GATEWAY 1: What are the global patterns of health and diseases?

What are the indicators used to measure health?

- **Health** is the state of complete physical, mental and social well-being.
- **Infant mortality rate** is the number of infants that die before reaching one year old per 1,000 live births in a year.
    - **LDCs** usually have a higher infant mortality rate than **DCs**.
- **Life expectancy** is the average number of years from the time of birth that a person can expect to live.
    - **DCs** usually have a higher life expectancy than **LDCs**.

How and why does the health of people differ between DCs and LDCs? (SEE)

Factors	Aspect	Description	DCs	LDCs
Social	Diet	● **Diet** refers to the food and drink that people consume.	● **Obesity** is a medical condition in which there is excessive fat accumulation in the body that can impair one's health. ● If a person is obese, they are more likely to develop illnesses like hypertension or heart disease, which can directly impact their health.	● **Malnutrition** is a condition in which the body does not get the sufficient or balanced amount of nutrients it needs to maintain healthy tissues or organ functions. ● If a person suffers from malnutrition, they may be more sickly as their immune systems may be more easily compromised.
	Lifestyle choices	● **Lifestyle choices** refer to how a person chooses to live and behave, according to attitudes, habits and values. ● A healthy lifestyle reduces the risk of many diseases including heart disease.	● People in DCs are more likely to be subject to physical inactivity, which can cause obesity and a heightened risk for various diseases. ● However, people in DC usually have more balanced diets, which allows them to have a stronger immune system and improved overall health.	● People in LDCs are more likely to smoke and hence run a higher risk of developing respiratory illnesses.
	Education	● **Education** refers to the process of teaching and learning, often within the context of formal institutions such as a school or university.	● People in DCs are more likely to be better educated. ● This means they are better informed on how to lead a healthy lifestyle. ● They also earn higher incomes, that gives them better access to quality medical treatment. ● Higher level of women's education means that they are more informed of nutrition and healthcare and hence can care for their children more effectively. ● Children who receive formal schooling are more likely to learn about healthcare and nutrition and hence can make better informed choices about diet and lifestyle.	● People in LDCs are not as well educated as education is not usually compulsory in LDCs and because poverty usually forces many children to quit school at an early age. ● They earn less and hence may not be able to afford quality healthcare. ● This means that they lose out on critical knowledge regarding their health and hence cannot make as well-informed choices about their lifestyle.
Economic	Poverty and affluence	● **Poverty** is a state of not having enough money and material resources such as food, water, clothing and shelter. ● **Affluence** is having an abundant supply of money, property and other material goods.	● There are more affluent people in DCs than in LDCs. ● Affluent people have a greater access to food and better quality health services, increasing their resistance to diseases and enabling them to deal with diseases. ● People with higher incomes can choose to adopt healthy and nutritious diets. ● People who are affluent can also consult well-trained healthcare professionals. ● However, people who are affluent are also more likely to consume high amounts of meat and other non-staple food which may lead to other health problems.	● There are more people in LDCs under the poverty line of US$1.90. ● Poverty limits the purchasing power that people have to afford basic healthcare. ● Poverty exposes people to health risks because of poor quality housing. ● Poverty exposes people to nutritional illnesses like kwashiorkor, caused by severe protein malnutrition. ● People living in poverty have less access to vaccinations, exposing them to more illnesses.
	Investment in health care and access to health services	● **Access to health services** refers to people's ability to obtain the services of healthcare. ● **Doctor-patient ratio** refers to ratio of the number of doctors to a given population.	● DCs often have greater investments in healthcare than LDCs due to the greater resources of their governments and private sector. ● There are more hospitals in DCs which means that people are better able to get access to healthcare in a timely manner. ● Hence, people in DCs are more likely to have better access to healthcare than	● LDCs often have smaller investments in healthcare than DCs due to the limited resources of their governments and private sector. ● LDCs do not have adequate health care infrastructure due to a lack of sufficient resources or inappropriate use of existing funds, causing the burden of healthcare to be

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		● **Bed-patient ratio** refers to the ratio of the number of hospital beds to a given population.	people in LDCs ● This is evident in how DCs have larger bed-patient and doctor-patient ratios.	transferred to patients who may not be able to afford it.
Environmental	**Living conditions**	● **Living conditions** refer to a set of characteristics that includes housing, living spaces and access to basic services such as water, electricity and sanitation.	● People in DCs usually have better living conditions than LDCs. ● People in DCs usually live in permanent homes which have clean water, electricity and sanitation. ● This keeps the houses clean and reduces the incidence of diseases.	● People in LDCs usually have worse living conditions than DCs. ● Slums are common in LDCs and they often have poorly secured structures, poor ventilation and overcrowding. ● This allows diseases to spread easily and allows for vermin to breed..
	Access to safe drinking water	● **Drinking water** is defined by the WHO as water that is used for domestic purposes, such as for drinking, cooking and personal hygiene.	● People in DCs have reliable access to safe, potable drinking water. ● This eliminates the chances of contracting water-borne illnesses such as cholera. ● It also eliminates the chances of suffering from heavy metal poisoning.	● People in LDCs do not have reliable access to safe drinking water. ● THe water may be contaminated by heavy metals or have parasites like cholera. ● People who consume this water may develop water-borne illnesses or suffer from illnesses related to consumption of heavy metals.
	Proper sanitation	● **Sanitation** refers to the safe storage, treatment and disposal of waste. ● This includes having functioning toilets, urinals, sewage pipes and treatment plants.	● DCs usually have properly sanitation facilities like functioning toilets, urinals, sewage pipes and treatment plants. ● They also have facilities which help manage, reuse and recycle trash, such as rubbish bins, garbage trucks and landfills. ● Sanitation facilities deal with human waste and can prevent people from being exposed to harmful microorganisms living in waste. ● THey also help keep the population of pests low and reduce the amount of vectors for diseases to spread.	● LDCs usually have poorer sanitation. ● Poor sanitation can result from the dumping of sewage into water bodies such as reservoirs, rivers and lakes. ● This can pollute water bodies and lead to the spread of waterborne diseases.

Which diseases cause more deaths in DCs and LDCs?

- **Infectious diseases** are diseases that are communicable or contagious and are transmitted by microorganisms such as bacteria, viruses, parasites and fungi.
    - They can be spread from person to person through air, food, blood or physical touch.
    - Infectious diseases occur at a higher rate in LDCs than in DCs as LDCs.
        - LDCs have poorer environments and are usually unsanitary.
        - LDCs have poorer access to clean drinking water, leading to the spread of waterborne illnesses.
        - LDCs have improper sewage and garbage disposal which allows insects to spread diseases.
        - LDCs have overcrowded living conditions which allow for infectious diseases to spread easily.
- **Degenerative diseases** cause affected tissues or organs deteriorate over time because of lifestyle choices, eating habits, bodily wear and tear or genetic causes.
    - Degenerative diseases do not spread from person to person.
    - Degenerative diseases are usually more prevalent in DCs than in LDCs.
        - The rising affluence in DCs leads to an over-indulgence in food.
        - People in DCs consume more animal fats and red meats which can cause issues like hypertension and high blood pressure if consumed excessively.
        - Modern conveniences in DCs leads to a lack of exercise that culminates in obesity which can lead to other obesity-related degenerative diseases.
        - Lifestyle choices like smoking and drinking or sedentary desk bound jobs can increase the risk of contracting certain diseases.

GATEWAY 2: What influences the spread and impacts of infectious diseases?

What is the scale at which diseases occur?

- **Endemic diseases** are diseases that are present at low levels constantly in a particular population or region.
    - Malaria is endemic in tropical regions.
- **Epidemics** occur when an infectious disease spreads rapidly to many people within a short period of time.
    - This means the number of new cases, or the incidence rate, is greater than what is expected.
    - They affect many people in a given period and spread in an area where the disease is not usually prevalent.

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    - One example of a common epidemic is cholera, which is a disease that affects the small intestine and is caused by bacteria that grow in unclean food and water.
        - Cholera epidemics are most prevalent in LDCs such as Haiti.
        - After the 2010 Haiti Earthquake, the country's water supply and sanitation infrastructure was heavily damaged.
        - This contaminated the water supply with waste materials and as such caused cholera to spread through communities.
- **Pandemics** occur when an infectious disease spreads across a large area, such as across multiple continents or the whole world.
    - One example of a pandemic was the global outbreak of SARS in 2003.
        - It was first reported in Asia in 2003 and it rapidly spread to countries nearby as a result of a carrier checking into an international hotel known as the Metropole.
        - Due in part to its high contagiousness, SARS was able to spread quickly and rapidly.

What is malaria and how is it transmitted?

- **Malaria** is a life-threatening disease caused by a parasite.
- It is transmitted from person to person via living organisms, commonly insects such as mosquitoes.
    - Female Anopheles mosquitoes are the main carriers of the disease.
    - The mode of transmission is through a human-mosquito-human chain.
    - A mosquito first takes blood from a human infected with malaria parasites.
    - The malaria parasites enter and infects the mosquito.
    - The mosquito then bites another human, injecting malaria parasite into that person.
    - The malaria parasites then migrate to the liver where they reproduce and spread into the bloodstream.

What is the extent and spread of malaria in the world and in Asia?

- Malaria spreads through **expansion diffusion**, which is when an infectious disease is spread outwards from its source.
    - Malaria is most widespread in tropical and subtropical zones.
- Africa has the highest malaria mortality rates.
    - African mosquitoes have a relatively long lifespan, allowing them to infect more people.
    - African mosquitoes prefer to bite humans over animals, increasing spread of malaria.
- It is an **endemic disease**, which is a disease that constantly occurs in an area or community.

Factors contributing to the spread of malaria (SEE)

Social factors

- **Lack of proper sanitation**
    - The lack of proper sanitation can contribute to the spread of malaria.
    - If wastewater is not disposed of properly, stagnant pools of water may form.
    - These stagnant pools are favourable breeding grounds for mosquitoes, allowing them to breed and proliferate, indirectly increasing the chances of someone being infected with malaria.

Economic factors

- **Limited provision of and access to health care**
    - The limited provision of and access to healthcare through the shortage of doctors, lack of health services in rural areas and the cost of malaria treatment contributes to the spread of malaria.
    - There is a critical shortage of doctors in India, which when combined with India having the highest malaria cases in Asia, leads to the spreading of malaria.
    - Most healthcare provision in India is concentrated in the urban areas, which limits coverage for rural areas.
    - This increases the chances of the disease spreading in rural areas.
    - Malaria treatment (Artemisinin Combination Therapy) is also unaffordable for poor areas where malaria is prevalent, preventing people from seeking treatment.

Environmental factors

- **Overcrowded living conditions** refer to situations where large numbers of people live very close together in a small area.
    - In such close conditions, people tend to share the same spaces and interact with one another more often.
    - Diseases can thus spread more quickly and easily because of the increase in contact.
    - For example, housing for refugees and migrant workers is often overcrowded and unhygienic.
        - They sometimes do not even have proper mosquito nets to keep out Anopheles mosquitoes at night.
        - The mosquitoes can infect multiple people easily, further increasing the chance of the spread of malaria.
- **Poor drainage or stagnant water**
    - Poor drainage of water creates conditions favourable for the growth of mosquito populations.
    - Mosquitoes can breed quickly and without interruption, especially in areas where there is low awareness of malaria and without any precautions to remove pools of stagnant water.
    - For example, water from 8,000 kilometres of canals in the Great Indian Thar Desert leaks into many places.
        - This creates stagnant pools which are ideal breeding grounds for Anopheles mosquitoes.
        - As a result, there have been regular outbreaks of malaria in the desert part of Western India since the 1980s.
- **Effect of climate**

- Temperature, rainfall and relative humidity have a direct impact on mosquitoes as they affect the size of their breeding grounds.
- **Monsoons** create favourable conditions for mosquitoes to breed by bringing large amounts of rainfall.
  - Heavy rains sometimes flush out the breeding grounds, temporarily decreasing malaria infection rates.
  - Heavy rains can also block storm drains, leading to pools of stagnant water where mosquitoes can breed easily.
  - Post-monsoon periods coincide with peak malarial infection periods because there are many more pools of stagnant water.
- Tropical regions have the **high average temperature** which mosquitoes need to thrive.
  - Temperatures in the range of 22 to 30 degrees celsius increase the lifespan and frequency of bites by female mosquitoes.
  - High temperatures also shorten the development time of the parasites in the mosquito host, as a result they become active and infectious sooner.
  - The aquatic life cycle of the mosquitoes is reduced to 7 days from the 20 days when temperature increases.
  - This results in increased mosquito activity which can contribute to the spread of the diseases.

What are the impacts of malaria? (SE)

Social impacts

- **Death rate**
  - Malaria can be fatal, which results in an increased death rates for countries where the disease is endemic.
  - In 2010 alone, more than 537,000 people died of malaria.
    - Most of these cases were from LDCs like the Democratic Republic of the Congo and Nigeria.
- **Infant mortality rate**
  - Malaria can be especially fatal for children and newborns as they tend to have weaker immune systems.
  - Malaria can be spread by a pregnant woman to their unborn child.
  - This complicates their pregnancy and the infants may then die during their first year of birth due to their low birth weight.
  - For example, more than 75,000 infants die every year as a result of this.

Economic impacts

- **Burden of malaria on households**
  - Malaria can cause economic burdens for the family of a person suffering from it.
  - This is because a person suffering from malaria has increased medical expenses such as the need to buy medication for treatment.
- **Cost of healthcare**
  - Countries affected by malaria need to set aside more funds for the provision of healthcare to address the disease.
  - Malaria can account for as much as 40 percent of all public health spending in some countries.
  - These funds are used for investment in hospitals or the purchase of insecticide-treated nets or medication.
- **Loss of productivity,** which is the rate at which goods and services are produced.
  - People suffering from malaria have poorer health and as such may not be able to work as well as a healthy person.
  - For instance, they may be unable to do manual labour, work as many days or even work at all.
  - This reduces the productivity in a workforce as not everyone can work to their maximum efficiency.
  - The long-term reduction in productivity leads to a slowing in economic growth, which is a trend seen in areas endemic to malaria such as Africa.

What is HIV/AIDS and how is it transmitted?

- **Human Immunodeficiency Virus (HIV)** is a virus that attacks the cells of the immune system by destroying white blood cells that are critical to fighting infections.
- The body loses its ability to fight infections, leading to **Acquired Immune Deficiency Syndrome (AIDS).**
- **AIDS** is the final stage of **HIV** infection and occurs when the immune system is severely damaged, causing the body to become vulnerable to infections as a result of the compromised immune system.
- **HIV** infected individuals may be asymptomatic for the next 9 to 10 years after which the person may then begin to show signs of **AIDS.**
- **HIV/AIDS** can be transmitted from person to person through blood or bodily fluids.
  - **Sexual contact** is the most common form of HIV/AIDS transmission.
  - **Sharing of infected needles** can cause the virus to be transmitted from person to person.
    - This accounts for one-third of all HIV/AIDS transmission accounts in North America, China and Eastern Europe.
  - **Contaminated blood transfusions** can cause the transmission of HIV.
    - 5 to 10 per cent of the world's infections occur through contaminated blood transfusions.
  - **Pregnant mothers infected with AIDS may transmit the disease to their babies.**

What is the extent of spread of HIV/AIDS in the world and in Sub-Saharan Africa.

- HIV/AIDS spreads through both **expansion diffusion**, which is when an infectious disease is spread outwards from its source, and **relocation diffusion**, which is when a disease spreads to new areas outside its current geographic range.
  - AIDS/HIV spread mainly through expansion diffusion in Africa during the 1990s, causing epidemics in Sub-Saharan Africa.

    - However, AIDS/HIV has also managed to spread to new continents such as North America through relocation diffusion, allowing the disease to further spread by expansion diffusion in these new areas.
- AIDS is most prevalent in LDCs where the people may not be properly educated about the dangers of engaging in unprotected sex or where lapses in medical practice are more common.
    - Africa has the highest amount of people infected with AIDS, accounting for two-thirds of all AIDS victims in 2003.
        - The percentage of people infected with AIDS can exceed 15% in some countries like Botswana.
    - Sub-Saharan Africa, Central America and Southeast Asia experience the highest incidence rates of HIV/AIDS.

Groups vulnerable to HIV/AIDS

- **Women** are more prone to AIDS because they are twice as likely to contract it during sexual interourse and because in some societies women are more likely to be subjected to sex without their consent.
- **People who participate in risk-taking behaviours** are more prone to AIDS because they have greater chances of being infected.
- **People who lack sexuality education awareness** are more prone to AIDS because they lack the knowledge precautionary measures like condoms.
- **Children or infants born to HIV-positive mothers** are prone to AIDS as it can spread to unborn children.

Factors contributing to the spread of HIV/AIDS (SE)

Social factors

- **Social stigma,** which is an extreme disapproval associated with a particular circumstance.
    - HIV/AIDS patients faces various forms of discrimination which can include refused access to healthcare facilities, rejection by family or community, being expelled from school or denial from housing/
    - As a result of this social stigma, people who are infected with the disease may not wish to reveal their status, indirectly contributing to the uncontrolled spread of the disease.
    - Prejudice against people with HIV/AIDS and ignorance about how the disease is transmitted also hindered containment efforts in the 1980s, leading to the explosion of HIV/AIDS cases worldwide.
- **Lack of education**
    - People living in some areas may not know how diseases are transmitted due to a lack of education.
    - As a result, the people living there thus do not know how to protect themselves and avoid being infected, causing them to be more vulnerable to AIDS/HIV.
    - In some countries where the discussion of sex is taboo like Nigeria, sexuality awareness education is not conducted in schools, leading to a lack of knowledge in these areas.
- **Lifestyle choices**
    - Certain lifestyle choices can contribute to one's risk of being infected with HIV/AIDS.
        - Drug users may be infected by the sharing of contaminated needles.
        - People who refuse to use condoms may run a higher risk of being infected with HIV.
    - These choices increase exposure to HIV and hence can increase the chances of one being infected with the disease.
- **Lapses in medical practices**
    - Mistakes, corruption, and negligence associated with medical practices contribute to the spread of HIV/AIDS.
    - For instance, 5-10 percent of all HIV/AIDS infections are transmitted by tainted blood transfusions.
        - This occurs especially often in countries where there exists no effective blood screening, allowing for blood infected with HIV to be used in blood transfusions.

Economic factors

- **Vice trades**, which refer to commercial activities such as those like the drug or sex trade.
    - People who participate in these vice trades, particularly women in LDCs, tend to be more exposed to open sex.
    - This causes them to be more vulnerable to HIV/AIDS.
    - For instance, many women who move from villages to cities in search of work often only find employment in these trades, causing them to have increased vulnerability to HIV/AIDS.
- **Mobility** refers to the movement of people from one place to another, often for work reasons.
    - People may move to cities or mining areas in search of work, often leaving their families behind.
    - As a result of being separated and living in a foreign place, this causes them to feel more socially excluded.
    - As such, they may engage in risk-taking behaviours which puts them at greater risk of contracting HIV.
    - For instance, tourism which is another form of mobility, often puts people at risk of contracting HIV, especially if they participate in risk-taking activities overseas.
        - Queensland, Australia, recorded its highest incidence of HIV/AIDS with 206 people diagnosed with HIV in 2010.
        - Some of them were infected when they travelled to Papua New Guinea for a vacation and contracted it there.

What are the impacts of HIV/AIDS? (SE)

Social impacts

- **Life expectancy and infant mortality rate**
    - The diseases increases the number of deaths and reduces life expectancy, population size and population growth.
    - These impacts are most prevalent in LDCs where HIV/AIDS is prevalent such as Uganda or Botswana.
    - In countries most affected by HIV/AIDS, the life expectancy is reduced by almost 6 years.

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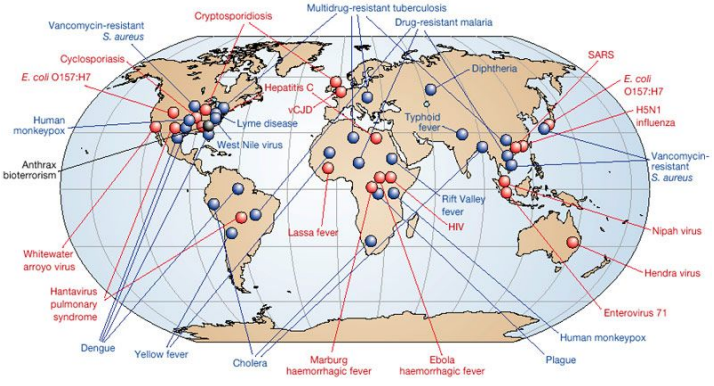
- HIV/AIDS also causes an increase in IMR, which can be seen in LDCs most affected by it.
- **Orphan crisis,** which refers to the situation in which large numbers of children lose their parents due to HIV/AIDS.
  - Around the world, there are 17 million orphans due to AIDS.
  - Most of them live in Sub-Saharan African countries like Nigeria, Tanzania and Uganda.
  - The carers of the orphans are plunged into deeper poverty due to the medical costs and living expenses incurred by the orphans living with them.
  - The orphans suffer from the emotional trauma of losing their parents and are also stigmatised by society because they are often assumed to be HIV positive themselves.
  - As such, this can limit their access to basic necessities such as shelter, food, clothing, health and education.
  - This causes them to suffer from malnutrition and illnesses and be infected with HIV/AIDS as well, often causing them to be faced with a lower standard of living.

Economic impacts

- **Cost of healthcare**
  - Health care costs for HIV/AIDS can be expensive for individuals and countries.
  - Antiretroviral drugs can cost from 160 to 1200 USD a month in Singapore and the fact that they have to be taken daily adds to this cost.
    - Antiretroviral drugs do not cure AIDS but rather inhibits its progress in the body.
    - It also stops patients from suffering from complications for many years and even decades.
  - Pregnant mothers with HIV/AIDS have to go through screening for HIV/AIDS prior to delivery and then receive antenatal treatment to reduce the risk of passing HIV/AIDS to their babies.
  - Ultimately, this results in an increased amount of resources having to be allocated to care for HIV/AIDS patients, causing diversion of resources that could've been used for other purposes.
- **Loss of productivity resulting in slower economic growth**
  - HIV/AIDS slows economic growth by causing there to e a shortage in skilled lab labour and general labour in the workplace.
  - HIV/AIDS causes high death rates which shrink the workforce.
  - It also leads to illnesses that cause an employee to be absent from work for long periods, resulting in reduced labour productivity.
  - The high amount of funds that are required to deal with AIDS, particularly in the most severely-stricken LDCS like Kenya, means that less money can be spent on improving educational infrastructure, leader to a less skilled work force.
  - This deters foreign investments and hinders economic growth as businesses cannot find people to employ, thus reducing economic growth.
  - For instance, Uganda's economic growth has been slowed by 1.2 percent by AIDS each year due to AIDS.

GATEWAY 3: How can we manage the current and future spread of infectious diseases?

What are the challenges in managing the spread of infectious diseases?



- **Emerging and re-emerging infectious diseases**
  - **Emerging infectious diseases** are diseases that appear in a population for the first time.
    - One example of an emerging infectious disease is SARS.
    - It first began spreading in Guangdong in 2002 and was finally contained in 2003 with a final death toll of 914 deaths.
    - A slow response to early cases and difficulty of identifying SARS had led to the outbreak of the pandemic.
  - **Re-emerging infectious diseases** are diseases which may have existed in a population previously but are rapidly increasing in incidence or geographic range.
    - One example of a re-emerging infectious disease is dengue fever.
    - Dengue fever is re-emerging in the USA, with outbreaks reported in states from Hawaii to Florida.
    - Dengue fever has also spread to new areas such as France and Croatia.
- **Diseases spreading globally**
  - The efficiency of modern transportation and communications, including more efficient air, sea and land transport has contributed to the ease of transmission for diseases today.
  - Aeroplanes that can fly halfway around the world in a day while carrying hundreds of people are an example of this.
  - While these innovations have made the world more connected than before, they have also made it easier for diseases to spread.
  - For instance, the SARS pandemic in 2002 spread globally in a matter of months because of the movement of airplane passengers infected with the airborne virus.

Why is there a re-emergence of malaria?

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- **Resistance to antimalarial drugs**
    - The use of counterfeit or incomplete doses of antimalarial drugs allows surviving malaria parasites to build up resistance to the drug as the drug did not kill all of them.
    - This ends up creating drug-resistant strains of malaria such as mefloquine-resistant malaria which is found in Southeast Asia.
- **Climate change**
    - When the climate gets warmer, temperatures at higher altitudes and worldwide increase.
    - These places now become favourable breeding sites for mosquitoes due to the increased temperatures, increasing the spread of malaria.
    - For instance, this has exposed 4 million more people to malaria in the Central Highland due to the increase in average temperatures allowing for mosquitoes to breed in larger areas.
- **Air travel**
    - Due to the increase in air travel, disease-causing organisms can be transported to new areas.
    - This has led to a re-emergence of malaria in areas such as France, where in 1995 malaria was first reported.
- **Insecticide-resistance mosquitoes**
    - Mosquitoes have built resistance to chemical pesticides such as pyrethroids in a relatively short time.
    - As such, anti-mosquito measures such as insecticide coated nets are becoming ineffective.
    - Mosquito resistance to insecticides have been detected in 64 countries around the world and if the situation worsens, could potentially place 120,000 children under five years of age in Africa at risk of malaria.

What are the challenges in managing the spread of malaria? (SeE)

Socio-economic challenges

- **Limitations of healthcare**
    - The ability of malaria to develop resistance to antimalarial drugs as caused by incomplete treatment of people infected with malaria has caused issues in the treatment of malaria.
    - For instance, mefloquine-resistant malaria strains have been detected in Thailand and have complicated treatments because mefloquine cannot be used to treat it.
- **Population movement due to efficient transport and communications**
    - **Population movement** is the movement of people across borders.
    - The movement of people spreads and transmits disease to new locations and malaria control programmes in specific regions become ineffective as it is difficult to monitor the movement of people.
    - This movement is increasing at scale and speed due to the increasing ease of travelling with better transport links between countries.
    - This allows for malaria to flourish along international borders and allows it to be transmitted to relatively low transmission areas.

Environmental challenges

- **Effects of climate change**
    - Climate change affects the temperature and the amount of rainfall that a place receives.
    - This affects the behaviour and range of mosquitoes as follows:
        - Increased temperatures cause mosquitoes to breed and mature faster.
        - Increased rainfall increases the amount of pools of stagnant water, allowing mosquitoes more areas to breed.
        - These conditions also lengthen the period in which mosquitoes can breed and transmit malaria.
    - This results in an increased frequency of malaria, which results in an increased scale of the epidemic.
- **Effects of monsoons**
    - As monsoons bring high rainfall during the wet season, this creates an increased abundance of stagnant water pools for mosquitoes to breed in.
    - This results in increased malaria cases during monsoons.
    - For instance, in urban areas in India monsoons often create long-lasting pools of stagnant water to breed.
        - This is because of most Indian cities' poor sanitary and drainage infrastructure.
        - This allows for mosquitoes to flourish and spread malaria to the urban population.

What are the challenges in managing the spread of HIV/AIDS? (SeE)

Socio-economic challenges

- **Difficulties in HIV detection**
    - HIV is difficult to detect as it is asymptomatic for most of the period of infection.
    - Infected people may not know that they are infected and continue with their normal behaviours, potentially infecting others.
    - People with limited access to healthcare may also have greater difficulty obtaining HIV testing.
    - For instance, this particular factor was verified when a survey in selected African communities showed that not knowing one's HIV status was a major cause of the spread of the disease.
        - The survey showed that in countries like Congo, only 35% of the women knew that they had the disease out of those that actually had the disease.
- **Lifestyle choices**

    - Lifestyle choices include being sexually active at a young age, having many sexual partners and using injection drugs.
    - SInce these are primarily ways through which HIV/AIDS spreads, this causes them to have increased risk of contracting the disease.
    - Culture also often influences lifestyle choices and makes it hard to manage the spread of HIV/AIDS.
    - For instance, certain African tribes in Zambia and Kenya still practise polygamy and as testing for HIV/AIDS before marriage is not practised in these countries, AIDS/HIV spreads further amongst the populations.
    - Changing people's lifestyle choices and cultural beliefs is hard and as such, this makes it a challenge in managing the spread of HIV.
- **Social stigma leading to non-reporting of disease**
    - The social stigma associated with having AIDS causes many people to shy away from being tested and receiving treatment.
    - This increases the spread of the disease and makes it difficult to contain disease outbreaks.
    - For instance, people with HIV/AIDS may infect their partners as social stigma causes them to stay silent about their condition.
    - This stigma is present even in DCs such as the USA, as revealed by a 2008 report by UNAIDS which showed that 27 percent of Americans would prefer not to work closely with a woman infected with HIV/AIDS.
- **High cost of antiretroviral therapy**
    - **Antiretroviral therapy** is the application of drugs in the treatment of HIV/AIDS.
    - While these drugs can control the disease, improve quality of life and reduce risk of transmission for its patients, it is very costly and unaffordable to many patients.
    - Although it is becoming cheaper, it may still be unaffordable due to other costs such as getting to the clinic or forgoing a day's earning to go to the clinic.
    - This is evident in how in Botswana, despite the 25 percent adult population having aids, waiting times of up to 4-12 hours disincentive many people from seeking and taking medication.
- **Population movement across borders and along transport routes for work**
    - Some populations are associated with the spread of HIV/AIDS due to their higher mobility.
    - For instance, the Kinshasa Highway which links Uganda and Kenya is known as the AIDS highway because of the high prevalence of HIV/AIDS among commercial sex workers along the road.
    - As such, truck drivers in these areas, who are already more prone to risk-taking behaviours due to spending long hours away from their families, may have greater risks of contracting HIV/AIDS.
    - The areas near the borders of some countries like South Africa and Zimbabwe experience high population movement and as such have a higher prevalence of AIDS.

What can individuals, communities, governments and organisations do to limit the spread of infectious diseases

Individuals

- Individuals can take action by being aware of what diseases are and the conditions that contribute to their spread.
    - For example, being aware of Hand, Foot and Mouth Disease outbreaks in a community can make individuals more mindful of their hygiene.
    - They may be more aware of the ways in which the disease can be transmitted.
    - This may cause them to undertake measures to curb its spread like washing their hands.
- Individuals can also exercise social responsibility by being constantly aware of unsanitary conditions or conditions which are conducive for the spread of diseases.
    - For instance, they could identify potential breeding spots for mosquitoes such as pools of stagnant water and remove them.
- Finally, individuals can also avoid from participating in risk-taking behaviours.
    - For instance, they could obtain timely and up-to-date vaccinations to stop them from contracting certain illnesses and hence granting herd immunity to the society.

Communities

Strategy	Description of strategy	Successes	Limitations
Community-Led Total Sanitation (Sierra Leone)	● CLTS is one of the methods Sierra Leone is using to rapidly increase sustainable sanitation worldwide. ● It raises awareness and offers affordable sanitation options to curb open defecation. ● The community often organises itself to go from house to house digging toilets for each household that needs assistance.	● Implementation of CLTS has helped 754 communities improve their sanitation, thereby reducing the incidences of diarrhoea.	● CLTS works best in rural areas where the population density is low. ● This is because urban areas lack the space for toilets.
Community-based mosquito control (Managua,	● The community residents conduct surveys to ascertain neighbourhood residents' understanding of dengue and their	● The dengue infection rate in children declined more than half from 2004 to	● The community needs cooperation with the government to deal with

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Nicaragua)	mosquito-control practices. ● They also identified mosquito breeding spots and examined households for breeding sites.	2007.	water and waste management issues. ● This issue arises when the community needs to access areas like sewers which are normally not accessible to residents.
Geographic Information System (GIS) to monitor dengue outbreaks (Vellore, India)	● GIS is used to identify the locations of infections and pinpoint the start of outbreaks of dengue fever. ● It is also used to locate potential mosquito breeding zones that may be targeted for control	● Since there is no vaccine for dengue fever, identifying and reducing the breeding sites of mosquitoes is the only way of effectively reducing long-term dengue exposure.	● In some areas, street addresses are not available for mapping. ● Additionally, pinpointing a disease and the potential environmental risk factor is hard.

Governments

Precautionary strategies	Description of strategy	Successes	Limitations
Providing vaccinations against H1N1 (Singapore)	● Vaccinations help a body increase its immunity to certain diseases. ● For instance, in 2009, SIngapore began providing vaccinations against H1N1 for its population before the virus emerged in its country. ● To ensure adequate supply, more than 400 family clinics worldwide were stocked with the vaccines.	● Despite the high severity of H1N1 infections in other countries, most cases of H1N1 infection in Singapore were mild, with only up to 18 deaths reported in 2009.	● Vaccinations take up to two weeks to take effect. ● Individuals who also have compromised immune systems may not be able to safely receive these vaccinations, exposing them to greater danger.
Thermal fogging (Singapore)	● **Thermal fogging** involves the distribution of insecticides by using fog produced by heat. ● For example, the National Environment Agency of Singapore frequently conducts thermal fogging in housing estates to ensure that pests such as mosquitoes do not breed there.	● Thermal fogging is able to kill adult mosquitoes found outdoors, curbing the spread of mosquito-borne illnesses.	● Thermal fogging is expensive and must be carried out regularly to be effective, as such it is only an option for rich and urban cities, limiting its effectiveness.

Mitigation strategies	Description of strategy	Successes	Limitations
Control measures during the SARS outbreak in 2003 (Singapore)	● Singapore implemented various comprehensive measures to mitigate the impact of the SARS outbreak,. ● It designated a dedicated hospital for the isolation of infected people. ● It created a set of stringent procedures regarding the treatment of such individuals infected with the disease so as to limit the potential spread to health workers. ● It invoked the Infectious Diseases Act, allowing it conduct these activities.	● Government intervention was highly instrumental in curbing the spread of SARS, which would otherwise have easily spread through the urban and dense environment in Singapore. ● Singapore was praised for its handling of the outbreak and open reporting of the cases which allowed it a lowered fatality rate compared to other countries like China or Hong Kong.	● Some patients displayed symptoms not commonly associated with SARS ● Some patients also did not show any signs of SARS until much later. ● As such, containment of potential patient was harder as they may have already come into contact with other people and unknowingly infected them.
National Environment Agency's approach to vector control (SIngapore)	● The NEA has various measures to controlling diseases by curbing the proliferation of the vectors through which they spread. ● For example, it's "Do the Mozzie Wipeout" campaign is one example. ○ The campaign included community outreach and raising awareness on prevention methods against dengue fever such as the capping of the bamboo pole holders.	● The number of cases with more serious dengue fever has decreased in recent years since the 2005 dengue fever outbreak.	● Most people are unaware or complacent about Aedes mosquitoes breeding at their place of residence. ● Such measures are only effective with the cooperation of homeowners and as such this poses difficulties in the execution of the policy.

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International organisations

Strategy	Description of strategy	Successes	Limitations
Getting to Zero (2011-2015) UNAIDS strategy	● UNAIDS pools together the resources of the UNAIDS Secretariat and 10 UN system organisations for coordinated and accountable efforts to unite the world against AIDS. ● This allows for comprehensive action with which to tackle the global scale of AIDS.	● UNAIDS' support helped ensure the successful agreement between the Government of Kenya and the GLobal Fund for the implementation of its Round 10 grants of US$483 million, thereby giving the Kenyan government much needed money with which to tackle AIDS.	● However, despite widespread commitment to help curb the spread of HIV/AIDS, the cooperation and execution of strategies from governments prove to be challenging, limiting its effectiveness ● For instance, social stigma, discrimination and violence against women and girls or other HIV-related abuses of human rights continue to remain widespread and obstruct effective HIV responses.

Non-governmental organisations

Strategy	Description of strategy	Successes	Limitations
Measles & Rubella Initiative (MRI) (since 2011)	● The M&R is a global partnership committed to ensuring no child dies from measles or is born with congenital rubella syndrome. ● They achieve this by providing vaccination with two doses of measles and rubella containing vaccines through routine immunisation and campaigns. ● THey also monitor the diseases and evaluate results to ensure progress.	● There are measurable goals for the whole alliance. ● Organisations that work with IHAA will use this strategy alongside their own national plans, to shape their future strategies to help combat the global epidemic.	● Many LDCS have limited funds to help combat these illnesses and as such cannot fully cooperate with the initiative. ● For example in 2008 and 2009 there was an outbreak of the disease and as a result of the limited funds, an increase in deaths caused by the disease.

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