CHAPTER 1

INTRODUCTION

Epidemiology is the study of the patterns, causes, and effect 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 in study design, collection and dissemination of result (including peer view and occasional systematic review). Epidemiology has helped develop methodology used in clinical research public health studies and to a lesser extent, basic research in biological science.

“Epidemiology” literally meaning “the study of what is upon the people” is derived from Greek epi, meaning upon among, demos, meaning people, district,” and logos, meaning study word discourse, suggesting that it applies only to human population. However, the term is widely used in studies of zoological population (veterinary epidemiology), although the term “epizology” is available and it has also been applied to studies of plant populations (Miquel Porta, 2008 & Nutter, Jr, F.W. 1999).

One of the most important reasons that developed countries have become as productive as they are today is that the population remains healthy and disease free. This essential task is performed by each country’s health department and is carried out by individuals known as epidemiologists. Without their efforts and their coordination with others in the medical field, it would be very difficult if not impossible to obtain current information regarding important diseases, methods of transmission, methods of control, and the like. Furthermore, information on the incidence or prevalence of diseases and statistics on morbidity and mortality rates, all of which are essential to physicians and other medical personnel to help control and understand diseases, would not be available without the efforts of the epidemiologists (Black, 2004).
In fact, epidemiology is often described as the basic science of public health. First, epidemiology is a quantitative discipline that relies on a working knowledge of probability, statistics, and sound research methods. Second, epidemiology is a method of causal reasoning based on developing and testing hypotheses grounded in such scientific fields as biology, behavioral sciences, physics, and ergonomics to explain health-related behaviors, states, and events. However, epidemiology is not just a research activity but an integral component of public health, providing the foundation for directing practical and appropriate public health action based on this science and causal reasoning (Cates, W). Epidemiology is concerned primarily with the distribution and determinants of the frequency of disease in population (Macmahon, B. Pugh, T.F. 1970).

**HISTORY**

The epidemiologic way of thinking originated in writings ascribed to the Greek philosopher-physician Hippocrates in the fifth century BC. In On Airs, Waters, and Places, Hippocrates displayed an extraordinary awareness of the impact of environment and behavior on personal well-being (Hippocrates, 1937). The Greek physician Hippocrates is known as the father of medicine, and was the first epidemiologist (Alfredo Morabia. 2004, Jones & Bartlett). Hippocrates sought a logic to sickness. He is the first person known to have examined the relationship between influence (Ray M. Merrill).

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 humors in question to balance the body. This belief led to the application of bloodletting and dieting in medicine (Merril, Ray M). He coined the terms “endemic” (for diseases usually found in some places but not in others) and “epidemic” (for diseases that are seen at some times but not other) (Duncan & Associates).
In pinpointing these factors, Hippocrates identified forces that epidemiologists today recognize as major determinants of human health. However, Hippocrates overlooked the importance of quantification, which is necessary for assessing the nature and severity of health problems as well as for understanding their etiology. Some 800 years after Hippocrates, during the third century, the Romans began to record apparent numerical patterns in their everyday lives (Trenerry, C.F).

If anyone searches diligently, it is possible to trace the roots of epidemiological thinking back to the “father of medicine”. Hippocrates, who as early as 300 B.C, suggested a relationship between the occurrence of disease and the physical environment (Markellis, V.C).

Epidemiology originates from Hippocrates’ observation more than 2000 years ago that environmental factors influence the occurrence of disease. However, it was not until the nineteenth century that the distribution of disease in specific human population groups was measured to any large extent. This work marked not only the formal beginnings of epidemiology, but also some of its most spectacular achievements (Beaglehole R, Bonita R).

The logical underpinnings for modern epidemiologic thinking evolved from the scientific revolution of the 17th century (Lilienfeld DE, Stolley). Although several epidemics occurred in Asia during the 15th and 18th centuries, it was not until the 19th century that John Snow first described preventive measures for the disease during an epidemic in London, UK (Snow J).

Although epidemiology as a discipline blossomed during World War II, epidemiologic thinking has been traced from Hippocrates through John Graunt, William Farr, John Snow, and others. The contributions of some of these early and more recent thinkers are described below. Hippocrates attempted to explain disease occurrence from a rational rather than a supernatural viewpoint. In his essay entitled “On Airs, Waters, and Places,”
Hippocrates suggested that environmental and host factors such as behaviors might influence the development of disease. Another early contributor to epidemiology was John Graunt, a London haberdasher and councilman who published a landmark analysis of mortality data in 1662. This publication was the first to quantify patterns of birth, death, and disease occurrence, noting disparities between males and females, high infant mortality, urban/rural differences, and seasonal variations (Snow, J. 1936).

**DEFINITION**

Maxcy, one of the pioneer epidemiologists of the past century, offered the following definition: “Epidemiology is that field of medical science which is concerned with the relationship of various factors and conditions which determine the frequencies and distributions of an infectious process, a disease, or a physiologic state in a human community” (Lilienfeld. 1978).

“Epidemiology is the **study** of the **distribution** and **determinants** of **health-related states or events** in **specified populations**, and the **application** of this study to the control of health problems” (John M. Last).

**MODERN ERA**

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 (David Vachon & John Snows). He began with 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 to shape public health policies around the world (Snow Gro Harlem Brundtland & John Snow).

In recent years the field of epidemiology has expanded tremendously in size, scope, and influence. The number of epidemiologists has grown rapidly along with the number of epidemiology training programs in schools of public health and medicine. Many subspecialties have been established that are defined either by disease, exposure, or population being studied. Disease-specific subspecialties include reproductive, cancer, cardiovascular, infectious disease, and psychiatric epidemiology. Exposure specific subspecialties include environmental, behavioral, and nutritional epidemiology and Pharmaco-epidemiology. Population-specific subspecialties include pediatric and geriatric epidemiology. In addition, the scope of epidemiologic research has expanded in two divergent directions. First, some epidemiologists examine health determinants at the molecular and genetic level and so combine the basic and public health sciences. For example, genetic epidemiology investigates whether certain diseases cluster in families, whether the clustering is caused by inherited factors or a shared environment, and how genes influence the risk of disease (Beaty T.H, Khoury M.J).

PUBLIC HEALTH IN ATTENTION AND PRECAUTION OF THE STUDY

For this reason, the field of public health has received less attention and fewer resources than the field of medicine has received. Nevertheless, public health has a greater impact than medicine on the health of populations. For example, since the turn of the 20th century, the average life expectancy of Americans has increased by almost 30 years from 47.3 to 76.7 years (Hyattsville, 2000). Past 25 years can be attributed to improvements in public health and only 5 years can be attributed to improvements in the medical care system (Bunker JP, Frazier HS, Mosteller F. 1994).
Public health achievements that account for improvements in health and life expectancy include the routine use of vaccinations for infectious diseases, improvements in motor vehicle and workplace safety, control of infectious diseases through improved sanitation and clean water, modification of risk factors for coronary heart disease and stroke (such as smoking cessation and blood pressure control), safer foods from decreased microbial contamination, improved access to family planning and contraceptive services, and the acknowledgment of tobacco as a health hazard and the ensuing antismoking campaigns (Centers for Disease Control and Prevention).

Public health surveillance is the ongoing, systematic collection, analysis, interpretation, and dissemination of health data to help guide public health decision making and action. Surveillance is equivalent to monitoring the pulse of the community. The purpose of public health surveillance is sometimes called “information for action” (Orenstein, W.A and Bernier, R.H).

While public health surveillance traditionally has focused on communicable diseases, surveillance systems now that target injuries, chronic diseases, genetic and birth defects, occupational and potentially environmentally-related diseases, and health behaviors. Since September 11, 2001, a variety of systems that rely on electronic reporting have been developed, including those that report daily emergency department visits, sales of over-the-counter medicines, and worker absenteeism (Wagner, M.M. Tsui, F.C. Espino, J.U. Dato, V.M. Sittig, D.F. Caruana, F.A. et al & Centers for Disease Control and Prevention).

HEALTH SCIENTISTS

Basic scientists such as toxicologists study disease in a laboratory setting by conducting experiments on cells, tissues, and animals. The focus of this research is often on the disease mechanism or process. Because basic scientists conduct their studies in a
controlled laboratory environment, they can regulate all important aspects of the experimental conditions. For example, a laboratory experiment testing the toxicity of a chemical is conducted on genetically similar animals that live in the same physical environment, eat the same diet, and follow the same daily schedule (Beaglehole, R. Bonita, R and Kjellstrom, T).

Public health scientists study ways to prevent disease and promote health in the population at large. Public health research differs from clinical research in two important ways. First, it focuses mainly on disease prevention rather than disease treatment. Second, the units of concern are groups of people living in the community rather than separate individuals visiting a health care facility. For example, a public health research project called “Lead Free Kids” determined the impact of removing lead-contaminated soil on children’s blood lead levels (Weitzman, M. Aschengrau, A. Bellinger, D. Jones, R. Hamlin, J.S. Beiser, A).

FUNCTION

In the mid-1980s, five major tasks of epidemiology in public health practice were identified: public health surveillance, field investigation, analytic studies, evaluation, and linkages (Tyler, C.W, Last, J.M).

BIBLIOMETRIC STUDY

The term “Bibliometric” was introduced by Alan Pritchard in 1969, although it seems that the term’s history is new and its origin goes back to Campbell’s study in 1896. According to Sengupta (1991), he states that Campbell’s (1896) statistical studies, in publications subject categories was conducted for the first time in Bibliometric studies up to Pritchard (1969) Bibliometric Studies was called statistical bibliography.

The literature contains various definitions on the term. Firstly, Pritchard, (1969) explained the term as “the application of mathematics and statistical methods to books and
other media of communication”. Broadus (1987) criticized the definition of Pritchard in terms of vagueness of phrase, in other media. He used the term, quantitative study while defining Bibliometric; he explained the term as bibliographic and/or physical published unit’s quantitative study White & McCain, also defined the term as quantitative study but emphasizing on the literature qualitative study.

**ORIGIN OF BIBLIOMETRIC**

The term “Bibliometric” was first coined by Prichard in 1969, and its usage and practice can be traced back to the second. Hulme used this idea and called it “statistical bibliography”. Pritchard explained the term “Bibliometric” as an “application of mathematical and statistical methods to books and other media of communication”. A pioneer example of a bibliometric study was a statistical analysis of the literature of comparative anatomy from 1542 to 1890 by counting the number of titles in both books and journals articles, and grouping them by countries of origin within periods.

**DEFINITION**

Fairthrone (1969) defined the term as “the quantitative treatment of the properties of recorded discourse and behavior pertaining to it”.

The British standard glossary of documentation of term (1976) defines “Bibliometric” as “the study of the use of documents and patterns of publications to which mathematical and statistical methods have been applied”, which is basically similar to Prichard’s definition.

Nicholas and Ritchie (1978) in their book literature on Bibliometric state that Bibliometric “provides information about the structure of knowledge and how it is communicated”. 
The 1970s saw the development of Scientometrics as an operational activity, a response to the pressing demand for the “measuring of science” especially in Russia and the USA. Since Vassily V. Nalimov coined the term Scientometrics in the 1960s, this term has grown in popularity and is used to describe the study, growth, structure, interrelationships and productivity. Scientometrics is related to and has overlapping interests with Bibliometrics. The terms Bibliometrics and Scientometrics refer to component fields related to the study of the dynamics of disciplines as reflected in the production of their literature.

Areas of the study range from charting change in the output of a scholarly field through time and across countries, to the library collection problem of maintaining control of the output, and to the low publication productivity of most researchers. These terms are used to describe similar and overlapping methodologies.

Scientometrics, according to Garfield, is “the study of the measurement of scientific and technological progress” (Garfield 1979). Its origin is in the quantitative study of science policy research, or the science of science, which focuses on a wide variety of quantitative measurements of science at large.

Scientometrics is related to and has overlapping interests with Bibliometrics and Informetrics. The terms Bibliometrics, Scientometrics, and Informetrics refer to component fields related to the study of the dynamics of disciplines as reflected in the production of their literature (Hood & Wilson. 2001).

Scientometrics, the first leading journal on scientometrics, was launched in 1978. The journal boldly presented Scientometrics as an independent field. Since then, Scientometric literature has grown considerably. According to the prior studies, most Scientometric research has been published by larger countries, such as the United States, Canada, the
United Kingdom, France, Germany, Japan, Netherland, China, and India (Moogshali, Alijani, Karami, & Khasseh. 2011, Schubert. 2002).

The terms Bibliometrics and Scientometrics were almost simultaneously introduced by Pritchard and by Nalimov and Mulchenko in 1969. While Pritchard explained the term Bibliometrics as “the application of mathematical and statistical methods to books and other media of communication”, Nalimov and Mulchenko defined scientometrics as “the application of those quantitative methods which are dealing with the analysis of science viewed as an information process”.

The Bibliometrics is a well established part of library and information science research (Narin and Moll 1977; White and McCain 1989; Wilson 1999), and the use of it in libraries for e.g. collection development and management is also a well-known practice, not the least in relation to digital library development (Dikeman 1975; Jimenez-Contreras et al. 2006; Kishida 1995; Nicholson 2003). Academic libraries applying Bibliometric and Scientometric methods and techniques for research evaluation purposes, however, is a more recent phenomenon (Ball and Tunger 2006; Brennan 2008; Carlsson and Hällgren 2008; Gerritsma. 2010).

LAWS OF BIBLIOMETRICS

One of the main areas in Bibliometric research concerns the application of bibliometric laws. The three commonly laws used in Bibliometrics study are: Lotka’s law of scientific productivity, Bradford’s law of scatter and Zipf’s law of word occurrence.

This study focuses on Bibliometric analysis of epidemiology based on Web of Science database. The purpose of this study is to evaluate the research activity of the countries on epidemiology development and their research output. Bibliometric studies are applied to identify the pattern of publication, authorship, citations and secondary journal
coverage. These factors can give an insight into the dynamics of the area under consideration, hoping this consequently leads to better organization of information resources which is essential for systematic use of available information (Braun. T, Bujdoso. E, Schubert. A. 1987). The aim is to integrate the cognitive or intellectual structure of research with a view to appraise the relations among the authors, institutions, journal article and as a means of assisting the peer review procedure.

The performances of analyses, based on publication have received wide attention. It is used to assess the research performance of countries, universities, department or persons (Noyons. E.C.M, Moed. H.F and Luwel. M.1999).

The study of author productivity is relatively important aspect. The performance of scientists could be viewed in terms of their productivity. Productivity is referred to as the quantity of research output and publication that a researcher has done. It is often measured by counting the number of papers, books, reviews and reports produced by a scientist over a period of time. Productivity of a scientist has been linked to various factors such as subject specialization, institutional rank, support and financial rewards.

The present study focuses on the publication relation to epidemiology research based on Web of Science database issues in bibliometric on the basis of country wise analysis. In general bibliometric indicators play an important role in science policy decisions and in evaluation of research performance. It is observed that bibliometric indicators help to evaluate the research performance of individual scholar and research groups.

This study illustrates the research status of the individual countries, the most focused area of specialty (themes/issues), the most active countries in conducting research and the impact of this research on epidemiology development. This would benefit the academic researchers, policy planners, funding agencies and other professional associations and
organizations. The resulting database of this work would be a ready reference for the researchers to decide upon their future areas of researches and it also helps them to avoid duplication of research efforts. This type of studies would reveal geometric properties of the data distribution and searching for clusters and thereby become a spontaneous and stimulating interactive process.

**WEB OF SCIENCE (WoS)**

Web of Science (WoS) is a bibliographic database that covers the publications of about 12,000 journals in the sciences, the social sciences, and the arts and humanities. Each journal in WoS is assigned to one or more subject categories. These subject categories can be interpreted as scientific fields. There are about 250 subject categories in WoS. Some examples are Astronomy and Astrophysics, Economics, Philosophy, and Surgery. Multidisciplinary journals such as Nature, Proceedings of the National Academy of Sciences, and Science belong to a special subject category labeled Multidisciplinary Sciences. Each publication in WoS has a document type. The most frequently occurring document types are article, book review, correction, editorial material, letter, meeting abstract, news item, and review.
Reference


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