

Introduction to NCD Epidemiology

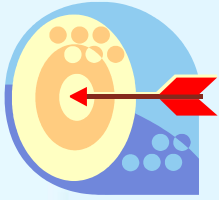
Presenter's Name

Presenter's Title

Title of Event

Date of Event





Learning Objective

At the end of the training, participants will be able to describe how to use epidemiology to address a public health problem.



Lesson Overview

- Basic terminology
- Comparison of non-communicable diseases and communicable diseases
- Definition and approaches of epidemiology
- Public health management cycle
- Core functions of epidemiology

Non-Communicable Disease (NCD): Definition

Noncommunicable diseases (NCDs), also known as chronic diseases, are not passed from person to person. They are of long duration and generally slow progression.

(WHO, 2011)

Non-Communicable Disease (NCD): Definition (*cont.*)

- Chronic conditions are characterized by the following:
 - do not result from an (acute) infectious process
 - are “not communicable”
 - cause premature morbidity, dysfunction, and reduced quality of life
 - usually develop and progress over long periods
 - often initially insidious
 - once manifested there is usually a protracted period of impaired health

Non-Communicable Disease (NCD): Extended Definition

In some definitions, NCDs also include:

- chronic mental illness
- injuries, which have an acute onset, but may be followed by prolonged convalescence and impaired function

Types of NCDs

- Cardiovascular disease (Coronary heart disease, Stroke)
- Cancer
- Chronic lung disease
- Diabetes
- Chronic neurologic disorders (Alzheimer's, dementias)
- Arthritis/Musculoskeletal diseases

http://www.who.int/gho/ncd/mortality_morbidity/en/index.html

Leading Causes of Attributable Global Mortality and Burden of Disease, 2004

Attributable Mortality

	%
1. High blood pressure	12.8
2. Tobacco use	8.7
3. High blood glucose	5.8
4. Physical inactivity	5.5
5. Overweight and obesity	4.8
6. High cholesterol	4.5
7. Unsafe sex	4.0
8. Alcohol use	3.8
9. Childhood underweight	3.8
10. Indoor smoke from solid fuels	3.3

59 million total global deaths in 2004

Attributable DALYs

	%
1. Childhood underweight	7.8
2. High blood pressure	7.5
3. Unsafe sex	6.6
4. Unsafe water, sanitation, hygiene	6.1
5. High blood glucose	4.9
6. Indoor smoke from solid fuels	4.8
7. Tobacco use	3.9
8. Physical inactivity	3.8
9. Suboptimal breastfeeding	3.7
10. High cholesterol	3.3

1.5 billion total global DALYs in 2004

Characteristics of NCDs

- Complex etiology (causes)
- Multiple risk factors
- Long latency period
- Non-contagious origin (non-communicable)
- Prolonged course of illness
- Functional impairment or disability
- Incurability
- Insidious onset

Risk Factor

“An aspect of personal behavior or lifestyle, an environmental exposure, or a hereditary characteristic that is associated with an increase in the occurrence of a particular disease, injury, or other health condition.”

(Principles of Epidemiology, CDC, 2006)

Modifiable Risk Factor

A risk factor that **can** be reduced or controlled by intervention, thereby reducing the probability of disease.

The WHO has prioritized the following four:

- Physical inactivity
- Tobacco use
- Alcohol use
- Unhealthy diets

Non-Modifiable Risk Factor

A risk factor that **cannot** be reduced or controlled by intervention, for example:

- Age
- Gender
- Race
- Family history (genetics)

Common Risk Factors

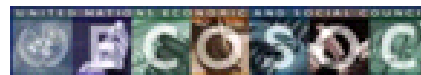
Noncommunicable Diseases

4 Diseases, 4 Modifiable Shared Risk Factors

	Tobacco Use	Unhealthy diets	Physical Inactivity	Harmful Use of Alcohol
Cardio-vascular				
Diabetes				
Cancer				
Chronic Respiratory				



Noncommunicable Diseases
World Health Organization
ECOSOC High-level Segment



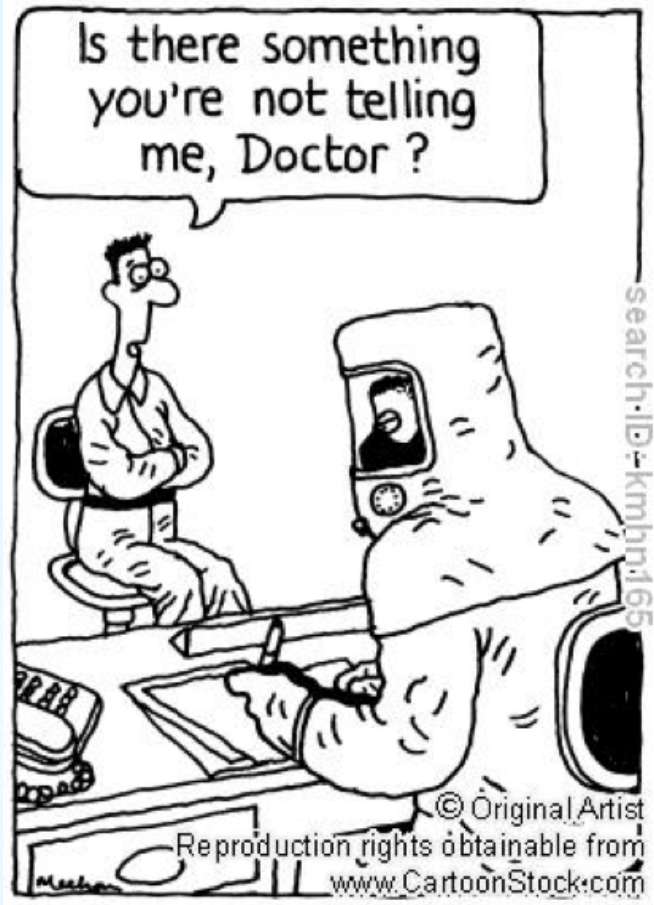
World Health
Organization

COMPARISON OF NCDS AND COMMUNICABLE DISEASES

Communicable Disease: Definition

- An infectious disease transmissible (as from person to person) by direct contact with an affected individual or the individual's discharges or by indirect means (as by a vector)
- Examples:
 - Measles
 - Dengue
 - Typhoid

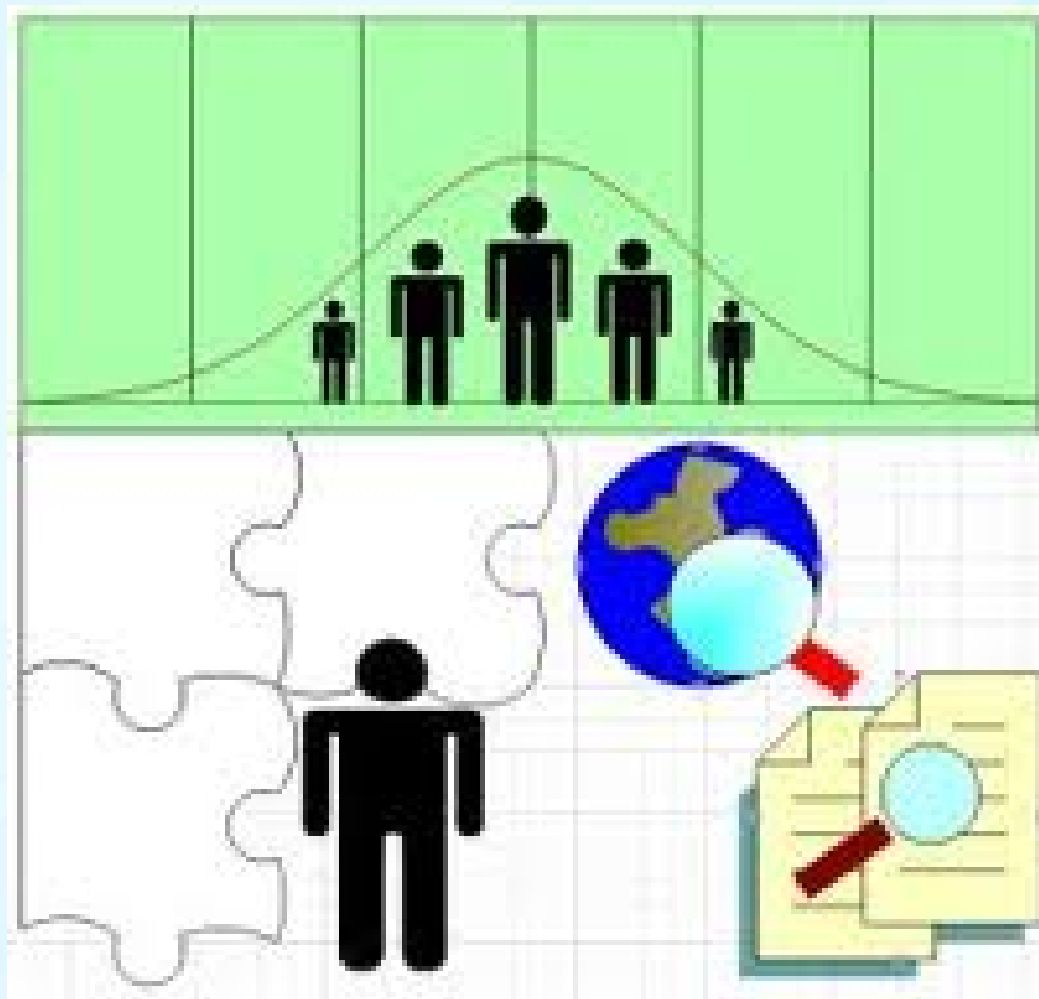
Non-Communicable Diseases vs. Communicable Diseases



- How do they differ regarding:
 - Infectiousness?
 - Risk of Disease?

DEFINITIONS AND APPROACHES OF EPIDEMIOLOGY

What is Epidemiology?



Epidemiology: CDC Definition

“The study of the distribution and determinants of health-related states in specified populations, and the application of this study to control health problems.”

distribution

determinants

health-related states

specified population

application

(Last, 2001)

Epidemiology: CDC Definition Distribution

Distribution: Occurrence of cases by **time, place,**
and **person**

Example: According to a study of deaths in **Country X** in **2008**, **1,034** cervical cancer deaths occurred among women **between the ages of 45-54.**

Epidemiology: CDC Definition Determinants

Determinants: All the causes and risk factors for the occurrence of a disease, including physical, biological, social, cultural, and behavioral factors

Example: Smoking was a risk factor or determinant for the greater number of cancer deaths among women ages 45-54 in Country X.

Epidemiology: CDC Definition Health-Related States

Health-related states

- Diagnosis of a specific disease or cause of death
- Health-related behavior (e.g., smoking, taking prenatal vitamins)
- Example: According to the 2008 study in Country X, 1,034 **cervical cancer deaths** occurred among women between the ages of 45-54.

Epidemiology: CDC Definition

Specified Population

Specified Population: A measurable group, defined by location, time, demographics, and other characteristics

Example: Women aged 45-54 living in a rural village in Country X from 2001 through 2009.

Epidemiology: CDC Definition

Application

Application

- Analysis, conclusion, distribution, and timely use of epidemiologic information to protect the health of the population
- Example: As a result of the Country X Study, free cervical cancer screening programs were implemented. They targeted women living in remote areas in hopes of finding women with cervical cancer at an earlier stage of cancer in order to prevent death.

Purpose of Epidemiology

- To measure frequency of disease
 - Quantify disease
- To assess distribution of disease
 - Who is getting disease?
 - Where is disease occurring?
 - When is disease occurring?
- To form hypotheses about causes and preventive factors
- To identify determinants of disease
 - Hypotheses are tested using epidemiologic studies

Epidemiologic Assumptions

- Diseases and other health-related events do not occur at random.
- Diseases and other health-related events usually have causal and preventive factors that can be found.

Approaches in Medicine vs. Epidemiology

Approach/ Consideration	Clinical Medicine	Epidemiology
Focus	Individuals	
Main Goal	Diagnosis and treatment	
Questions	What is wrong with this patient?	
Treatment	What treatment is appropriate for this patient?	
Who is involved?	Physician, laboratorian, nurse, and others	

Approaches in Medicine vs. Epidemiology: Focus

Approach/ Consideration	Clinical Medicine	Epidemiology
Focus	Individuals	Populations
Main Goal	Diagnosis and treatment	
Questions	What is wrong with this patient?	
Treatment	What treatment is appropriate?	
Who is involved?	Physician, laboratorian, nurse, and others	

Approaches in Medicine vs. Epidemiology: Main Goal

Approach/ Consideration	Clinical Medicine	Epidemiology
Focus	Individuals	Populations
Main Goal	Diagnosis and treatment	Prevention and control
Questions	What is wrong with this patient?	
Treatment	What treatment is appropriate?	
Who is involved?	Physician, laboratorian, nurse, and others	

Approaches in Medicine vs. Epidemiology: Questions

Approach/ Consideration	Clinical Medicine	Epidemiology
Focus	Individuals	Populations
Main Goal	Diagnosis and treatment	Prevention and control
Questions	What is wrong with this patient?	What are the leading causes of death or disability in this population? Risk factors?
Treatment	What treatment is appropriate?	
Who is involved?	Physician, laboratorian, nurse, and others	

Approaches in Medicine vs. Epidemiology: Treatment

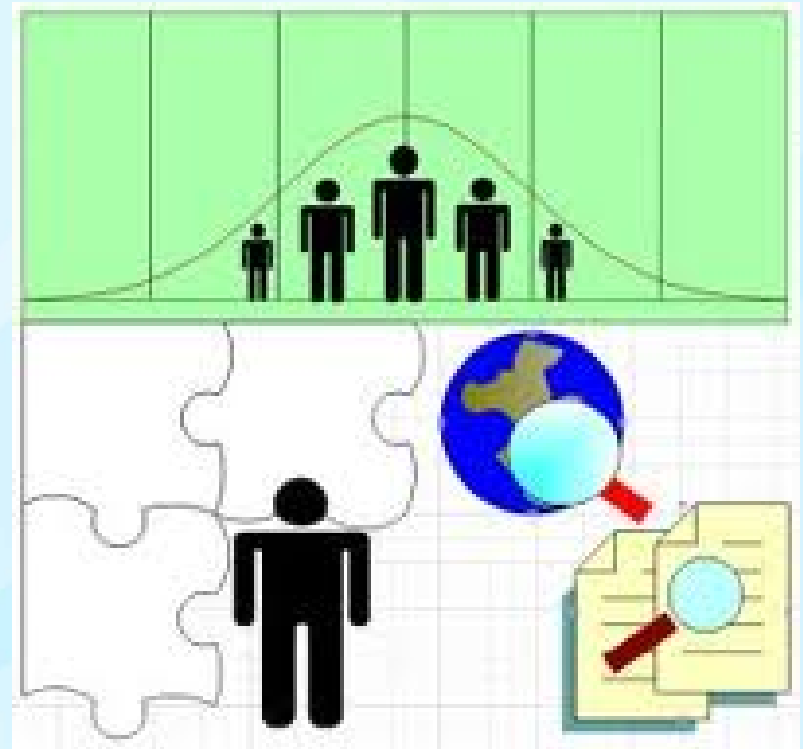
Approach/ Consideration	Clinical Medicine	Epidemiology
Focus	Individuals	Populations
Main Goal	Diagnosis and treatment	Prevention and control
Questions	What is wrong with this patient?	What are the leading causes of death or disability in this population? Risk factors?
Treatment	What treatment is appropriate?	What can be done to reduce or prevent disease or risk factors?
Who is involved?	Physician, laboratorian, nurse, and others	

Approaches in Medicine vs. Epidemiology: Who is Involved?

Approach/ Consideration	Clinical Medicine	Epidemiology
Focus	Individuals	Populations
Main Goal	Diagnosis and treatment	Prevention and control
Questions	What is wrong with this patient?	What are the leading causes of death or disability in this population? Risk factors?
Treatment	What treatment is appropriate?	What can be done to reduce or prevent disease or risk factors?
Who is involved?	Physician, laboratorian, nurse, and others	Epidemiologists, statisticians, and others from diverse disciplines

Approaches to Epidemiology

1. **Descriptive Epidemiology**
2. **Analytic Epidemiology**



Descriptive Epidemiology

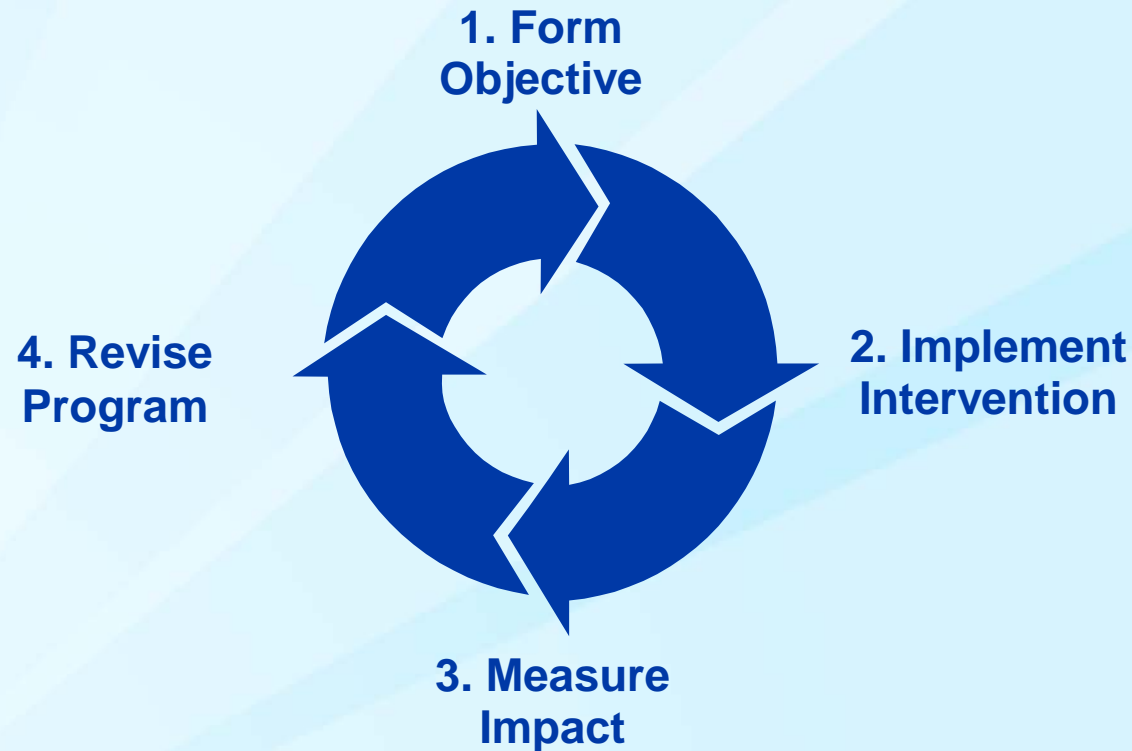
- Studies the *pattern* of health events and their *frequency* in populations in terms of:
 - Person
 - Place
 - Time
- Purpose:
 - To identify problems for further study
 - To plan, provide, and evaluate health services

Analytic Epidemiology

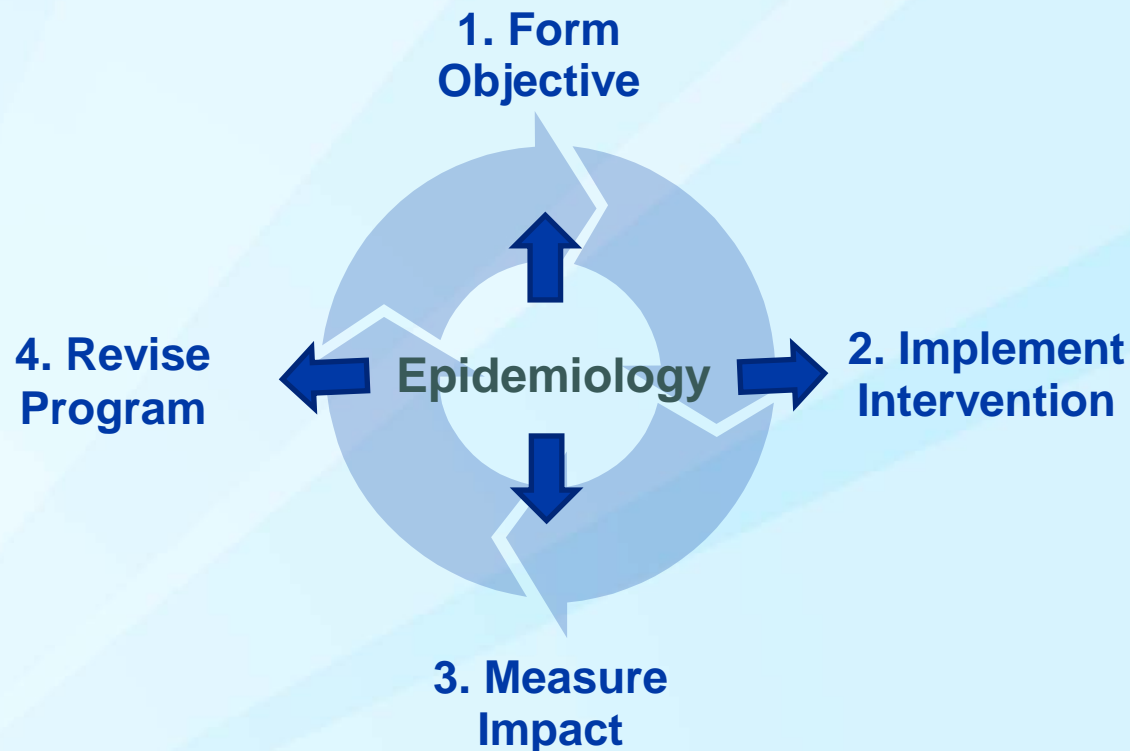
- Studies the association between *risk factors* and disease
- Purpose:
 - To determine *why* disease rates are high (or low) in a particular group

PUBLIC HEALTH MANAGEMENT CYCLE

Public Health Management Cycle



Epidemiology in the Public Health Management Cycle



FUNCTIONS OF EPIDEMIOLOGY

Functions of Epidemiology

Public Health Surveillance

Investigation

Data Analysis

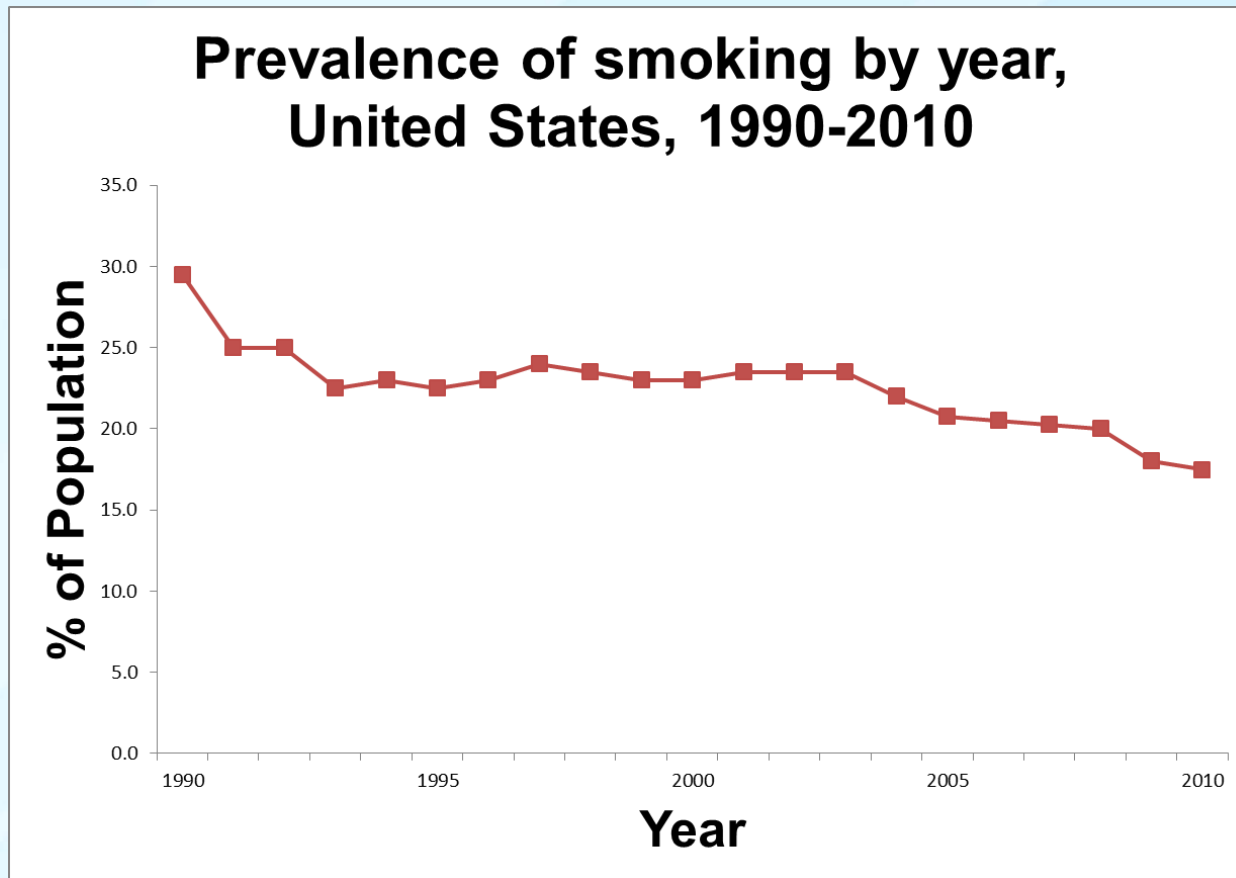
Intervention

Evaluation

Communication

Management and Teamwork

Public Health Surveillance



Public Health Surveillance: CDC Definition

Ongoing, systematic collection, analysis, and interpretation of health-related data essential to the planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those responsible for prevention and control.

Investigation



Data Analysis

- Describe the distribution of a health condition or event in a community
- Create a hypothesis about what causes or protects against disease or injury
- Learn about factors thought to be associated with disease
- Assess associations between risk factors and disease, using statistical methods
- Interpret results and disseminate information

Intervention

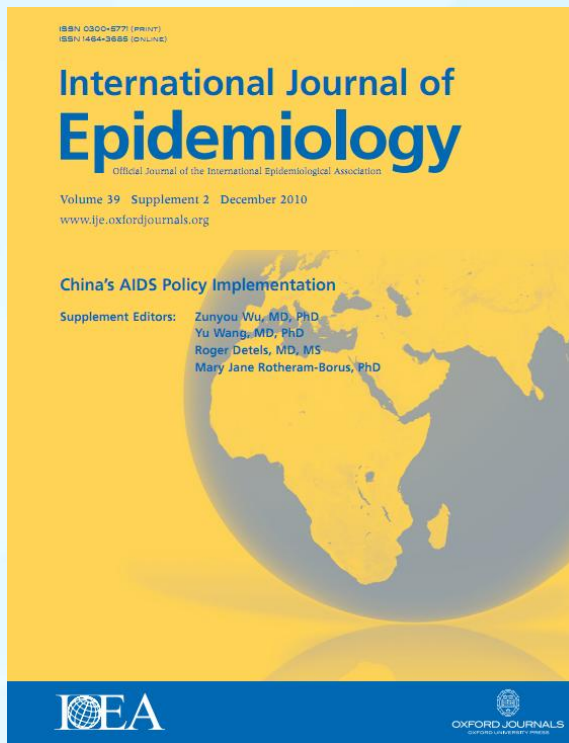


Evaluation

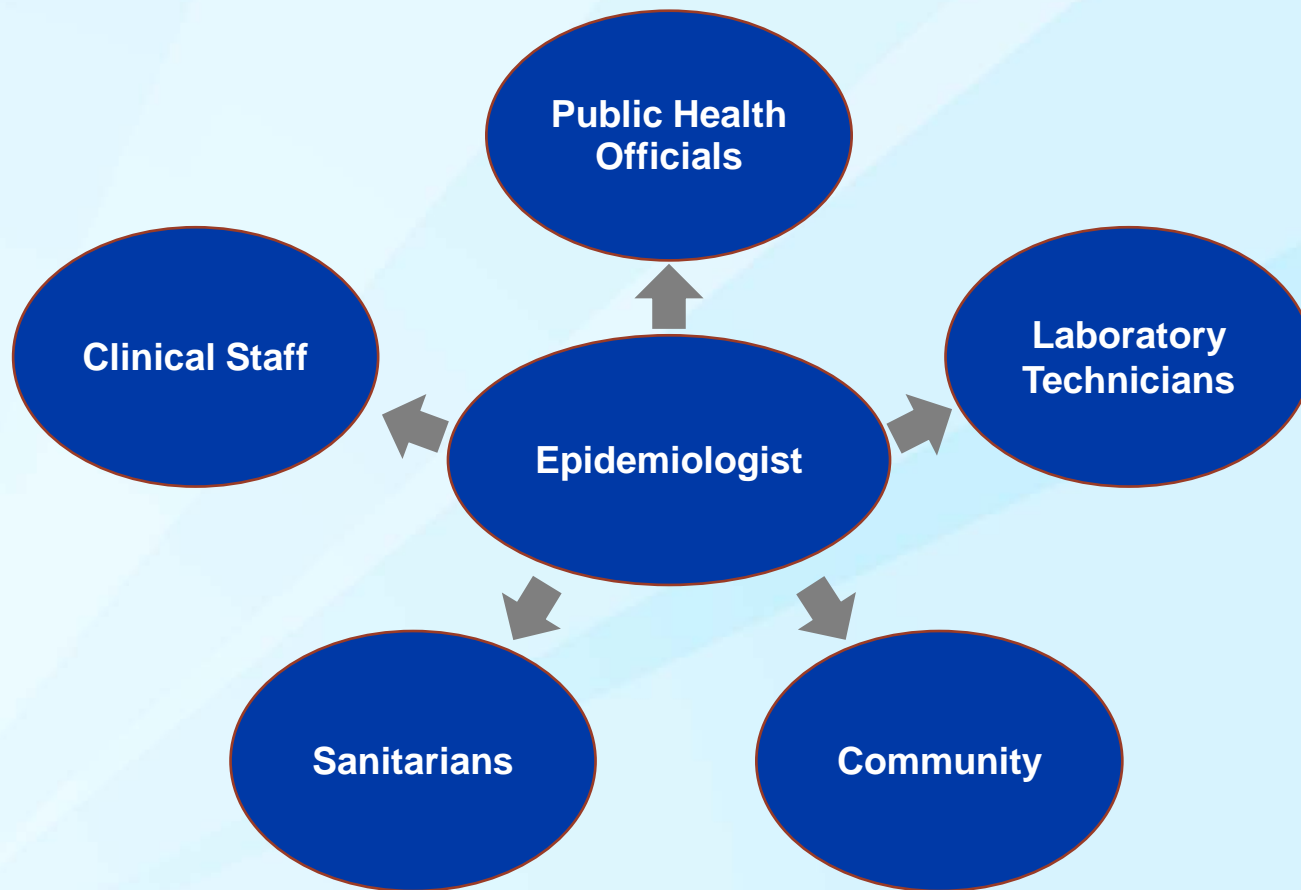
Process

Outcome

Communication



Management and Teamwork



Review: Functions of Epidemiology

Public Health Surveillance

Investigation

Data Analysis

Intervention

Evaluation

Communication

Management and Teamwork



REVIEW



Review: Questions 1-2

1. Name at least four types of NCDs.
2. Name at least four characteristics of NCDs



Review: Answers 1-2

1. Name at least four types of NCDs.
cardiovascular disease, cancer, diabetes, chronic lung disease, chronic neurologic disorders, arthritis, musculoskeletal disorders
2. Name at least four characteristics of NCDs
complex etiology, multiple risk factors, long latency period, non-contagious origin, prolonged course of illness, functional impairment or disability, incurability



Review: Questions 3-4

3. What are at least three examples of modifiable risk factors?
4. What are at least three examples of non-modifiable risk factors?



Review: Answers 3-4

3. What are at least three examples of modifiable risk factors? *alcohol use, smoking, poor diet, physical inactivity, high blood pressure, high blood glucose*
4. What are at least three examples of non-modifiable risk factors? *age, race, gender, family history*



Review: Question 5

5. How do NCDs and communicable diseases differ?



Review: Answer 5

5. How do NCDs and communicable diseases differ?
- a. *Communicable disease occurrence depends upon the presence / absence of disease already occurring in that population; For NCDs, all disease events are generally independent of one another.*
 - b. *For NCDs, the risk of disease largely depends on population characteristics and other health behaviors; Communicable disease can also be influenced by these characteristics, but they have properties that contribute to whether an exposed individual will become infected.*



Review: Questions 6-8

6. What questions does epidemiology answer?
7. What are two approaches of epidemiology?
8. What are the four main roles of epidemiology in the Public Health Management Cycle?



Review: Answers 6-8

6. What questions does epidemiology answer?
Who? What? When? Where? Why? How?
7. What are two approaches of epidemiology?
descriptive and analytic epidemiology
8. What are the four main roles of epidemiology in the Public Health Management Cycle?
form objectives, implement interventions, measure impact, revise programs



Review: Question 9

9. What are the functions of epidemiology?



Review: Answer 9

9. What are the functions of epidemiology?
 1. *Public health surveillance*
 2. *Investigation*
 3. *Data analysis*
 4. *Intervention*
 5. *Evaluation*
 6. *Communication*
 7. *Management and teamwork*

Half-Truths and Misunderstandings

HALF-TRUTH

Everyone
has to die of
something

Half-Truths and Misunderstandings: Reality



Name	Jonas Justo Kassa
Age	65
Country	United Republic of Tanzania
Diagnosis	Diabetes

Reality: death is inevitable but it does not need to be slow, painful, or premature



Skill Assessment

1. You will work in small groups to complete the assessment.
2. You will discuss a local health problem and describe which **functions of epidemiology** to use to address the problem.
3. Assign a member of your group to record your responses.
4. Spend 20 minutes completing the assessment.
5. Be prepared to share your work with the class.



Centers for Disease Control and Prevention (CDC). Introduction to NCD Epidemiology. Atlanta, Georgia: Centers for Disease Control and Prevention (CDC); 2013.

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Visit: www.cdc.gov | Contact CDC at: 1-800-CDC-INFO or www.cdc.gov/info

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

