

Introduction to Population Health

Eric Delmelle - August 26, 28 2025

SYLLABUS!!!

Objectives

- Define health, public health, population health, and its scope.
- Identify key determinants of health.
- Explore foundational concepts and measures in population health.
- Highlight the importance of equity and data in improving population health.

Defining Health



from ChatGPT with the prompt 'draw someone who is (not) in good health'

Defining Health

- Most of us know when we are **healthy** and when we are not.
 - **Definition:** “*state of complete physical, mental and social well-being and not merely the absence of disease or infirmity*” (WHO)
 - To be healthy is a resource for everyday life.
 - You don’t live to be healthy!
-

What is public health?

- **Definition:** Array of programs and services organized primarily (but not exclusively) by various levels of governments to
 - **protect**
 - **promote**
 - **restore** the health of citizens.
-

What is population health?

- **Definition:** The health outcomes of a group of individuals, including the distribution of those outcomes within the group.
 - Focus on:
 - Improving health outcomes for populations rather than individuals.
 - Interventions at multiple levels: individual, community, and systemic.
 - Addressing disparities in health.
-

Determinants of health

1. **Biological Factors:** Genetics, age, sex.
 2. **Behavioral Factors:** Lifestyle choices such as diet, physical activity, and smoking.
 3. **Social Environment:** Income, education, social support.
 4. **Physical Environment:** Housing, sanitation, air and water quality.
 5. **Healthcare Access:** Availability, affordability, and quality of care.
-

Determinants of health



Göran, D., & Whitehead, M. (1991). Policies and strategies to promote social equity in health.

How to MEASURE population health

Metrics and Measures

- **Mortality Rates:**
 - Life expectancy
 - * worldwide [[WHO](#)]
 - * usa [[IHME](#)]
 - Infant mortality [[CDC](#)]
- **Morbidity Rates:** Prevalence and incidence of diseases
 - [[WHO](#)]

Metrics and Measures

- **Composite Metrics:**



- Disability-adjusted life years (**DALYs**).
-

Metrics and Measures

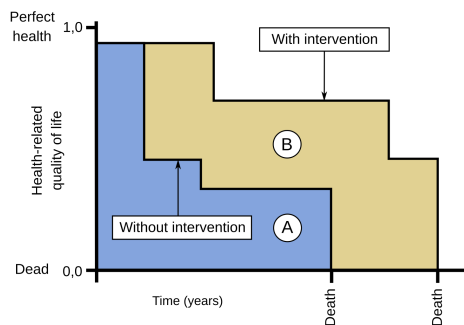
- **Composite Metrics:**

- DALYs measure the total burden of disease – both from years of life lost due to premature death and years lived with a disability.
 - One DALY equals one lost year of healthy life.
 - DALY's geographical variation, worldwide [[DALY-world](#)]
-

Metrics and Measures

- **Composite Metrics:**

- Quality-adjusted life years (**QALYs**).
 - * Assess the value of medical interventions.
 - * One QALY equates to one year in perfect health
-



Health disparities

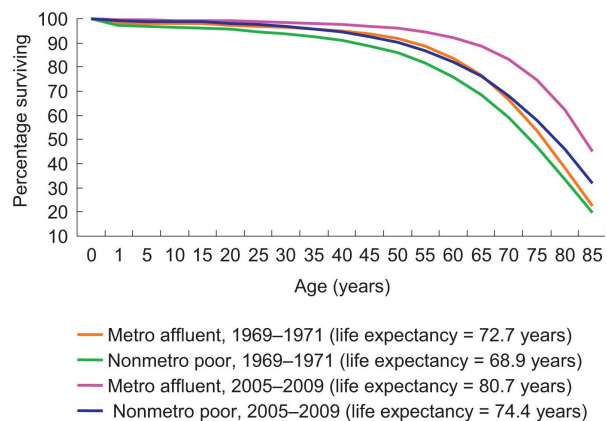
Understanding inequities

Variations in health outcomes by:

- Socioeconomic status.
- Race/ethnicity.
- Geography.

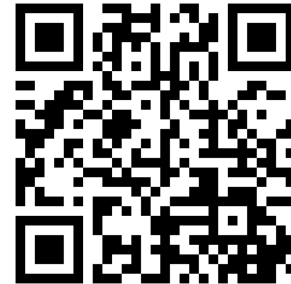
Understanding inequities

- Example: Differences in life expectancy between urban and rural populations.



- Addressing disparities to achieve health equity.

Understanding inequities



- So why do we observe lower life expectancy in rural areas?
 - <https://www.menti.com/alvwf32gwyfj>
-

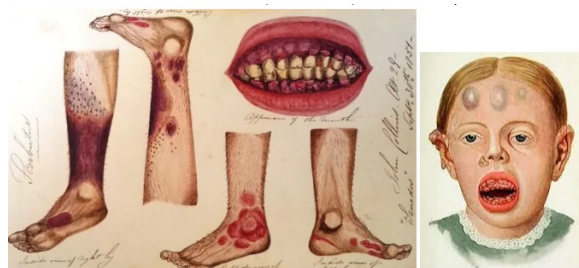
Interventions in population health

Levels of intervention

1. **Upstream:** Addressing root causes, such as policies and systemic changes.
 2. **Midstream:** Modifying behaviors and environments.
 3. **Downstream:** Providing healthcare services and individual interventions.
-

Case studies #1

Scurvy Among Sailors



Upstreams intervention

- **Addressing root causes:**
 - Identifying the dietary deficiencies (lack of vitamin C) as the fundamental cause of scurvy.
 - Enacting policies that mandated the inclusion of citrus fruits like lemons and limes in sailors' rations (e.g., British Navy's adoption of lemon juice in the 18th century).
-

Midstreams intervention

- **Modifying behaviors and environments:**
 - Educating ship captains and sailors about the importance of fresh fruit and vegetables in preventing scurvy.
 - Creating onboard systems to store and distribute citrus fruits to ensure consistent consumption.
-

Downstreams intervention

- **Providing healthcare services and individual interventions:**
 - Administering citrus fruits or vitamin C to sailors who were already showing symptoms of scurvy.
 - Treating symptoms of scurvy directly (e.g., wound care, hydration) to mitigate immediate health risks.
-

Summary

- The case study of scurvy exemplifies how upstream, midstream, and downstream interventions collectively address population health challenges:
 - **Upstream** policies ensure systemic changes (e.g., mandated citrus provisioning).
 - **Midstream** efforts focus on creating supportive environments and promoting healthy behaviors.

- **Downstream** actions treat individual cases, alleviating acute suffering and mortality.
-

Case Studies #2

John Snow and Cholera



- check this video [youTube](#)
-

Upstream Intervention

- **Addressing root causes:**
 - Investigated the cholera outbreaks in London and identified **contaminated water** as the **primary source of transmission**.
 - Advocated for systemic changes to the water and sewage systems, emphasizing the importance of **clean drinking water**.
 - Collaborated with policymakers to promote sanitary reforms, leading to infrastructure improvements.
-

Midstream Intervention

- **Modifying behaviors and environments:**
 - **Educated** the **public** about the **risks of contaminated water** and the importance of using clean water sources.
 - Marked contaminated water pumps, such as the infamous Broad Street pump, to prevent further usage.
 - Distributed educational materials to raise awareness about disease prevention and hygiene practices.
-

Downstream Intervention

- **Providing healthcare services and individual interventions:**
 - Encouraged immediate medical attention for cholera victims, focusing on hydration and supportive care.
 - Promoted boiling water as a short-term individual intervention to reduce the risk of consuming contaminated water.
 - Worked with communities to treat cholera cases and manage local outbreaks effectively.
-

Summary

- The John Snow cholera case highlights the importance of a multi-level approach to public health challenges:
 - **Upstream** interventions address systemic issues, such as contaminated water supplies.
 - **Midstream** efforts focus on behavior change and creating safer environments, like closing the Broad Street pump.
 - **Downstream** actions provide immediate relief and treatment to affected individuals, reducing mortality during outbreaks.
-

GROUP EXERCISE

Objective

- Analyze a population health issue,
 - Identify key determinants,
 - Propose interventions
 - Groups will brainstorm for 10 minutes, followed by brief presentations.
-

Instructions for Group Work

Step 1: Form Groups

- Divide into small groups of 3–5 students.
-

Instructions for Group Work

Step 2: Choose a Scenario (2 minutes)

- Select one population health issue or propose your own:
 - Childhood Obesity
 - Air Pollution
 - Vaccine Hesitancy
 - Access to Healthy Food
 - Mental Health Among Adolescents
 - Smoking in Low-Income Communities
-

Instructions for Group Work

Step 3: Analyze the Issue (5 minutes)

- Identify **key determinants of health**:
 - Social, economic, environmental, or behavioral factors.
 - Discuss:
 - How do these determinants impact health outcomes?
 - Are there disparities (e.g., geographic, racial, or socioeconomic)?
-

Instructions for Group Work

Step 4: Propose Interventions (5 minutes)

- Develop **two** interventions:
 1. **Upstream Intervention:** Systemic or policy-level solutions.
 2. **Midstream Intervention:** Community-level or individual-focused actions.
-

Instructions for Group Work

Step 5: Present to class (2 minutes)

- Develop **two** interventions:
 1. **Upstream Intervention:** Systemic or policy-level solutions.
 2. **Midstream Intervention:** Community-level or individual-focused actions.
-

Summary

Key Takeaways

- Population health focuses on **groups** rather than individuals.
 - Health outcomes are shaped by a range of determinants, from biological to societal.
 - Equity is a core principle of population health.
 - Data and metrics are essential tools for identifying needs and evaluating interventions.
-