

Chapter 2

Genomics Applications in Public Health

ABSTRACT

In the transformation of health, through genomics applications in public health, many of the disease burdens which were incriminated for low life expectancies are being scientifically challenged. However, efficient environmental sanitation played a major role in the eradication of hitherto life threatening vector-borne diseases. However, the outbreaks of emerging infectious diseases and chronic and degenerative conditions pose new challenges. Dr. Zerhouni, the former director of the National Institutes of Health meticulously identified the aging phenomenon. Health disparities and emerging and re-emerging infectious diseases and emerging non-communicable (obesity) as the precursors new health problems which demand innovative strategies. He has suggested, as key of the components of the future paradigm, the four Ps which comprise predictive, personalized, preemptive and, participatory techniques to combat national and international public health challenges. This innovative approach is currently being utilized to preempt the onset of many chronic and degenerative diseases.

INTRODUCTION

Having read this chapter, the learner should be able to:

- Provide a conceptual framework for innovations, and capacity building in genomic technology
- Assess existing infrastructures for genomic technology
- Assess the background of genomic workforce
- Specify genomic applications with reference to genetic diseases, and
- Develop logic model to integrate genomics into public health centers.
- Discuss the genomic characteristics of BRCA1 and BRCA2 mutations
- Advocate the adoption of the Health Belief Model for the dissemination of health education worldwide to prevent the onset of breast cancer in women
- Access pertinent sources of health information about breast cancer and assistance for at-risk patients in developed and developing nations

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- Emphasize the importance of health education of the public using female humanitarian with high international profile to mitigate the impact of breast cancer
- Accentuate the impact of precision (P4) medicine in preventing and managing the lethal consequences of breast cancer

GENOMIC APPLICATIONS IN PUBLIC HEALTH

Based on epidemiological trends and scientific clinical observations, genomics is bound to play significant role in public health. Genomics as the study of the entire human genome is poised to have numerous role not only on public health but create the incipient stage of scientific revolution which is about to improve clinical medicine while as well accentuate the relevant of preventive disciplines and behavioral interventions in the clinical management of the health problems of healthcare consumers worldwide. Genomics is a branch of biological science which focuses on the development and application of very effective mapping, sequencing and bioinformatics computational techniques. Scientists trained in genomics and other molecular biologists apply large-scale molecular techniques for linkage analysis, physical mapping, and sequencing of genomes to generate detailed data which are subjected to analysis using high-speed computer facility.

The new international tools of genomics include the high-throughput deoxyribonucleic acid (DNA) sequences, genotyping machines and large-scale DNA arrays (DNA chips). These scientific tools have the capacity to analyze thousands of genes promptly and accurately. These devices can be used to study the cells of virtually all living organisms. To reiterate a typical genome is the entire collection of chromosomes which are present in the nucleus of each cell of an individual organism.

In nations where there are adequate technological resources, genomic science continues to revolutionize public health as we move into the 21st century. As a result of the numerous milestone accomplished in sequencing the human genome, public health career is steadily becoming a pre-eminent preventive medicine discipline. Evidenced-based public health activities are now obvious in neonatal screening for genetic, chronic and degenerative diseases. Besides, genomics now plays significant impact in environmental health in enabling scientists to identify microbial agents which can be applied to identify microbial agents for carbon dioxide sequestration which is a predominant greenhouse gas. Two decades into the 21st century, the highly industrialized nations are now able to comprehensively utilized the anticipated benefits of genomics in molecular medicine, microbial genomics, risk assessment, bioarcheology, anthropology, evolution, and human migration. Innovative DNA identification process are now being retroactively applied to free incarcerated prisoner who were present in heinous crime scenes but had nothing to do with specific crimes. Genomics technologies are now being applied to revolutionize agriculture, livestock breeding and bioprocessing

We must reiterate that the completion of the human genome sequencing (HGS) sponsored by the U.S. Department of Energy and the National Institutes of Health (NIH) is comparable to the feat associated with theory of relativity propounded by Albert Einstein in the 20th century. In 1915, Einstein completed his general theory of relativity, a theory of gravity which demonstrates more precision than that of Sir Isaac Newton. Besides, Einstein also illustrated that photoelectric effects involving ejection of electrons from metal by action of light can be explained, if light has particle nature as well as wave characteristics. These discoveries have many and varied implications in engineering, physics, electronics and our understanding of the global planetary systems (Einstein, 2000). However, the contrast

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