Comparing Health Events in Populations: A Framework for Analysis

Eric Delmelle September 2 and September 5 2025

Introduction

- **Definition of Health Events**: Disease outbreaks, chronic conditions, injuries, and health behaviors.
- **Importance of Comparisons**: Understanding disparities, identifying risk factors, guiding public health interventions.
- **Key Concepts**: Population health, epidemiology, and biostatistics.

Objectives of Population Health

Four Key Objectives:

1. **Describe**: Understand population-level health outcomes.

2. **Explain**: Identify determinants and drivers of health outcomes.

3. **Predict**: Anticipate future health trends and patterns.

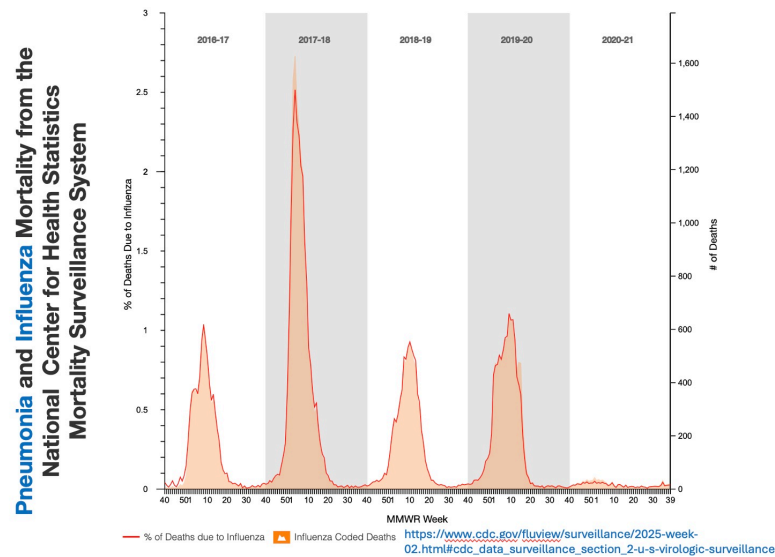4. **Control**: Implement interventions to improve outcomes.

Historical Context

Key Figures:

- **John Snow**: Cholera outbreak mapping.

- **Ignaz Semmelweis**: Importance of handwashing.

- **Joseph Goldberger**: Nutritional causes of pellagra.
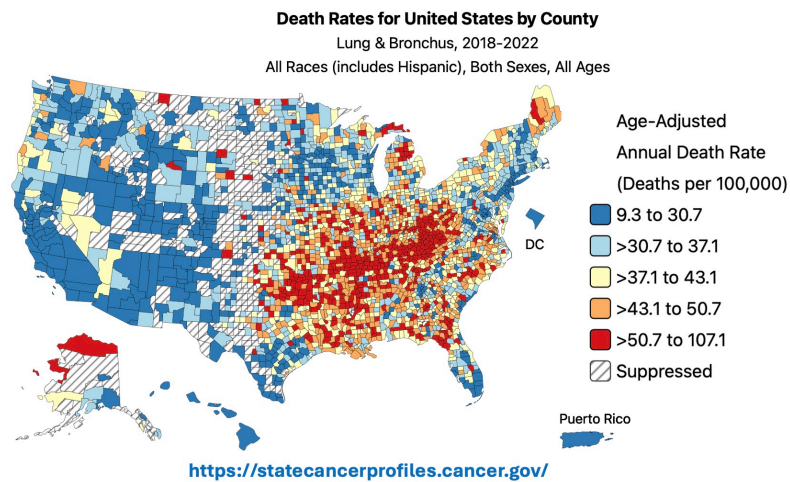

Type of Comparisons

Time-Based

Pneumonia and Influenza Mortality from the National Center for Health Statistics Mortality Surveillance System

https://www.cdc.gov/fluview/surveillance/2025-week-02.html#cdc_data_surveillance_section_2-u-s-virologic-surveillance

Key Metrics:

- **Incidence**: New cases over time.
- **Prevalence**: Existing cases at a given time.

Place-Based

Death Rates for United States by County

Lung & Bronchus, 2018-2022

All Races (includes Hispanic), Both Sexes, All Ages

Age-Adjusted
Annual Death Rate
(Deaths per 100,000)

- 9.3 to 30.7
- >30.7 to 37.1
- >37.1 to 43.1
- >43.1 to 50.7
- >50.7 to 107.1
- Suppressed

DC

Puerto Rico

https://statecancerprofiles.cancer.gov/

Example:

- **Urban vs. Rural Heart Disease Mortality**:

    - Urban: 50 per 100,000.

    - Rural: 75 per 100,000.

Group-Based

Example:
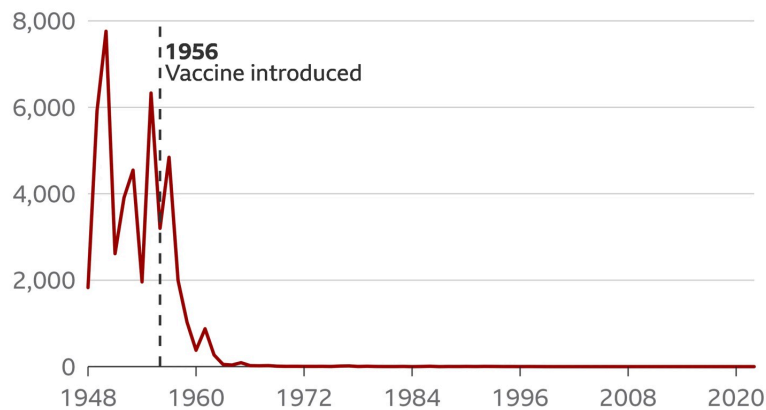
- Health disparities by race, age, and income.

Event-Based

Key Concept:

- Natural experiments: Before vs. after policy changes or interventions.

How polio was eradicated

Number of polio cases in England and Wales (1948-2022)

1956
Vaccine introduced

Source: Public Health England   **BBC**

Additional Event-Based Example

Measures of Comparison

Key Metrics:

- **Age-Standardized Rates**: Adjusted to eliminate age structure differences.
- **Attributable Risk**: Measures the impact of specific risk factors on outcomes.

Levels of Analysis

Frameworks:

- **Individual-Level**: Biostatistical and clinical trials.
- **Population-Level**: Geographic and demographic patterns.

Determinants of Health

Categories:

1. **Social and Economic Factors**
2. **Environmental Conditions**
3. **Behavioral and Genetic Influences**

Challenges in Comparisons

Key Challenges:

- **Data Quality**: Inaccuracies or incomplete datasets.

- **Ethical Considerations**: Privacy and fair comparisons.

Population vs. Community Health Assessments

Key Differences:

- **Community Health Assessments**:
  - Focus on local needs/resources.
  - Qualitative methods (e.g., interviews).

- **Population Health Assessments**:
  - Broad, systemic focus.

  - Quantitative data (e.g., chronic disease rates).

Population vs. Community Health Assessments

Example:

- Community: Identifying food deserts.

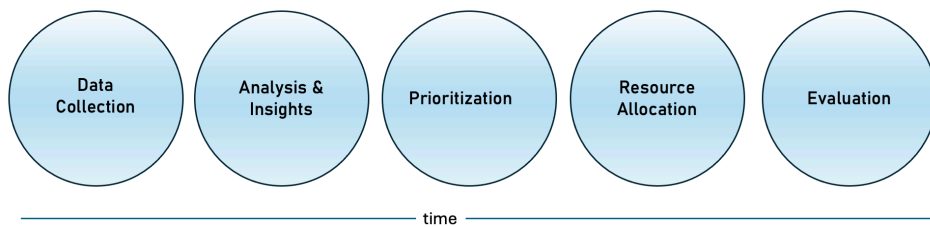- Population: Obesity prevalence across counties.

Policy Implications

Using Comparisons to Drive Change:

1. **Set Priorities**: Identify at-risk groups (e.g., elderly, low-income communities).

2. **Develop Interventions**: Targeted programs (e.g., tobacco cessation).

3. **Advocate for Policy Change**: Use data for systemic reforms.

Policy Implications

Visual:

Interactive Example

Dataset Example:

Population	Cases	Rate (per 100,000)
Urban	200	50
Rural	300	75

Prompt:

- "What does this suggest about resource allocation?"

Recap and Transition

Key Takeaways:

- Importance of describing, explaining, predicting, and controlling health events.

- Tools and methods to compare health outcomes.

- Practical implications for population health strategies.

Next:

- Group activity: Apply concepts to a real-world health disparity.

Group Activity: Population Health Comparison

Objective:

Apply Chapter 1 metrics to analyze health disparities.

Instructions:

1. Form groups of 5 (see groupe in 2 slides).

Instructions:

2. Analyze the provided dataset on coursesite

   - Calculate rates (e.g., incidence, prevalence).

   - Identify disparities (e.g., geographic, demographic).

   - Propose targeted interventions.

3. Prepare to present findings in 3 minutes.

Group Assignments and Analysis Instructions

- Group **John Snow** (5): Dhyana Abeysinghe; Nora Albright; Jaimie Alva; Carrie Rothman; Mikaela Villajoaquin
- Group **Pasteur** (5): Cameron Driscoll; Kendall-Marie Fitzgerald; Mia Freeman; Alex Sawh; Juliea Zhao
- Group **Nightingale** (5): Maria Garcia Rodriguez; Sarah Haque; Daniel Hughes; Emily Snyder; Keira Conway
- Group **Gupta** (5): Anna Jones; Nora Kerrigan; Phillip Kim; Alana Thomforde; Herve Sanon
- Group **Fauci** (6): Mariana King; Esther Lee; Nicole Mejias; Aili Tutschek; Christos Vlanti; Maya Bjorneby
- Group **Wakefield** (5):Samantha Pfeffer; Harnek Purewal; Mary Reed; Bibian Verdugo; Mackenzie Barlow

Analysis Instructions

- **Analyze the provided dataset on coursesite**:
    - Calculate rates (e.g., incidence, prevalence).

    - Identify disparities (e.g., geographic, demographic).

    - Propose targeted interventions.

- **Presentation Guidelines**:
    - Prepare findings for a **3-minute presentation**.

    - Include key calculations, identified disparities, and proposed interventions.