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A Probabilistic Encounter to Illnesses Risk Analysis have used Smog and Storms

Wing Du*

Department of Environmental Science, University of California, San Diego, USA

Abstract

Meteorological conditions and air pollutants are recognised as important for human health, with mortality and morbidity of certain diseases linked to abrupt climate change or air pollutant concentration. Environmental factors have been identified in the literature as risk factors for chronic diseases such as ischemic heart disease. However, there is no likelihood evaluation of disease occurrence probability due to environmental factors. The susceptible group was defined as people aged 51-90 years who were free of ischemic heart disease between 1996 and 2002. A risk information system was built using a Bayesian conditional logistic regression model based on a case-crossover design and applied to data from three databases in Taiwan: air quality variables from the Environmental Protection Administration.

Keywords: Ischemic • Meteorological • Disease • Protection

Introduction

Air pollution and weather conditions have been linked to an increase in the incidence and mortality of respiratory and cardiovascular diseases. Several studies have found that exposure to air pollutants has a negative impact on human health, as well as a link between disability-adjusted life years and ozone levels. Based on data from 28 studies, a positive relationship between various air pollutants (ozone, particulate matter, NO2, SO2, CO, etc.) and cardiorespiratory disease was discovered in a meta-analysis. This association is not limited to vulnerable populations such as children and the elderly; it affects people of all ages and is linked to all-cause mortality. The harmful effects of ozone exposure are typically depicted as a pyramid, with severe outcomes such as death or hospital emergency department visits at the top and less severe outcomes at the bottom [1].

The increased incidence and mortality from respiratory and cardiovascular diseases has been linked to air pollution and weather conditions. Several studies have found that air pollution has a negative impact on human health, as well as a link between ozone levels and disability-adjusted life years. A meta-analysis of 28 studies found a positive relationship between various air pollutants (ozone, particulate matter, NO2, SO2, CO, etc.) and cardiorespiratory disease. This link does not only affect vulnerable populations like children and the elderly; it affects people of all ages and is linked to all-cause mortality. The harmful effects of ozone exposure are commonly represented as a pyramid, with severe outcomes such as death or hospital emergency department visits [2].

To reduce the negative effects of air pollutants and meteorological parameters on health, strategies and responses must be developed. Such a formulation may be influenced by differences in susceptible populations, age groups, disease types, and factor effect sizes. Studies evaluating these factors and health events in a large population can aid in the development of a statistical model that can be used to quantify the degree of heterogeneity and impact and design a system of response recommendations. Although previous research has documented environmental factors that can have an impact on health conditions, it is still unclear how the risk of disease events can be assessed stochastically [3].

Literature Review

To provide a quantified evaluation of disease occurrence, we focused on the likelihood estimation of the first attack of ischemic heart disease associated with both air pollutants and weather conditions in this study. Specifically, we want to know whether the risk is greater than a certain threshold. Ischemic heart disease (IHD), also known as coronary artery disease (CAD), is a leading cause of death worldwide. We considered a case-crossover study design because this disease is associated with many confounders and risk factors, such as high blood pressure, diabetes, smoking, and a sedentary lifestyle. Furthermore, the case-crossover matching design allows diseased and non-diseased subjects to be in similar living environments if the weather is reasonably stable in the study area [4].

To predict the disease's risk, a Bayesian conditional logistic regression model was developed. We used meteorological factors, air pollutants, seasonal factors, and lag effects as covariates in this risk prediction model, and we built separate models for the three different geographic regions. To predict the risk of ischemic heart disease, the posterior means and 95% credible intervals of the regression coefficients based on Bayesian conditional logistic regression were calculated. Minimum temperature, maximum temperature, average relative humidity, and maximum relative humidity were all linked to ischemic heart disease in Northern Taiwan. In addition to the effects on the day of onset, we found lag effects of environmental factors one day and three days before disease onset [5].

Discussion

The issue of choosing a reference time in case-crossover studies was discussed. According to the authors, if there is always a time trend in exposure and reference before the index time, the estimate may be biased. In this study, neither pollution nor meteorological factors show an increasing or decreasing pattern, whereas temperature clearly shows seasonal trends. As a result, we fitted the seven-day temperature with a sine function with a period of 365.25 (days) and predicted the seven-day temperature difference. To eliminate bias caused by seasonal changes in temperature, the temperature in the control window was adjusted by this predicted seven-day temperature difference [6].

***Address for Correspondence:** Wing Du, Department of Environmental Science, University of California, San Diego, USA, E-mail: wingdu@gmail.com*

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The use of Bayesian prediction provides a stochastic risk evaluation. In other words, the risk of being in various alert intervals can be quantified in terms of probability, allowing individuals or authorities to determine whether the risk is high enough to warrant action. This probability is determined by the definition of alert intervals based on the critical values determined in Equation. These values are not typically uniform across different areas/countries; they frequently vary depending on the local environment. The Bayesian prediction approach provides this flexibility and is simple to apply when different scenarios are considered [7].

Conclusion

The case-crossover design was used in this study, and Bayesian conditional logistic regression was used to build a disease risk prediction model by integrating three databases with patient data, meteorological factors, and air pollutants data. We investigated the link between environmental factors and ischemic heart disease. The findings indicate that environmental risk factors differ across regions and seasons. Ischemic heart disease is associated with minimum temperature, maximum temperature, average relative humidity, maximum relative humidity, and average O3. We observed the lag effects of environmental factors in addition to the effects on the day of onset. Maximum temperature and average relative humidity (day 0) were only significantly associated with ischemic heart disease in Northern Taiwan and Central and Southern Taiwan; maximum relative humidity (day 0) was only significantly associated with ischemic heart disease in Central and Southern Taiwan.

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Conflict of Interest

There is no conflict of interest by author.

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