

Chapter 22

Geographic Information System (GIS) Modeling Analysis and the Effects of Spatial Distribution and Environmental Factors on Breast Cancer Incidence

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ABSTRACT

Breast cancer is a public health problem among women in the United States. According to the American Cancer Society, about 40,290 women in the United States are expected to die in 2015 from breast cancer. This chapter contains an analysis of the breast cancer distribution in the United States by comparing the spatial distribution of breast cancer cases against physical environmental factors using geographic information system (GIS). Results show that the exposure to some spatial environmental factors seems likely to have a major impact on the overall trends in breast cancer rates. Moreover, the possibility to develop cancer is existing naturally through the environment factors.

INTRODUCTION

Breast cancer is a major health issue in all countries affecting thousands of women (Tazzite et al., 2013; Dube & Gupta, 2015). So far its cause(s) are unknown and the national and international strategies to reduce its morbidity and mortality levels are based on early detection of cancer through screening and treatment according to clinical guidelines. Thus, knowledge of which women are at risk and why they are at risk is therefore essential component of disease prevention and screening. Researchers from

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the International Agency for Research on Cancer (IARC) and the World Health Organization (WHO) reports that globally breast cancer might contribute to the greatest burden on women's health when compared to other cancer sites (World Health Organization, n.d.). In 2015, an estimated 231,840 new cases of invasive breast cancer are expected to be diagnosed in women in the United States, along with 60,290 new cases of non-invasive (in situ) breast cancer (Siegel et al., 2015). However, all locations are not equal for breast cancer risk and thus support a major role of the geography in breast carcinogenesis (Akram & Nanna, 2003).

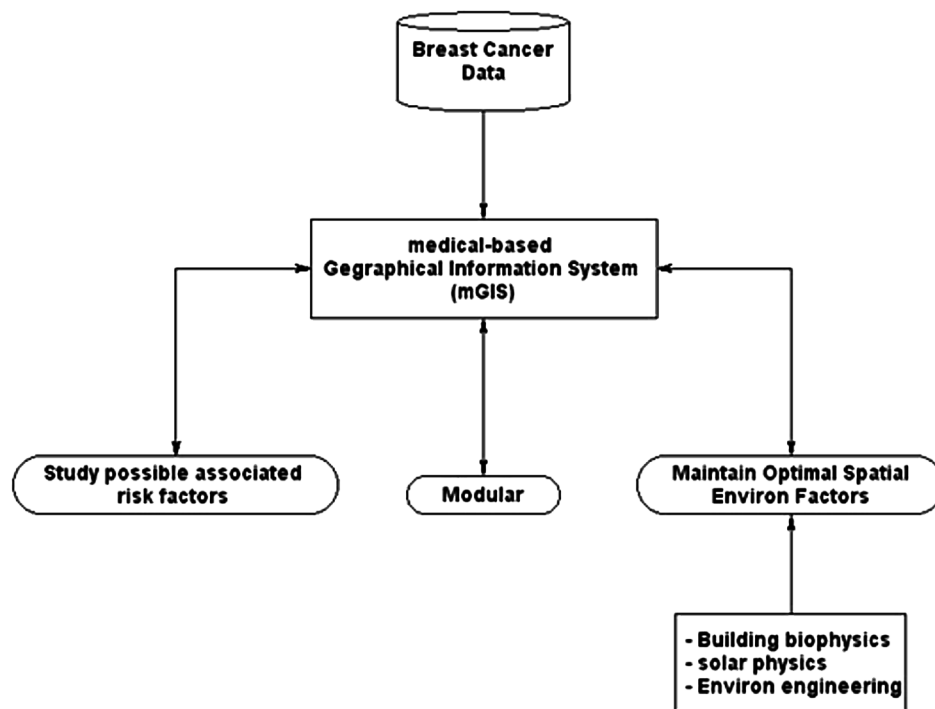
The purpose of this work is to provide a more detailed analysis of the breast cancer distribution in the United States by comparing the spatial distribution of breast cancer cases against physical environmental factors using Geographic Information System (GIS) (Figure 1). Further, it gives background information to the GIS and its applications in health-related research.

BACKGROUND

Breast Cancer Facts/Spatial-Based Patterns

Previous reports have shown that the Northeast United States has a 16% higher breast cancer mortality rate than the rest of the country (Kulldorff et al., 1997). The probability of breast cancer risk is not equal for all locations which indicate that geography plays a very important role in the etiology of breast cancer.

Figure 1. Medical-based GIS



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