

Food and Nutrition Report

The Role of the Food and Nutritional Sciences in Examining the Determinants of Health

Melissa Johnson

Department of Food and Nutritional Sciences, Tuskegee University

***Corresponding author:** Melissa Johnson, PhD, Department of Food and Nutritional Sciences, Tuskegee University, Tel: +1-334-727-8625; Fax: +1- 334-727-8493; E-mail: mjohnson@mytu.tuskegee.edu

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Abstract

Typically the food and nutritional sciences have been reviewed and viewed in isolation in regard to human health. However, the food and nutritional sciences are both dynamic and interactive disciplines that transcend the traditional labels often employed in an attempt to explain how we are what we eat. Although casually joined in a colloquial sense, the food and nutritional sciences are highly integrative and relies on understanding and applying concepts across many disciplines within the life sciences, social sciences and integrative biosciences. More recently, the contagious interest in functional foods has opened the door for the food and nutritional sciences to be applied within the areas of pharmacology, genomics, metabolomics, proteomics, nutrigenomics, and nutrigenetics- to name a few. In addition to capturing the relationship between food (i.e. nutrients) and subsequent biological structure and physiological function, the food and nutritional sciences are on the forefront in the battle to promote health, prevent disease and mitigate health disparities. This abbreviated synopsis provides a snapshot of the role of the food and nutritional sciences in understanding human health, with an emphasis on the multifaceted nature of the field and its potential application to bridge the gap from farm to table, as well as from the laboratory to the lifespan.

Keywords: Food science, Nutritional science, Human health, Disease.

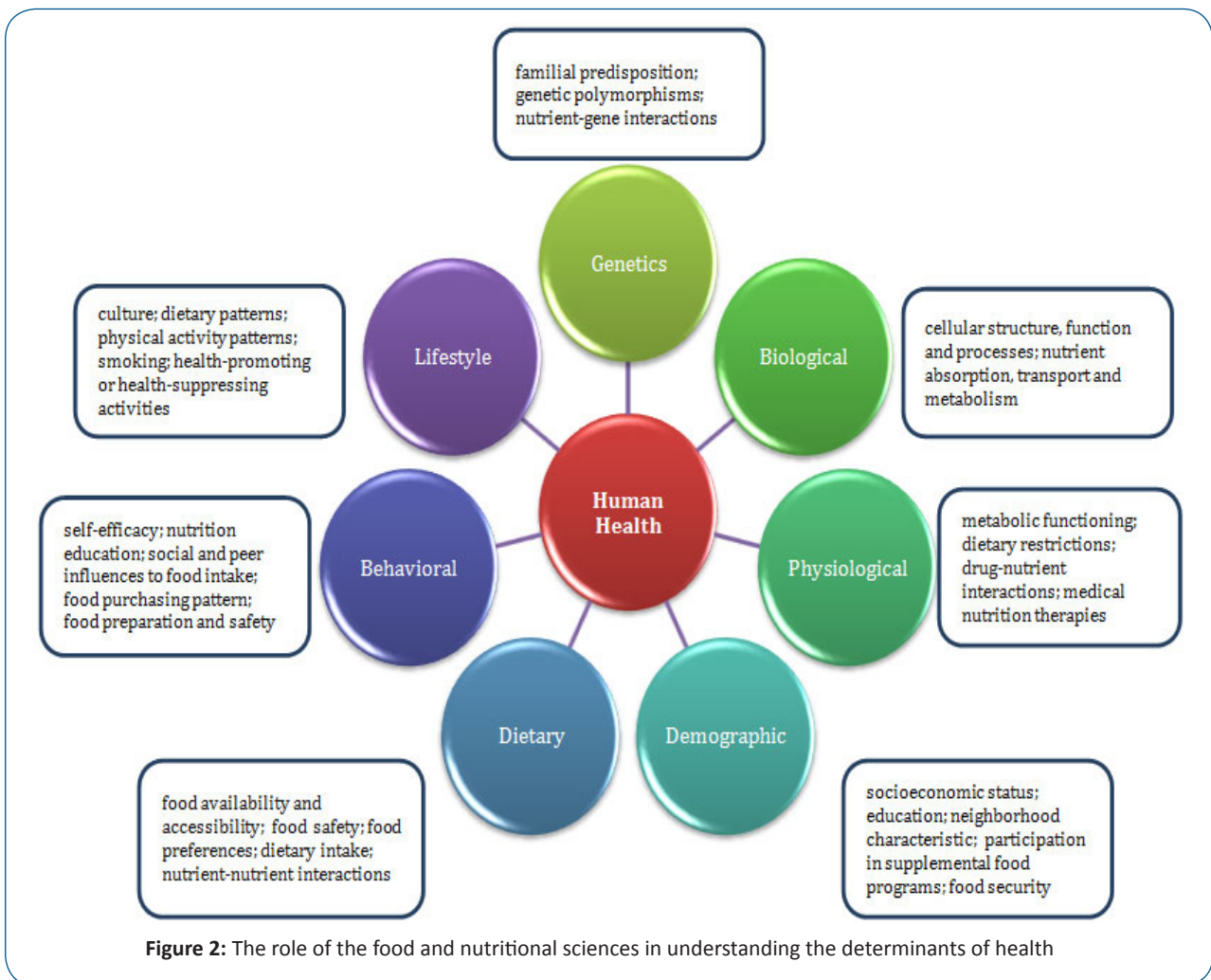
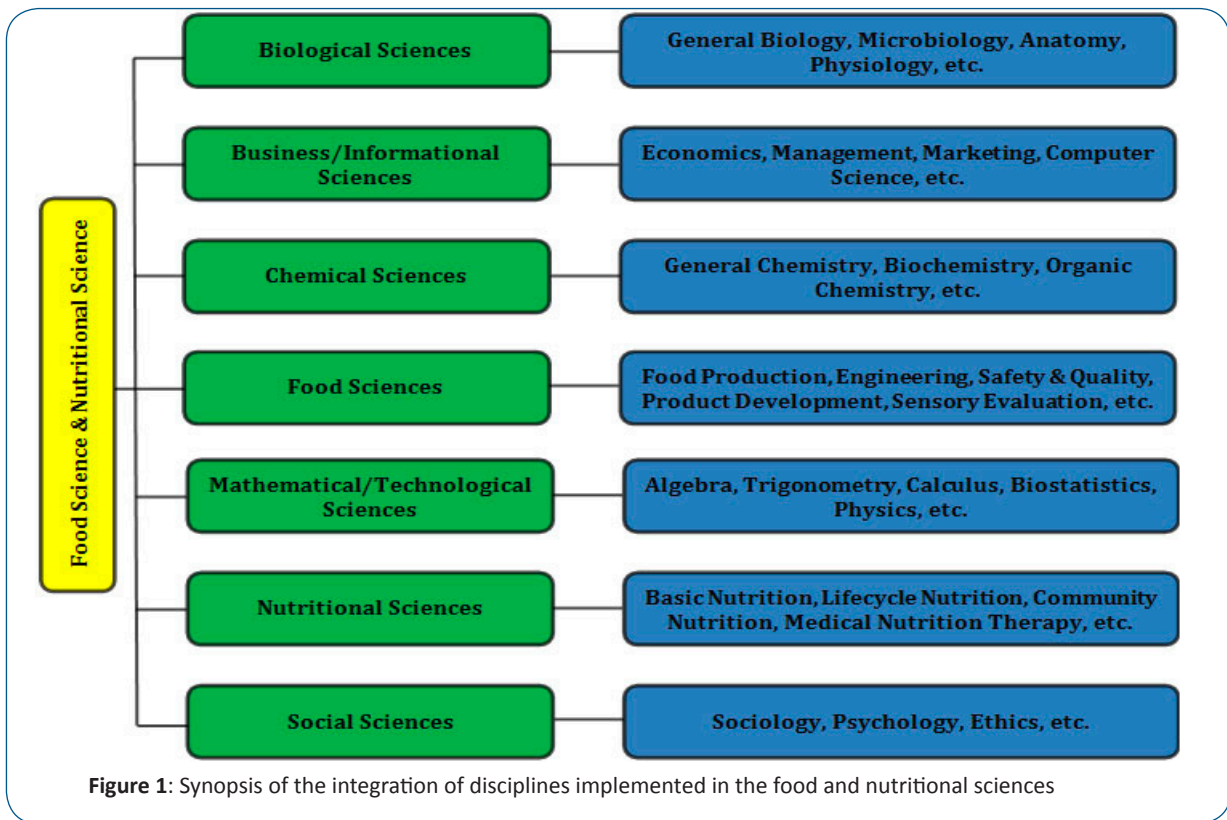
Of all the copious academic disciplines, the food and nutritional sciences are among the few that are truly integrative and inclusive in nature, theory and practice. Within the food and nutritional sciences there are an extensive array of concentrations that investigate the physical, chemical and sensory characteristics of food, as well as the biological, physiological and metabolic responses to food. In addition, the physical, psychological, social, economic, environmental and cultural lobbyists to food intake are examined within the food and nutritional sciences. Broadly included in the food and nutritional sciences are more specific areas of study such as food science, food engineering, food safety (e.g. food microbiology), nutritional science, dietetics, and public health nutrition, with core nutrition knowledge being acquired through the convergence, connection and interface of many

disciplines [1]. Further, food science assembles concepts from a wide range expertise from plant science [2] to statistics [3].

Curriculum prerequisites to studies in the food and nutritional sciences heavily rely on areas of STEM (science, technology, engineering, mathematics) exposure to provide basic, foundational and advanced understanding of biology, biochemistry, chemistry, anatomy and physiology, microbiology, sociology, psychology, statistics, and in some cases physics and management (Figure 1). The more advanced ranks of the food and nutritional sciences encompass genetics, public health, epidemiology, nutritional genomics and nutrigenetics. Moreover, the importance of fundamental and advanced concepts in the food and nutritional sciences has been incorporated into other curricula and areas of study such as medicine [4-6], nanotechnology research [7], statistics and bioinformatics [8].

An exciting and emerging concept within the food and nutritional sciences is nutrigenomics, which examines the relationship between the biomolecular profile of food (e.g. macromolecules, micromolecules, bioactive compounds, antioxidants, etc.) and it's ultimate effect on the genome of the consumer (e.g. transcriptome, proteome, metabolome, gene expression, etc.) [9]. Foundational and advanced knowledge and application of these concepts offer significant insight into the role of the food and nutritional sciences in understanding human health (Figure 2).

The importance of diet and adequate nutrition throughout the life cycle in promoting health and preventing disease has long been recorded throughout the history of mankind. In addition to functioning as a source of nutrients, food occupies an important role within the family unit that transcends both the individual and society- and ultimately influences the nutritional status and health of the individual and the global community [10-15]. Foods have long been promoted as biologically functional agents with cardio-protective, chemopreventive and medicinal capabilities [16-20]. Characterized as "functional foods", these foods are critical in preventing disease and promoting optimal health [21]. The awareness and acceptability of functional foods depends on factors such as beliefs, stress, familiarity with such foods and perceived health benefits [22-24]. The nutritional sciences are critical in understanding the physiological and social determinants



of food intake and equally important are the food sciences, which emphasize food product development, packaging, marketing and safety.

In an attempt to more clearly understand the health of an individual one must embrace the sciences of food and nutrition. With the human lifespan projected to steadily increase in parallel with increases in the global population, sufficient foods, with adequate nutrients to protect and promote longevity as well as quality of life are needed. Unfortunately, one of the consequences of longevity is an increased susceptibility to disease. Food and nutritional scientists are critical in meeting the challenges presented by the external (e.g. food availability, accessibility, safety) and internal (e.g. cellular and subcellular) environments in health promotion and disease prevention. Therefore a translational approach is needed to protect public health, which translates science-based evidence while simultaneously transcending cultural, economic and other demographic characteristics to ensure the health and well-being of all. Besides promoting health, preventing disease and enhancing longevity-while optimizing the quality of life, this translational approach is critical in mitigating health disparities such as diet-related and environmentally-induced chronic diseases, which significantly contribute to morbidity and mortality.

The food and nutritional sciences can further help us to understand the influence of food on disease risk, pathogenesis, progression and outcomes in obesogenic, carcinogenic, atherosclerotic, atherogenic, toxic and teratogenic environments. As vibrant and dynamic fields, the food and nutritional sciences offer cutting edge in vitro, in vivo, clinical and applied evidence of the physical, social, cultural, psychological and biological determinants of health. Emerging leaders within these disciplines receive inter- and intradisciplinary training that prepares them to address the critical challenges to optimum health and well-being. Although not exhaustive, this synopsis highlights the complexity of the food and nutritional sciences and their importance in understanding human health.

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