HSS 3110: Lecture 1 - Introduction to Epidemiology and Approaches

■ Define and discuss the goals of public health.

- Public health is a multidisciplinary field whose goal is to promote the health of the population through organised community efforts.1(pp3-14).
  public health focuses on preventing illness in the com-
  munity.
  Key public health activities include assessing the health status of the population, diagnosing its problems, searching for the causes of those problems, and designing solutions for them.
- The solutions usually involve community-level interventions that control or prevent the cause of the
  problem.
- public health has had a greater effect on the health of populations than medicine has had.

■ Distinguish between basic, clinical, and public health research.

- The scientific basis of public health activities mainly comes from (1) the basic sciences, such as pathology and toxicology; (2) the clinical or medical sciences, such as internal medicine and pediatrics; and (3) the public health sciences, such as epidemiology,
- **Basic Scientists** study disease in a laboratory setting by conducting experiments on cells.
- The focus of this research is often on the disease mechanism or process. This type of research provides valuable information on the disease process that cannot be obtained in any other way. The results are often difficult to extrapolate to real-life situations.
- **Clinical scientists** focus their research questions mainly on disease diagnosis, treatment, and prognosis in individual patients.
- they are usually the first to identify new diseases,
  the adverse effects of new exposures, and new links between an exposure and a disease. information is typically published in case reports.
- contribute to scientific knowledge by record-ing treatment and response information in their patients' medical records.
- **PH scientists** study ways to prevent disease and promote health in the population at large.
- it focuses mainly on disease prevention rather than disease treatment.
- Units of concern are are groups of people living in the community

■ Define epidemiology and explain its objectives.

- "the study of that which falls upon
  the common people."
- The study of the distribution and determinants of disease frequency in human populations and the application of this study to control health problems.13(p1),14(p95)

the objectives of epidemiology are to

- (1) study the natural course of disease from onset to res-olution,

- (2) determine the extent of disease in a **population**,
- (3) identify patterns and trends in disease occurrence,
- (4) identify the causes of disease, and
- (5) evaluate the effectiveness of measures that prevent and treat disease. All
- **Population, disease frequency, disease control, disease distribution, disease determinants**

■ Discuss the key components of epidemiology (population and frequency, distribution, determinants, and control of disease).

- **Population**: the heart of all epidemiological activities because epidemiologists are concerned with disease occurrence in groups of people rather than in individuals.
- The size of the population is often determined by a census
- **Disease Freuqency:** quantifying how often a disease arises in a population. includes three steps: (1) developing a definition of disease, (2) instituting a mechanism for counting cases of disease within a specified population,and (3) determining the size of that population.
- **Disease Distribution:** refers to the analysis of disease patterns according to the characteristics of person, place, and time, in other words, who is getting the disease, where it is occurring, and how it is changing over time. Understanding health status and forming hypothesis
- **Disease determinants:** factors that bring about a change in a person's health or make a difference in a person's health. Determinants consist of both causal and preventive factors.
- Epidemiological research involves generating and testing specific hypotheses about disease determinants.
- **Disease control:** Epidemiologists accomplish disease control through epidemiological

research, as described previously, and through surveillance. The purpose of surveillance is to monitor aspects of disease occurrence that are pertinent to effective control.

■ Discuss important figures in the history of epidemiology, including John Graunt, James Lind,William Farr, and John Snow.

- The historical development of epidemiology spans almost **400** years and is best described as slow and unsteady.
- **John Graunt,** who summarized the pattern of mortality in 17th-century London.
- He became the first epidemiologist, statistician, and demographer when he summarized the **Bills of Mortality** for his 1662 publication and he discovered the numerical regularity of deaths and births, of ratios of the sexes at death and birth, ALSO FIRSt epidemiologist
- **James Lind,** who used an experimental study to discover the cause and prevention of scurvy; propose that "the principal and main predisposing cause" was moist air and that its "occasional cause" was diet.
- **William Farr,** who pioneered a wide range of activities during the mid-19th century that are still used by modern epidemiologists;
- most important contributions involved calculations

that combined registration data on births, marriages, and deaths (as the numerator) with census data on the population size (as the denominator). Founder of modern epidemiology. Looked at births and death in relation to the population.

- **John Snow**, **father** of epidemiology who showed that cholera was transmitted by fecal contamination of drinking water; Snow also investigated pockets of the Broad Street population that

had fewer cholera deaths. never found direct evidence of sewage contamination of the Broad Street pump well, he did note that the well was near a major sewer and several cesspools.

- He concluded, “The mortality in the houses supplied by the Southwark and Vauxhall Company was therefore between eight and nine times as great as in the houses supplied by the Lambeth Company.”
- Snow organized his observations logically so that meaningful inferences could be derived from them, 2 he recognized that “a natural experiment” had occurred in the subdistricts of London that would enable him to gather proof either for

or against his hypothesis. 3, he conducted a quantitative analysis of the data contrasting the occurrence of cholera deaths in relation to the drinking water company.

- Looked at ditrsubituion of deaths caused by the disease and looked at possible determiants of these geographic distribution and formed hpothesi with relation to the contaminated water and found more info about drinkingwater and habits of the people.

■ Discuss important modern studies, including the Streptomycin Tuberculosis Trial, Doll and Hill’s studies on smoking and lung cancer, and the Framingham Study.

- The development and application of epidemiological methods advanced slowly during the late 1800s and early 1900s.
- “modern” experimental studies with comparable treat-

ment and control groups of patients and comparable methods for assessing the disease changes were needed to yield correct conclusions.

- In 1940's the first modern experimental studies on the use of **streptomycin** to treat pulmonary tuberculosis.
- First and foremost innovation was its use of **randomization** to assign patients to the streptomycin and control groups. Second was was the placement of restrictions on the type of patient eligible for the trial. Third, the data collection methods helped ensure that the results would be free of bias. Fourth, the investigators considered the ethical issues involved in conducting the trial, including whether it was ethical to withhold the

streptomycin treatment from the control group.

- **Doll and Hill’s** first study was a “case–control study,”32 which included 709 subjects who had lung cancer (the cases) and 709 subjects who had diseases other than cancer (the controls).
- Doll and Hill found that proportionately more lung cancer patients than noncancer patients were smokers.
- Doll and Hill’s prospective study broke new ground. First, the study included tens of thousands of subjects, and therefore it had adequate “power” to examine numerous health effects of several levels of smoking. Second, the investigators followed the subjects

for a long period of time. A long follow-up period is particularly important in the study of diseases such as cancer that take decades to develop. Third, Doll and Hill incorporated changes in smoking habits over time and therefore were able to examine the health benefits of smoking cessation.

- the **Framingham** Study is notable for bringing about a shift in focus from infectious to noninfectious diseases following World War II.
- When the Framingham Study was started in 1947, its goal was to develop ways of identifying latent cardiovascular disease among healthy volunteers.
- Framingham Study is “undisputedly the foundation stone for current ideas about risk factors in general and the prevention of ischemic heart disease in particular.”

■ Discuss the current activities and challenges of modern epidemiologists.

- some epidemiologists examine health determinants at the genetic and molecular level and therefore combine the basic and public health sciences.
- The second direction of epidemiological research has involved the study of determinants at the societal level.41
- The third new direction of epidemiological research has involved the analysis of determinants across the life span.
- more challenging problems for epidemiologists, such as “air, water and soil pollution; global warming; population growth; poverty and social inequality; and civil unrest and violence.”49(p5)