LEARNING OBJECTIVES

• Describe the key events in the development of the field of epidemiology

Epidemiology is the study of the patterns, causes, and effects of health and disease conditions in defined populations. It is the cornerstone of public health, and informs policy decisions and evidence-based medicine by identifying risk factors for disease and targets for preventive medicine. Epidemiologists help with study design, collection and statistical analysis of data, and interpretation and dissemination of results. Epidemiology has helped develop methodology used in clinical research, public health studies and, to a lesser extent, basic research in the biological sciences.

The Greek physician Hippocrates is known as the father of medicine, and was the first epidemiologist. Hippocrates sought a logic to sickness. He is the first person known to have examined the relationships between the occurrence of disease and environmental influences. Hippocrates believed sickness of the human body to be caused by an imbalance of the four Humors (air, fire, water and earth “atoms”). The cure to the sickness was to remove or add the humor in question to balance the body. This belief led to the application of bloodletting and dieting in medicine.

The distinction between “epidemic” and “endemic” was first drawn by Hippocrates, to distinguish between diseases that are “visited upon” a population (epidemic) from those that “reside within” a population (endemic). The term “epidemiology” appears to have first been used to describe the study of epidemics in 1802 by the Spanish physician Joaquín de Villalba in Epidemiología Española. Epidemiologists also study the interaction of diseases in a population, a condition known as a syndemic.

One of the earliest theories on the origin of disease was that it was primarily the fault of human luxury. This was expressed by philosophers such as Plato and Rousseau, and social critics like Jonathan Swift. In the middle of the 16th century, a doctor from Verona named Girolamo Fracastoro was the first to propose a theory that these very small,
unseeable, particles that cause disease were alive. They were considered to be able to spread by air, multiply by
themselves and to be destroyable by fire. In 1543 he wrote a book De contagione et contagiosis morbis, in which he was
the first to promote personal and environmental hygiene to prevent disease. The development of a sufficiently powerful
microscope by Anton van Leeuwenhoek in 1675 provided visual evidence of living particles consistent with a germ
theory of disease.

Dr. John Snow is famous for his investigations into the causes of the 19th century cholera epidemics, and is also known
as the father of (modern) epidemiology. He began by noticing the significantly higher death rates in two areas supplied
by Southwark Company. His identification of the Broad Street pump as the cause of the Soho epidemic is considered
the classic example of epidemiology. He used chlorine in an attempt to clean the water and had the handle removed,
thus ending the outbreak. This has been perceived as a major event in the history of public health and regarded as the
founding event of the science of epidemiology, having helped shape public health policies around the world. However,
Snow’s research and preventive measures to avoid further outbreaks were not fully accepted or put into practice until
after his death.

Figure: Snow cholera map: A variant of the original map drawn by Dr. John Snow (1813-1858), a British physician who
is one of the founders of medical epidemiology, showing cases of cholera in the London epidemics of 1854, clustered
around the locations of water pumps.

In the early 20th century, mathematical methods were introduced into epidemiology by Ronald Ross, Anderson Gray
McKendrick and others. Another breakthrough was the 1954 publication of the results of a British Doctors Study, led by
Richard Doll and Austin Bradford Hill, which lent very strong statistical support to the suspicion that tobacco smoking
was linked to lung cancer.

Key Points

• The Greek physician Hippocrates is known as the father of medicine, and was the first epidemiologist.
• The distinction between “epidemic” and “endemic” was first drawn by Hippocrates, to distinguish between diseases that are “visited upon” a population (epidemic) from those that “reside within” a population (endemic).

• In the early 20th century, mathematical methods were introduced into epidemiology adding statistical support to the field (i.e. the suspicion that tobacco smoking was linked to lung cancer was backed by statistics).

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**Key Terms**

- **endemic**: (Especially of diseases.) Prevalent in a particular area or region.
- **epidemic**: A widespread disease that affects many individuals in a population.
- **epidemiology**: The branch of a science dealing with the spread and control of diseases, computer viruses, concepts, etc., throughout populations or systems.