk for infection given their activities during peak biting hours. Insecticide Treated Net (ITN) use is also subject to gender norms. Acceptability and use of ITNs are strongly linked to culturally accepted sleeping patterns, in which gender plays an important role in who uses the nets. In some instances, young children sleep with their mother and are therefore, protected by her net if she has one. Or, if a household only has one net, priority may be given to the male head of household as he is often considered the primary breadwinner. In other contexts, men have very little access to ITNs if they sleep predominantly outside. [19]

In Ethiopia too, women's status in society and their family roles expose them and their daughters to greater risks of infection. Women also shoulder the main responsibility for the care of malaria patients. Yet, they have the least access to information, financial resources and other resources needed to effectively care for a sick family member. Therefore, policies focusing on gender issues need to be an integral part of all prevention efforts.

> A gender approach contributes to both understanding and combating malaria. Gender norms and values that influence the division of labour, leisure activities, and sleeping arrangements, may lead to different patterns of exposure to mosquitoes for males and females. There are also gender dimensions to accessing treatment and care for malaria, as well as preventative measures such as mosquito nets. A careful understanding of the gender-related dynamics of treatment seeking behaviour as well as of decision making, resource allocation and financial authority within households is key to ensuring effective malaria control programmes. Therefore, gender and malaria issues are increasingly being incorporated into malaria control strategies in order to improve their coverage and effectiveness across contexts. **[19]**

Example 2: Tuberculosis

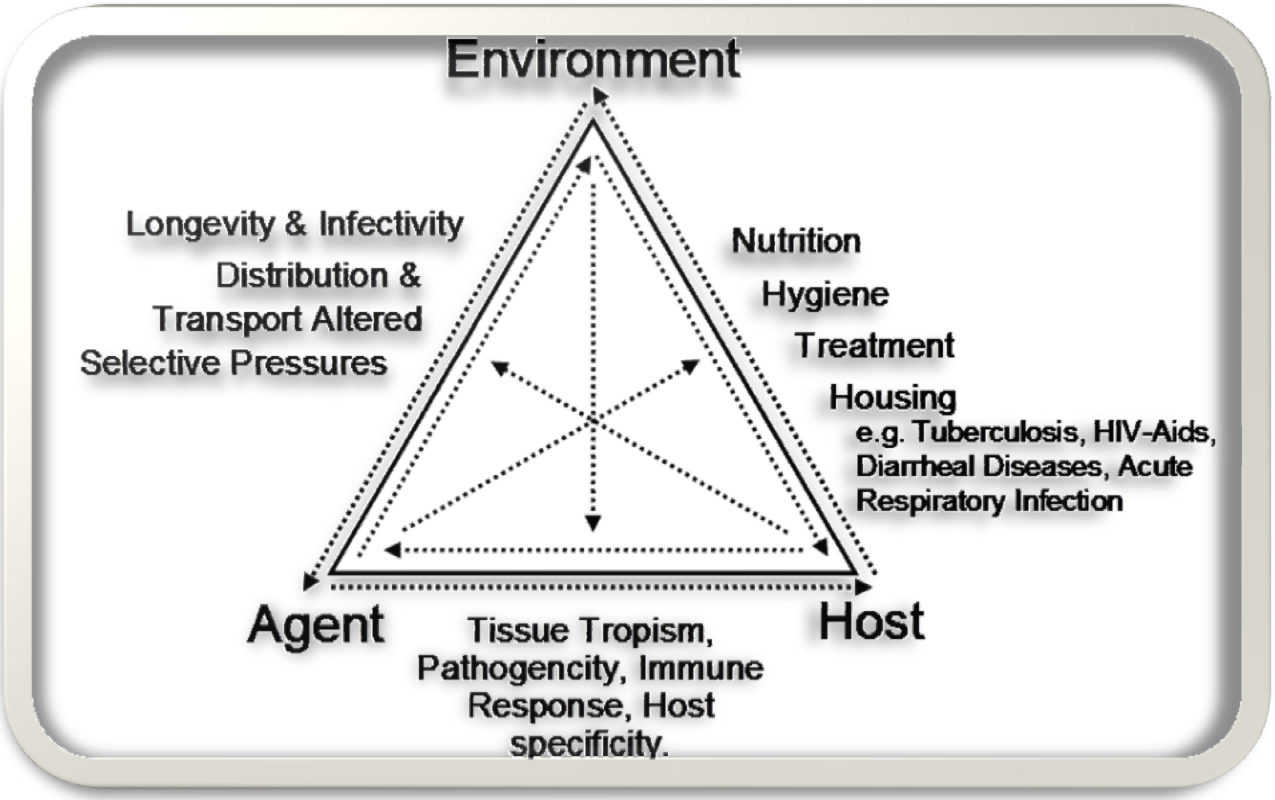
Tuberculosis (TB) is the leading cause of death in the world. About a third of humanity (2 billion people) is infected but a smaller proportion is actually suffering from active TB. The disease is a result of "a bacterial infection caused by a germ called *Mycobacterium tuberculosis*. The bacteria usually attack the lungs, but they can also damage other parts of the body. TB spreads through the air when a person with TB of the lungs or throat coughs, sneezes or talks" [20]

Environmental Factors (Habitat)

A study comparing the role of heredity to that of the physical environment in the transmission of tuberculosis found the environmental impact to be far greater than the genetic effect. Its conclusion reads: "In [a] survey of susceptibility to TB among twins, environmental factors (i.e., intensity of exposure to tubercle bacilli) outweigh the importance of hereditary factors. Environmental factors and the context of transmission should be given more emphasis when studying interindividual and population differences in susceptibility to infectious diseases such as TB". [21].

In the context of TB and its spread mechanisms, the term environment includes availability of and access to health care, housing, nutrition, information, and education (see Fig. below). Ethiopia's status as one of the poorest countries on earth ensures a very low level of education and knowledge about TB – its causes, prevention and treatment - a high level of crowding, poor nutrition and lack of access to health care as well compliance with drug treatment regimes.

> Cultural beliefs about the causes of tuberculosis may influence how people treat their symptoms. In south Ethiopia, people's perception about the cause and management of tuberculosis is unrelated to tubercle bacilli …. Many patients believe that tuberculosis and other diseases are generally caused by imbalances in behaviours or diet, and are best treated by herbal remedies and some special foods. …A recent study from south Ethiopia, has shown that people's perception about tuberculosis, especially in the rural areas, may need many years to change …. Only after symptoms persist for some time and the patient's health deteriorates, are modern tuberculosis control programmes consulted. These social conditions require culturally sensitive health education, taking into account local perceptions of tuberculosis …[22]



Source [23]

There is a serious overcrowding in urban homes, food shortage and malnutrition are endemic to Ethiopia, TB prevention education is at its infancy. Poor sanitation is another toxic ingredient in this mix of environmental risk factors for the spread of TB, the second major causes of hospital deaths in Ethiopia. [22].

Behavior

Co-infection with Tuberculosis and the Human Immunodeficiency Virus (HIV) has become a death sentence for TB patients in Ethiopia and elsewhere. Since HIV transmission in Ethiopia is primarily through heterosexual contact sexual practice is among behavioral factors pushing infected individuals toward rapid progression to active TB and death. Social stigmas, lack of education, low adherence to medication regimes, promiscuity, non-use of preventive measures such as wearing condoms, are also behavioral issues that the county needs to address. Among the disciplines looking at the link between behavior and risk of infections is Anthropology.

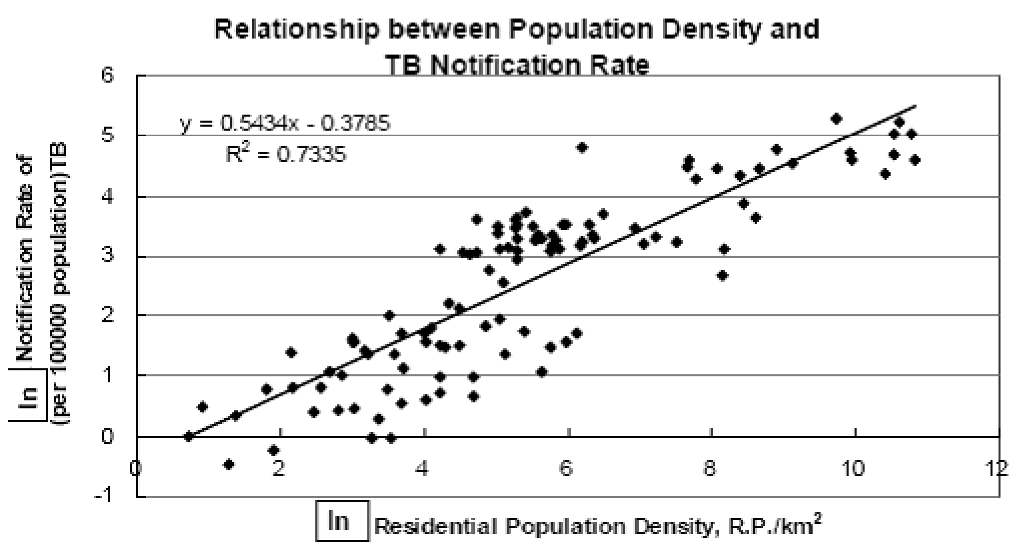
> Anthropological methods and approaches have been … valuable in understanding and addressing the broad range of socio-cultural, behavioral, and structural issues pertinent to TB control.… Studies examining how a local culture interprets TB causes and symptoms help providers understand why people delay seeking treatment. For example, in

Thailand, research indicates that some people, associating their TB symptoms with HIV/AIDS, delayed seeking treatment for fear of having AIDS… In Kenya, patients attributed TB to causes such as hereditary predisposition, consumption of alcohol, smoking, or witchcraft, which often resulted in delayed care-seeking at a clinic specifically for TB patients … Recent work in the Philippines showed that many patients attributed TB symptoms to drinking or smoking, and, thus, delayed seeking treatment for their “harm-less” … Similarly, in a study of the Igbo of Nigeria, TB patients who held rigidly traditional views that TB can be spread by eating beef and other high-protein foods reportedly delayed seeking treatment, often waiting until after they were malnourished.

Etiologic beliefs may influence how people choose to treat or be treated for their symptoms. A study in Malawi showed that patients thought TB resulted from bewitchment or breaking sexual taboos believed they could only be treated by traditional healers, while TB from other causes could be treated with Western medicine … In contrast, other groups express strong preferences for treatment from biomedically trained physicians, with little or no interest in traditional remedies … In Ethiopia, interview respondents believed TB and all diseases were generally caused by imbalances in behaviors or diet, and were best treated by herbal remedies and healthy foods…. A study among the Xhosa-speaking people of South Africa found that people often associated TB with a lack of hygiene and also with witchcraft, specifically the lightning bird, *impundulu*, and sought care first from a diviner….[24]

Population

The following graph, obtained from an Internet source, shows the strong relationship between **TB notification rates** and urban residential **population density** on a logarithmic scale.



Source: [25]

Direct contact with an infected person is the primary transmission mechanism. It is no wonder, then, that high population density – often referred to as crowding – leads to higher infection rates. This is the main reason jail houses and prisons have achieved notoriety as the deadliest incubators and propagators of the ***Mycobacterium Tuberculosis*** bacteria.

Prisoners around the world have consistently higher rates of tuberculosis (TB) infection and disease than the general population. In the former Soviet Union, TB disease in prisoners is reported to be 200 times more prevalent than in the general population, while the excess ranges from 3-11 times across the United States. The reasons for this elevated TB risk are threefold. First, prisoners have a higher risk of being infected with TB than the general population. Prisoners are predominantly young adult males, poorly educated and from socioeconomically disadvantaged groups. They have disproportionate rates of poverty, homelessness and substance abuse, which are risk factors for acquiring TB infection. Second, they have higher rates of risk factors and/or behaviors which predispose to the development of TB disease once infected. For example, prisoners have higher rates of HIV infection and injection drug use than the general population, both of which increase the probability of progression from TB infection to active disease. The internal prisoner hierarchy may create conditions that promote illness in the vulnerable subgroups. For example, food and medicine may be sold, bartered or stolen. Third, environmental conditions within the correctional facilities may facilitate spread of the TB bacteria. Overcrowding in prison facilitates transmission of TB bacteria among inmates. Sharing overcrowded living spaces with prisoners who may have infectious TB disease and then transferring these newly infected inmates within and between prisons has been shown to rapidly spread TB. TB originating in prisoners has been transmitted to staff, visitors, external health care workers and community contacts. [26]

Appendix I

Glossary: Elementary medical terms you need to know to understand Part II of the presentation on Ethiopian Demography and Health. [26, 27, 28]

Aberration
Abortion
Abscess
Absenteeism
Abstinence
Access
Acid rain
Acquired
Acute
Addiction
Aerobic
Aging
Allergen
Allopathy
Altitude sickness
Ambient
Ambulatory
Amenorrhea
Analgesic
Antibody
Antigen
Antiseptic
Antiviral
Apnea

Apoplexy
Arborvirus
ART (antiretroviral therapy
Artery
Autoimmune disease
Axial tomography, computerized (CAT scan)
Bacillus
Bacteria
Bad air
Bar graph
Basal cells
Baseline
Bednet
Benign
Beta cell
Bias
Bioactive
Biomarker
Biopsy
Birth cohort
Birth control
Birth rate
Black Death
Blastocyst
Blinded study
Blood group, ABO
Blood pressure
BMD (bone mass density)
BMI (Body mass index
Body surface area
Bubonic plague
Calorie
Cancer
Carbohydrate
Carcinogen
Cardiac
Chemo (slang for chemotherapy
Central place theory
Chronic
Clinical
Cohort
Congenital
Consumption
Data
Death rate

Detoxify
Disease
Diurnal
DNA
Degenerative
Ecology
Empirical
Endemic
Environmental medicine
Enzootic
Enzyme
Epidemic
Etiology
Eugenics
Evolution
Fahrenheit
False negative
False positive
Familial
Fecundity
Fiber
Flavivirus
Fungus
Gene
Genomics
Geriatrics
Germ theory
Health
Helminth
Hemorrhage
Heredity
Hierarchical diffusion
Histology
Homeopathy
Homeostasis
Homo sapiens
Hormone
Hospice
Host
Humor
Hygiene
Hyper-
Hypnosis
Hypo
Immunity
Immune response

Incidence
Infectious
Infarction
Insulin
In situ
Interferon
Intravenous (IV
In vitro
Juvenile
Kilocalorie
LASIK
Latency
Lifetime risk
Longitudinal
Lorenz curves
Magnetic resonance imaging: (MRI)
Malignant
Mammogram
Mania
Melanin
Menarche
Menopause
Metabolism
Metastasize
Microbe
MMR
Mutation
Nuclear family
Nutrition
Onset
Pandemic
Pathogen
Pathogenesis
Pathology
Physiologic
Placebo
Prevalence
Puberty
Radioactive
Random
Range
Reservoir
Risk factor
Senile
Somatic
Sputum

Stem cell
Stillbirth
Subclinical
Superbug
Symptom
Syndrome
Systemic
Triage
Vector
Virulent
Virus
Zoonosis

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