



# Population Management in eHealth

**Foundational Curriculum:**

**Cluster 7: Patient and Device Integration/Research and Biomedicine**

**Module 12: Patient Centered Interactions, Population Management and Public Health Informatics**

**Unit 2: Population Management in eHealth**

**FC-C7M12U2**

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# Unit Objectives

- Describe what population management is and explain its role in public health information
- Describe the concepts of population management and public health information
- Define terms: morbidity, mortality, epidemiology, epidemic and endemic disease, prevalence and incidence
- Define terms: statistics, data, demography, demographic variable, vital statistics and ethnography
- Describe disease transmission
- Describe how EHRs can enhance research in epidemiology, epidemic and endemic disease related to public health
- Explain how statistics, demographics and ethnography contribute to population health management



# Population Health Management



- **Population health management** is a field of study within the healthcare industry that analyses and facilitates care delivery across the general population of a region, country or state, or a health community
- Population health management intervenes and communicates with the populations, by not only studying it, but also interacting with it. These are situations in which patient self-care efforts are significant, or a primary focal point
- It can be said that 80 % of health outcomes<sup>1</sup> are associated with factors outside the traditional healthcare delivery. This includes health behaviors, social and economic factors and physical environment. Therefore, improvement of health outcomes highly depends on those external interactions
- Population health management undertakes:
  - Identifying similar risk factors affecting a community
  - Determining possible improvements of health for a community
  - Identifying preventive care interventions
  - Assisting in the clinical decision-making process by data analytics
  - Following-up with patients



<sup>1</sup> Source: HealthCatalyst, <https://www.healthcatalyst.com/population-health/>  
Retrieved: 18.12.2017



# Population Management Using Public Health Information



- **Public Health Informatics**, as stated in C4M7U1, is the systematic application of knowledge about systems that capture, manage, analyze and use information to improve population health
- **Public health** is the state of the entire people of a country, region or community's health. Population health management uses public health information to analyse and intervene in major public health conditions
- **Public Health Information** is the data available regarding the public's health. It is general information collected about a large scale number of patients. This information is used to study the public's health condition and major public health concerns





# Demographics

- **Demography** is the statistical study of populations. Demography encompasses the study of the size, structure, and distribution of these populations and changes in them in response to birth, migration, aging, and death.
- **Demographics** is statistical data relating to the population and particular groups within it. **Demographic variables** are important variables used to define the population studied in a demography, such as income level, gender, educational level, location, ethnicity, race, and family size might be used for measuring demographics.
- Other related studies include ethnography. **Ethnography** is the study and systematic recording of human cultures, as well as a descriptive work produced from such research. Ethnography generally relates to the comparison of different human cultures and the interactions between one culture and another or amongst individual cultures themselves.





# Vital Statistics

- **Statistics** is the mathematic study dealing with the collection, analysis, interpretation, presentation, and organization of data. For example, a child's growth chart is a visual interpretation of statistic data
- The term *data* has been used often throughout this unit and units prior. The full meaning and definition of **data** is the information that is collected together in a specified form to produce statistics, visualizations or interpretations
- **Vital statistics** are statistics on live births, deaths, fetal deaths, marriages and divorces. The information is collected through civil registration, a government system that records vital events in the population. These are used to understand population growth, stability, or decrease in countries, regions, states, cities and other population collections.





# The Use of Demographics in Population Health Management



- Statistics and demographics are used for quality metrics evaluation and reporting in population health management
- These statistics are measurable, quantitative data
- Ethnography via EHRs is also being increasingly utilized in healthcare as a core research method. Ethnography can study conditions caused by certain cultures predispositions, habits or behaviors.





# Epidemiology

- Demographics, ethnography, vital statistics and other data contribute to the field of epidemiology
- **Epidemiology** is the study of the distribution and determinants of health-related states or events and the application of this study to the control of diseases and other health problems. This includes surveillance and descriptive studies to evaluate distribution of diseases, as well as analytical studies to study determinants of those diseases.
- An **epidemic** is a widespread occurrence of an infectious disease in a community at a particular time
  - e.g. "a flu epidemic"
  - **Pandemics** are world wide epidemics
- An **endemic disease** is regularly found among particular people or in a certain area
  - One of the most talked about endemic diseases is malaria



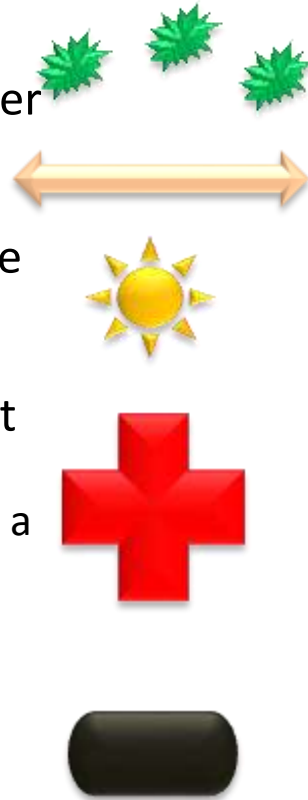




# Epidemiology (Cont'd)

Many terms need to be understood in the field of epidemiology in order to use information gathered about epidemics. These terms refer to how an epidemic may affect the population.

- **Incidence** is the occurrence or rate of newly diagnosed cases of a disease
- **Prevalence** is the actual number of cases occurring of the disease either during a period of time (**period prevalence**) or at a particular date in time (**point prevalence**)
- When the epidemic is cleared, the prevalence is minimal and incidence is rare or stopped completely, and the disease is said to be **eradicated**
- **Morbidity** is a diseased state, disability, poor health due to any cause, or the presence of any form of disease. It also refers to the degree that the health condition affects the patient.
  - **Morbidity rate** can refer to either the incidence rate, or the prevalence of a disease or medical condition
  - Morbidity rates help insurers predict the likelihood that the insured will contract or develop any number of specified diseases
- **Mortality** is the measurement of the amount of death
  - Mortality rate is the proportion of people dying during a given time interval.

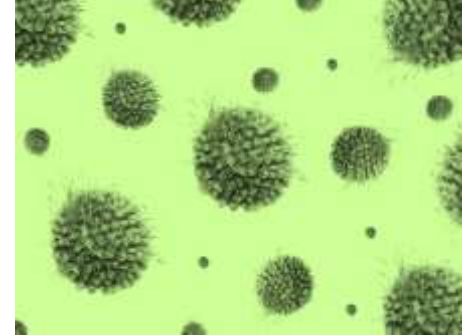




# Epidemiology in Population Health Management



- Epidemiology in Population Health Management:
  - In the United States and Europe, epidemiological data is key to assessing diseases, profiles and trends for patient populations in provider practices, health organizations and on a regional basis
  - Techniques fundamental to this approach include prolonged exposure of the investigators in the study environment, detailed collection of data through field notes and interviews, and extensive review of data from multiple perspectives
- Epidemiology in eHealth:
  - The EHR helps collect and analyse the statistical and demographic data, as well as transmit it to health departments and reporting agencies





# Disease Transmission

Diseases can be transmitted via direct on indirect contact.

- **Infectious diseases** are diseases that are transmittable through the environment that cause infection
- Direct contact is a common way of transmission in infectious diseases. **Direct contact** involves transmission of diseases via **person-to-person** contact (touch or exchange of bodily fluids) and **droplet spread** (sneezing or coughing)
- **Indirect contact** involves transmission of diseases via objects, such as:
  - Airborne transmission
  - Contaminated objects
  - Food and drinks
  - Animal-to-person contact, insect bites
  - Animal or human reservoirs





# Government Institutions in Population Health Management



- In the United States, the **Center for Disease Control and Prevention (CDC)** uses data collected in population health management in order to manage diseases such as obesity, malaria, and any and all diseases, **contagious** (spreadable) or otherwise.
- In Europe, the **European Centre for Disease Prevention and Control (ECDC)** uses population health management to manage diseases for European populations
- Although the CDC and the ECDC aid in international, global disease prevention and study in addition to their own population's demographics, other institutions do exist around the world. Other international institutions that aid in the prevention and control of diseases include:
  - **The World Health Organization (WHO)**
  - **The United Nations Children's Fund (UNICEF)**
  - **Doctors Without Borders/Medecins Sans Frontieres (MSF)**



World Health Organization



unicef





# The Use of EHRs to Enhance Research in Epidemiology



EHRs can be used extensively for population health research to survey and improve epidemiologic methods



Diverse research applications can benefit from large sample sizes and generalizable patient populations afforded by EHRs



Researchers can use EHRs to conduct epidemiologic investigations, ranging from cross-sectional studies within a given hospital to longitudinal studies on geographically distributed patients



EHR epidemiology with enhanced collection of social/behavior measures, linkage with vital records, and integration of emerging technologies such as personal sensing can improve clinical care and population health



# The Use of EHRs to Enhance Research in Epidemiology (Cont'd)



EHRs can help meet the challenges of epidemic and endemic disease control



EHRs can facilitate automated collection of surveillance data, infection control interventions at the point of care, or provide risk-adjusted patient outcomes



The increased adoption of EHRs and related health information systems and technology provide a unique opportunity for infection control professionals and infection diseases specialists to automate manual processes and address the growing challenge of **hospital acquired infections (HAI)** and guidelines for public reporting



# Population Health Management: Case Study in China



## Human infection with Avian Influenza A(H7N4) virus in China (The Avian Flu)

- On 14 February 2018, the National Health and Family Planning Commission (NHFPC) of China notified the World Health Organization (WHO) of one case of human infection with avian influenza A(H7N4) virus. This is the first human case of avian influenza A(H7N4) infection to be reported worldwide.
- The 68 year old woman was admitted to a local hospital for treatment of severe pneumonia and was discharged after 21 days. On 12 February, the **Chinese Center for Disease Control** and Prevention (China CDC) confirmed that the case-patient's samples were positive for avian influenza A(H7N4).
- Genetic sequencing of this A(H7N4) virus shows that all the virus segments originated from avian influenza viruses.
- Twenty-eight close contacts of the case-patient were under medical observation. None so far have tested positive.
- The Chinese government conducted a risk assessment, and has enhanced prevention and control measures, surveillance and epidemiological investigations including contact tracing and laboratory testing. Public risk communication and information sharing is ongoing.
- This is the first report of a human case of avian influenza A(H7N4) infection globally and the case reported exposure to live backyard poultry before illness onset.

Source: <http://www.who.int/csr/don/22-february-2018-ah7n4-china/en/>

Retrieved: May 28, 2018



# Population Health Management: Case Study in China (Cont'd)



In the example on the previous page, population health management measures were used, such as:

- The Chinese CDC notified the WHO. That information was collected, stored and kept for future analysis
- Genetic sequencing was attempted, a complex process that almost always requires an electronic process
- Risk assessments were made
- Surveillance and contact tracing: close contacts were tested and observed
- Laboratory testing: further lab tests, such as throat swabs, were made





# Unit Review Checklist

- Described what population health management is and explained its role in public health information (QB01)
- Described the concepts of population management and public health information (QL01)
- Defined terms: morbidity, mortality, epidemiology, epidemic and endemic disease, prevalence and incidence (EB02)
- Described disease transmission (GB13)
- Defined terms: statistics, data, demography, demographic variable, vital statistics and ethnography (EB03)
- Described how EHRs can enhance research in epidemiology, epidemic and endemic disease related to public health
- Explained how statistics, demographics and ethnography contribute to population health management



# Unit Review Exercise/Activity



1. Activity: Do research on the epidemic of obesity, and the endemic of cholera. What factors of each of these diseases contribute to one being an endemic and another being an epidemic?
2. Activity: Imagine the time, only a generation or two before, when population health management was attempted before the use of computers, software, and other technologies. List the benefits of having technologies when dealing with population health management, as well as the challenges faced with manual gathering and analysis of such large data.



# Unit Exam



1. Which of the following is not true about EHRs in epidemiology?
  - a) EHRs can facilitate automated collection of surveillance data
  - b) EHRs can facilitate infection control interventions at the point of care
  - c) EHRs often retrain researchers in their basic understanding of epidemiology
  - d) EHRs can provide risk-adjusted patient outcomes.
2. Which of the following defines morbidity?
  - a) measurement of the amounts of death
  - b) statistics on live births, deaths, fetal deaths, marriages and divorces
  - c) a widespread occurrence of an infectious disease in a community at a particular time
  - d) a diseased state, disability, poor health due to any cause, or the presence of any form of disease
3. Which of the following is not an example of a demographic variable?
  - a) Income level
  - b) Educational level
  - c) Expertise level
  - d) Location



# Unit Exam (cont'd)



4. True or False. The ECDC has the ability to aid in international, global disease prevention and study.
  - a) True
  - b) False
5. Obesity has been identified as being:
  - a) An incidence
  - b) An epidemic
  - c) A pandemic
  - d) An endemic