



Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

INTRODUCTION TO PUBLIC HEALTH

Infectious disease

LCHS7000

Dr Aishat

Trawsnewid Addysg; Trawsnewid Bywydau
Transforming Education; Transforming Lives



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Learning outcomes

On successful completion of this module, you should be able to:

- Demonstrate a thorough understanding and knowledge of the various approaches to social epidemiology interventions and ways for monitoring epidemiological information of a population during the life course.
- Apply knowledge on the link between social environment and health for the development of needs assessments, considering the social determinants of health and impact of social factors on individual and public health.
- Communicate analysis and evaluation of outcomes of epidemiological studies and how these outcomes relate to social and cultural contexts, public health interventions and policies.
- Demonstrate knowledge and understanding of the various forms of health inequalities in the UK and globally, and critically compare and evaluate public health policies and interventions.

Module Summary

- The module aims overall to introduce students to the various approaches to interventions and ways for monitoring public health information related to health inequalities, social determinants of health, socio-economic and demographic characteristics of a population.
- To familiarise students with the core concepts of social epidemiology and public health development and to acquire the skills necessary to describe and interpret epidemiological information.

Lesson objectives

To understand

- The term infectious disease
- The infectious disease agents
- Some examples of infectious diseases
- How infection are transmitted/Mode of transmission of infectious diseases
- How can infectious diseases be prevented?

WHAT ARE INFECTIOUS DISEASES?



Infectious Diseases

- Infectious disease also called **communicable diseases** can be defined as *"an illness due to a harmful organism (pathogens) or its toxic product, which arises through transmission from an infected person, an infected animal, or a contaminated inanimate object to a susceptible host"*.

(van Seventer and Hochberg, 2017)

Infectious Diseases

- **Infectious diseases** are “diseases caused by an agent, often a type of *pathogenic microorganism*, that impairs a person’s health”.

(Feigin *et al.*, 2020; WHO, 2022)

Infectious Diseases

- Infectious diseases are responsible for an immense global burden of disease that impacts public health systems and economies worldwide, disproportionately affecting the vulnerable populations.
- In many cases, infectious disease can be spread from person to person, either
 - **Directly** (e.g., via skin contact) or
 - **Indirectly** (e.g., via contaminated food or water).

(van Seventer and Hochberg, 2017)

The Global Burden of Disease

GBD is a ***systematic, scientific*** effort to quantify the ***comparative*** magnitude of ***health loss*** due to diseases, injuries, and risk factors by age, sex, and geographies for specific points in time.

WHAT ARE INFECTIOUS DISEASES AGENTS?



Infectious Disease Agents

- The agents of infection can be divided into different groups on the basis of their size, biochemical characteristics, or manner in which they interact with the human host.
- This infectious disease agent invade the body from the outside.
- Infectious agents are present all around us, and they come in different shapes and sizes.

(van Seventer and Hochberg, 2017)

Infectious Disease Agents

Infectious diseases can be categorised based on some common characteristics.

- Some are *single-celled* animals.
- Others are *multicellular organisms* such as worms are known to cause diseases.

(van Seventer and Hochberg, 2017)

Infectious disease agents

The groups of organisms that cause infectious diseases called *infectious disease agents* are categorised as

- **Fungi,**
- **Bacteria,**
- **Viruses.**
- **living parasites (helminths or protozoa),**
- **Prion**

(van Seventer and Hochberg, 2017)

Infectious disease

- Infected people develop symptoms when their cells are damaged or destroyed by the invading organism and as their immune system responds to the infection.
- Under normal circumstances, when the immune system of the host is fully functional, disease symptoms may not develop.
- If the host immune system is compromised, or the infectious agent overwhelms the immune system, it results into an infectious disease.

(Kotra, 2007)

Viral infections

- Viruses are single-celled organism inside a protective shell (capsid).
- Viruses are much smaller than human cells and have no way to reproduce on their own.
- They get inside human cells and use the cells' machinery to make copies of themselves.
- There are millions of viruses existing in the world.
- They are the main cause of viral infections such as **common cold, and influenza.**

(Cleveland, 2022)

Bacterial infections

- Bacteria are single-celled organisms with their instructions written on a small piece of DNA.
- Bacteria are all around us, including inside of our body and on our skin.
- Many bacteria are harmless or even helpful, but certain bacteria release toxins that can make human sick.

(Cleveland, 2022)

Fungal infections

- Like bacteria, there are many different fungi.
- They live on and in our body.
- When the fungi get overgrown or when harmful fungi get into our body through our mouth, our nose or a cut in your skin, one can get sick.

(Cleveland, 2022)

Parasitic infections

- Parasites use the bodies of other organisms to live and reproduce.
- Parasites include worms (helminths) and some single-celled organisms (protozoa).

(Cleveland, 2022)

Prion diseases

- Prions are faulty proteins that cause other proteins in the body, usually in the brain, to become faulty as well.
- Prion is a protein without a genetic material.
- The body is unable to use these proteins or get rid of them, so they build up and make one sick.
- Prions are an extremely rare cause of infectious diseases.
- Prions are infectious proteins that are transmitted either by inheritance or by eating/receiving contaminated meat or other biological product.
- Prions are responsible for slow-progressing neurological disorders such as Creutzfeldt-Jakob Disease and Transmissible spongiform encephalopathies (TSEs/prion diseases).

(Kotra, 2007)

WHAT ARE THE COMMON EXAMPLES OF INFECTIOUS DISEASES?



Infectious diseases

- Diarrheal diseases,
- HIV/AIDS,
- Tuberculosis (TB)
- Ebola virus
- Hepatitis B
- Coronavirus

(WHO, 2022)

Common Infectious diseases

- Chickenpox.
- Common cold.
- Diphtheria.
- E. coli.
- HIV/AIDS.
- Influenza (flu)
-

(WHO, 2022)

Common Viral Infectious Diseases

- Common cold.
- The flu (influenza).
- COVID-19.
- Stomach flu (gastroenteritis).
- Hepatitis.
- Respiratory syncytial virus (RSV).

Common Bacterial infectious diseases

- Strep throat.
- Salmonella.
- Tuberculosis.
- Whooping cough (pertussis).
- Chlamydia, gonorrhea and other sexually transmitted diseases (STDs).
- Urinary tract infections (UTIs).
- E. coli.
- Clostridioides difficile (C. diff).

Common Fungal infectious diseases

- [Ringworm](#) (like [athlete's foot](#)).
- Fungal nail infections.
- [Vaginal candidiasis](#) (vaginal yeast infection).
- [Thrush](#).

Common infectious diseases caused by parasites

- [Giardiasis.](#)
- Toxoplasmosis.
- [Hookworms.](#)
- [Pinworms.](#)

HOW ARE INFECTIOUS DISEASES TRANSMITTED?



Infectious Diseases Transmission

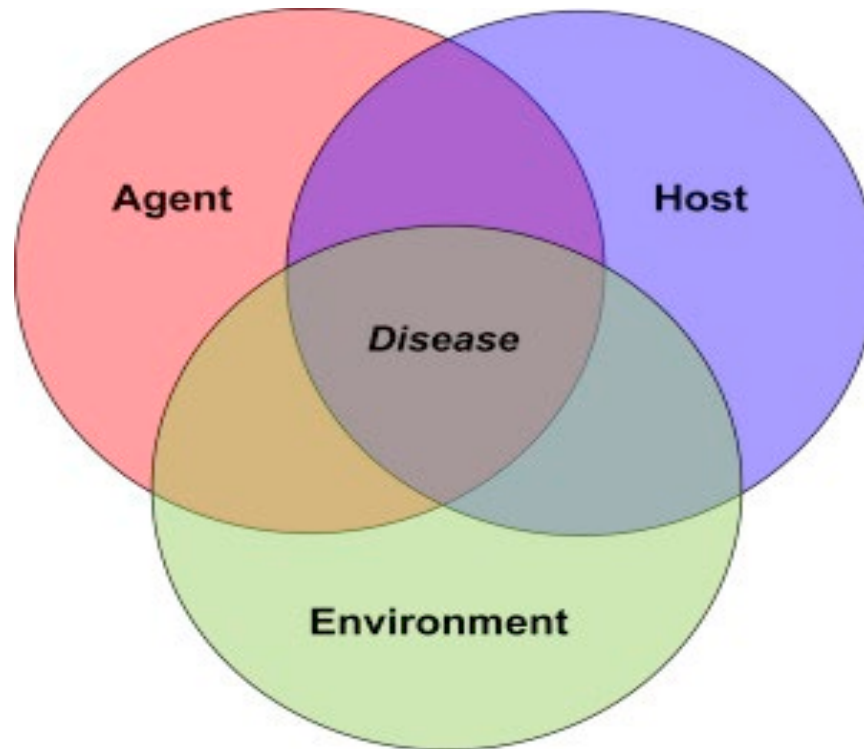
A classic model of infectious disease causation, the epidemiological triad (triangle) (Snieszko, 1974), predicts that an infectious disease results from a combination of

- agent (pathogen),
- host, and
- environmental factors

(van Seventer and Hochberg, 2017)

Infectious Diseases Transmission

The epidemiological triad model of infectious disease causation



(Snieszko, 1974)

Epidemiological triad model of infectious disease causation

- “The triad consists of an agent (pathogen), a susceptible host, and an environment (physical, social, behavioural, cultural, political, and economic factors) that brings the agent and host together, causing infection and disease to occur in the host”

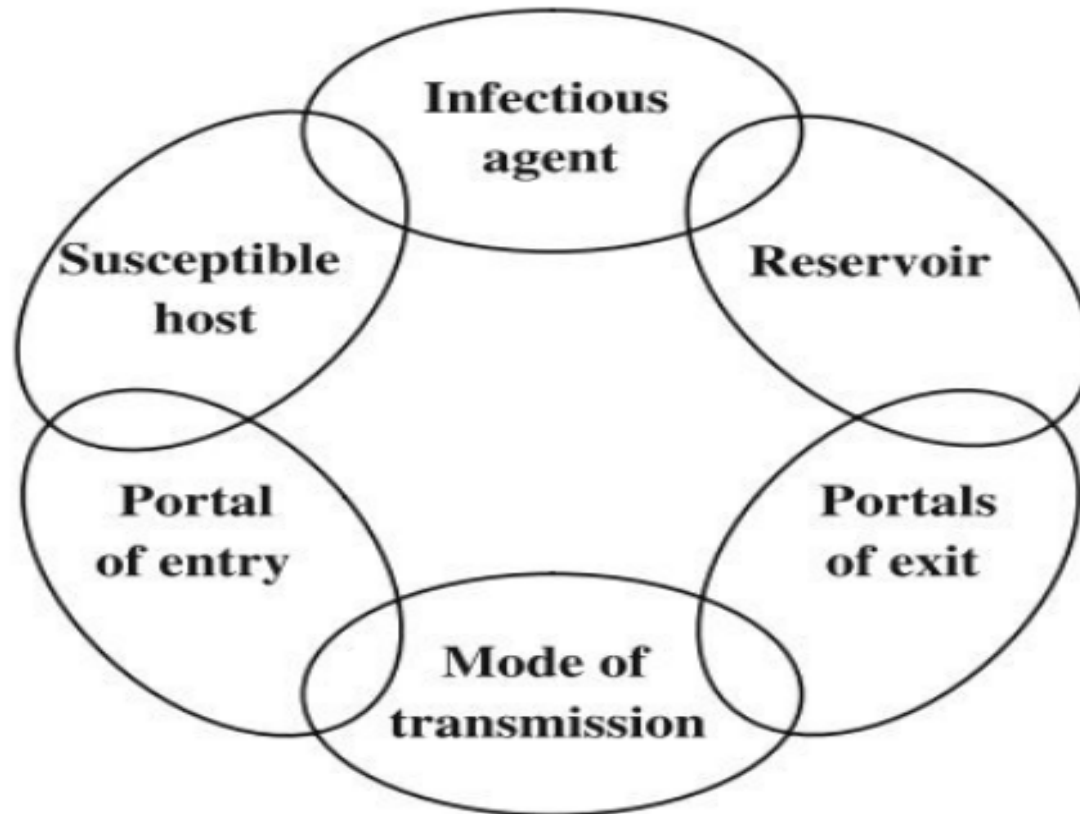
(van Seventer and Hochberg, 2017).

Transmission of infectious diseases

- Environmental factors determine if a host will become exposed to one of these agents, and subsequent interactions between the agent and host will determine the *exposure* outcome.
- Agent and host interactions occur in a cascade of stages that include infection, disease, and recovery or death.
- In this model, disease results from the interaction between the agent and the susceptible host in an environment that supports transmission of the agent from a source to that host.

(van Seventer and Hochberg, 2017)

The chain of infection



Page RM, Cole GE, and Timmreck TC (1995) Basic Epidemiological Methods and Biostatistics. A Practical Guidebook. Boston London Singapore: Jones and Bartlett Publishers

Reservoir of infection

- Reservoir of infection: **Any person, animal, plant, soil or substance in which an infectious agent normally lives and multiplies.**
- The reservoir typically harbours the infectious agent without injury to itself and serves as a source from which other individuals can be infected.

Portal of entry

- A portal of entry is the site through which micro-organisms enter the susceptible host and cause disease/infection. Infectious agents enter the body through various portals, including **the mucous membranes, the skin, the respiratory and the gastrointestinal tracts.**

Portal of exit

- Portal of exit is **the way the infectious agent leaves the reservoir** (through open wounds, aerosols, and splatter of body fluids including coughing, sneezing, and saliva)
- Mode of transmission is the way the infectious agent can be passed on (through direct or indirect contact, ingestion, or inhalation)

Susceptible host

- This is the organism (e.g., You or your resident) that will feel the effects of the infectious disease that has travelled through the chain of infection.

HOW DO INFECTIOUS DISEASES SPREAD?



Spread of infectious diseases

- Infectious diseases can spread through so many ways depending on the type.
- Pathogens can enter the body through the common places like the ***mouth, nose*** and ***cuts on the skin***.

Spread of infectious diseases

Diseases can spread through several means which include

- From person to person when you cough or sneeze. In some cases, droplets from coughing or sneezing can stay in the air.
- From close contact with another person, like kissing or oral, anal or vaginal sex.
- By sharing utensils or cups with other people.
- On surfaces like doorknobs, phones and countertops.

Spread of infectious diseases

- Through contact with faeces from a person or animal with an infectious disease.
- Through bug (mosquito or tick) or animal bites.
- From contaminated or improperly prepared food or water.
- From working with contaminated soil or sand (like gardening).
- From a pregnant person to their unborn baby.
- From blood transfusions, organ/tissue transplants or other medical procedures.

Activity

- Epidemiologists use a model for studying infectious disease and its spread that involves the microbe that causes the disease, the organism that harbors the disease, and the external factors that cause or allow disease transmission. This is also known as
 - A. host, vector, and transmission.
 - B. transmission, host, and environment.
 - C. host, agent, and environment.
 - D. organism, transmission, and environment.

HOW CAN INFECTIOUS DISEASES BE PREVENTED?



Prevention of infectious diseases

- Vaccination
- Use of antibiotics.
- Maintaining proper hygiene.
- Avoid travelling or going to work when you fall ill.
- Avoid sharing used personal belongings such as a razor, glass, toothbrush, comb, etc.
- Keeping your kitchen clean by washing all the used utensils, cooking area before and after preparing each food.
- Extra care needs to be taken while going to hospitals such as wearing a mask, using sanitizer, etc.

WHO IS MOST AT RISK FOR GETTING INFECTIOUS DISEASES?



People Most at Higher Risk of ID

- Anybody can get an infectious disease,
- But one may be at a higher risk if the *immune system* is weakened or
- If the person travel to areas with certain highly transmissible diseases.

People Most at Higher Risk of ID

People at higher risk of getting infectious disease include:

- Those with suppressed or compromised immune systems, such as those receiving cancer treatments, living with HIV or on certain medicines.
- Young children, pregnant people and adults over 60.
- Those who are unvaccinated against common infectious diseases.
- Healthcare workers.
- People traveling to areas where they may be exposed to mosquitoes that carry pathogens such as [malaria](#), [dengue virus](#) and [Zika viruses](#).



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What are the symptoms of infectious diseases?

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Symptoms of infectious diseases

- Symptoms of infectious diseases depend on the type of illness.
- Fungal infections usually cause localised symptoms, like ***rash and itching***.
- Viral and bacterial infections can have symptoms in many areas of the body.
- This include

Symptoms of infectious diseases

- Fever
- Chills
- Congestion
- Cough
- Fatigue
- Muscle aches and headache
- Gastrointestinal symptoms (diarrohea, nausea, vomiting)
- Prion diseases damage the brain, memory loss, and cognitive difficulties.

Break the Chain of Infection

BREAK THE CHAIN!

- ✓ Immunizations
- ✓ Treatment of underlying disease
- ✓ Health insurance
- ✓ Patient education

BREAK THE CHAIN!

- ✓ Diagnosis and treatment
- ✓ Antimicrobial stewardship

BREAK THE CHAIN!

- ✓ Cleaning, disinfection, sterilization
- ✓ Infection prevention policies
- ✓ Pest control



APIC
Association for Professionals in
Infection Control and Epidemiology

Learn how healthcare professionals can break the chain of infection:
www.apic.org/professionals

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