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Factors affecting the health of residents in China: A perspective based on the living environment

Yuhuan Sun [a,*], Jixia Shang [b]

[a] School of Statistics of Dongbei University of Finance and Economics, 116025 Dalian, Liaoning, PR China
[b] Graduate School of Dongbei University of Finance and Economics, 116025 Dalian, Liaoning, PR China

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ABSTRACT

Residents' health is an important factor affecting social development and harmony. Based on 2010 China Family Panel Studies data of the Institute of Social Science Survey, Peking University and using a multi-classification logit regression model, we analyze the factors that affect the health status of residents in China. These factors include environmental pollution, which is a particularly important factor. Our study found that the impacts of residents' characteristic variables, external living environment, and living habits vary. As residents age, their health status deteriorates. For the *General*, *Less healthy*, and *Unhealthy* groups, an income of less than CNY 10,000 significantly affects health status; however, when their income is greater than CNY 10,000, it no longer has a significant effect. For the *Very unhealthy* group, this particular threshold value is CNY 3000. At least one of urban–rural classification and residence registration status is significant, indicating that the urban–rural dual structure as well as the household registration system significantly affects residents' health status. However, the direction of this effect is uncertain. Cooking water significantly affects the *Less healthy* and *Unhealthy* groups, and tap water is more conducive to health. Polluting enterprises within a radius of five kilometers mainly affect the *Unhealthy* group, but the direction of its impact is contrary to expectations. Smoking and drinking significantly affect the health status of the *General*, *Less healthy*, and *Unhealthy* groups. However, the direction of their impact was contrary to expectations. For the *Very unhealthy* group, drinking has a significant impact on residents' health status, but the direction of the impact was again the opposite of what we expected. Smoking has no significant impact on the health status of this group. Exercise significantly affects the *Less healthy* and *Unhealthy* groups, but its influence has no obvious trend. Our study shows that living habits have a smaller influence on residents' health status.

1. Introduction

People have achieved significant economic progress by utilizing and transforming nature, but the ecological destruction and environmental pollution caused by these activities are posing a serious threat to the current survival and development of society. Perhaps the most direct expression of this threat is the harm it does to people's health.

Industry has played a crucial role in the post-war reconstruction of Western countries as one of the pillars of social progress. However, heavy metals, waste gas, and waste water generated in the process of industrial development have posed a major threat to people's survival and health (Schwarzenbach et al., 2010). In developing countries, 8% of the diseases are the results of unsafe drinking water. Moreover, unsafe water causes the deaths of at least 20 million people worldwide each year. Therefore, water pollution is regarded as "the world's number one killer". In addition to water pollution, air pollution has also become a serious global problem. In some parts of the world, haze, dust storms, and other inclement weather appear to be almost permanent. A prime example is the fog in the city of London, which is very much the product of industrial pollution. China, as a third world country, has long been adopting a rough development model, which has inevitably led to serious environmental damage in the process of socioeconomic development. Although China has realized the importance of the environment, some environmental pollution is irreversible, and the resulting harm to residents has become increasingly prominent.

People tend to focus on infectious diseases and pay less attention to diseases or harm caused by environmental pollution. In fact, the detrimental effects of environmental pollution on residents'

* Corresponding author. Tel.: +86 13704263150; fax: +86 411 8471 1892.
E-mail address: yhsun602@163.com (Y. Sun).

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health are rapidly increasing, and it is necessary to assess these impacts (Cesaroni et al., 2012). In addition, pollution from enterprises close to the residential areas has a more direct and serious impact on residents' health. These enterprises include non-ferrous metal smelting, steel processing, ferroalloys, waste incineration, power generation, chemical, papermaking, electroplating, printing, and dyeing factories. In China, air pollution is causing respiratory diseases, and the number of related deaths is increasing. For example, in areas with serious air pollution in Chongqing, nearly 50 per 100,000 people die of lung cancer every year, which is 4.7 times greater than the number in relatively clean areas. Other cities with a high level of air pollution include Taiyuan, Beijing, Urumqi, Lanzhou, Jinan, Shijiazhuang, Qingdao, Guangzhou, and Shenyang, and they too have higher incidences of lung cancer.

Environmental degradation is going to have an increasingly severe effect on human civilization, and hence, environmental problems are everyone's problem, including governments, businesses, and residents. Thus, this study on environmental pollution and other factors affecting people's health status has an important practical component. The remainder of this paper is organized as follows. In Section 2, we review the related literature. In Section 3, we introduce the variables selected and data source. In Section 4, we present detailed results and discussions, and in Section 5, we present our conclusions and provide some practical recommendations.

2. Literature review

After Grossman (1972) proposed the concept of healthy human capital and the health needs model, research into residents' health issues has become increasingly popular. Current research on health issues focus on the effects of specific factors on people's health status from a medical point of view. Reid et al. (2010) utilized the SF-36[1] and WBQ-12[2] questionnaires to study the effects of aerobic exercise and resistance training on the health status of patients with diabetes. Hawton et al. (2011) used the EQ-5D[3] and SF-12[4] questionnaires to obtain data to study the effects of social isolation of the elderly on their health and health-related quality of life, mainly using multiple regression analysis. Chrystyn et al. (2013) used correlation and regression analyses to study the relationship between the health status, compliance behavior, and the degree of satisfaction with their inhaler of patients with chronic obstructive pulmonary disease. Their data was obtained using questionnaires and Likert scales.

These studies are characterized by their use of questionnaires and a focus on only one or two factors that affect health status, and most of their samples include patients suffering from a particular disease. Furthermore, they used quantitative research methods, such as correlation analyses or regression analyses, and focused on measuring people's health from the perspective of clinical medicine.

In addition to these variables, many other factors affect the health of residents. In recent years, environmental pollution has become increasingly serious, and the impact of environmental factors on the health of residents can no longer be ignored. A number of studies have investigated the effects of environmental pollution and hazards on health, including the impact of indoor air pollution on health (Chen et al., 1990; Bruce et al., 2000) and of outdoor pollution on health (Kim, 2004). These studies analyzed the effects of environmental pollution on adult health, pregnant women (Maroziene and Grazuleviciene, 2002), children (Kim, 2004), and even on the human genome (Perera et al., 1992). López-Abente et al. (2012) studied the relationship between industrial pollution and pleural cancer mortality. They used data from a town in Spain between 1997 and 2006 to estimate the effect of pollution on mortality. Using a Bayesian Poisson regression model, they found that when there are more factories or chemical plants nearby (within a radius of two kilometers), residents have a greater probability of contracting pleural cancer. Environmental pollution has significant adverse effects on people's health status. However, current studies on these effects tend to be limited by a lack of extensive micro-database support or controlling variables. For example, Chen et al. (2013) focused their study on the city of Araihazar; Cordier's (2013) study included only male respondents; and Donders et al. (2012) investigated only employees in a university. Therefore, we have attempted to rectify these limitations in the present study. Based on the existing literature, and considering the availability of data, this study introduces the industrial environmental pollution variable, *polluting enterprises within a radius of five kilometers*. We then study the factors that affect the health status of residents in China in conjunction with other characteristic variables. In addition, owing to the cumbersome and non-uniform health index system, we adopt a self-rated health status system based on the available data.

3. Selection of indexes and theoretical assumptions

3.1. Source of data

The data in this study are from the China Family Panel Studies (CFPS), which are funded by the Peking University 985 project and conducted by the Institute of Social Science Survey (ISSS). The CFPS aims to reflect China's social, economic, demographic, educational, and health changes, as well as provide data for academic research and public policy analysis by tracking and collecting data at the individual, family, and community levels. The CFPS database of the year 2010 covers 25 provinces, municipalities, and autonomous regions, and includes complete interviews with 14,960 families, 33,600 adults, and 8990 children.[5]

3.2. Variable selection and data preprocessing

This study used SAS software to extract information associated with adults' income, age, and residence registration status, as well as other information from the village and family database using the CFPS2010 database on adults as an entry point. The results were then merged, yielding an initial sample of 33,600 observations.

We used the self-rated health status as the dependent variable, which was divided into five groups: *Healthy*, *General*, *Less healthy*, *Unhealthy*, and *Very unhealthy*. External variables were selected based on the living environment, which included three classes and their characteristics, such as expanded lifestyle categories. Three aspects were considered as independent variables: (i) external living environment, (ii) characteristics, and (iii) living habits. Since the dependent variable is a multi-category variable, we adopted a multi-nominal logistic model for quantitative analysis.

External living environment variables include the residence registration status, urban classification, distance from the nearest bus station, time spent traveling to the provincial capital, cooking water, and the presence of mineral resources in the area. After considering existing literature and China's unique urban–rural dual

[1] SF-36 refers to Short Form 36 Health Survey Questionnaire.
[2] WBQ-12 refers to Well-Being Questionnaire-12.
[3] EQ-5D refers to EuroQol-5 Dimensions.
[4] SF-12 refers to Short Form 12 Health Survey Questionnaire.

[5] From the Introduction of the CFPS on ISSS, http://www.isss.edu.cn/index.php?catid=17%3Famp;action=index.