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Correlation Analysis of Urban Environment Quality and Medical & Health Service

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Abstract

The rapid expansion of human beings and the excessive abuse of resources have gradually appeared great impact on the environment on the Earth, such as climate warming, thinning ozone layer, air pollution, water pollution, sea level rise (melting glacier caused by increasing surface temperature), rapidly decreasing tropical rain forest, and constantly reducing biodiversity. Concerning about the environment damage resulted from the economic development in various countries, the relationship between economic development and environment becomes an important issue. Correlations Analysis of urban environment quality and medical & health service is therefore preceded in this study. Total 289 cities (municipal districts) in China are taken as the research objects; basically, all cities in the nation are covered. The data source is the statistical communique and statistical yearbook of the cities. The research results are summarized as below. 1. Urban ecological management presents positive correlations with medical resource. 2. Urban pollution management shows positive correlations with medical resource. 3. Urban ecological management reveals positive correlations with medical investment. 4. Urban pollution management appears positive correlations with medical investment. Suggestions according to the results are proposed at the end, expecting to explain the promotion of urban environment quality and medical & health service in China.

Keywords: environment quality, urban pollution management, medical resource, health service

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INTRODUCTION

In the huge universe, the white atmosphere, the blue ocean, and the reddish brown land on the Earth comprise the beautiful and charming planet. Nevertheless, the rapidly exponential population growth results in great pressure on the Earth. The rapid expansion of human beings and the excessive abuse of resources gradually appear huge impact on the environment on the Earth, including climate warming, thinning ozone layer, air pollution, water pollution, sea level rise (melting glacier caused by increasing surface temperature), rapidly decreasing tropical rain forest, and constantly reducing biodiversity. The rapid construction and development and economic growth in many countries, after Industrial Revolution, have worsened the problem of pollution. Greenhouse effect refers to fossil fuel, which is often utilized in economic activity, especially carbon dioxide and nitrogen oxides emitted by the combustion of petroleum and coal and the largely used chlorofluorocarbons after Industrial Revolution, largely increasing the emission of greenhouse gas. In consideration of the environmental damage accompanied with the economic development in various nations, the relationship between economic development and environment becomes a primary issue. From existing studies, most of them focused on the relationship between environment quality and health, but not directly researched the influence mechanism between the development of medical & health service and environment quality; they simply discussed the policies to release environmental health risks. For this reason, this study attempts to experiment the interaction between environment quality and medical & health service in China, based on the past research. Structural Equation Modeling is utilized for displaying the function direction and degree of factors in environment quality and medical & health service.

LITERATURE REVIEW

Environment Quality

Environment is defined as various natural and social factors surrounding the space of crowds and directly or indirectly affecting human life and development (Guo et al. 2014). There are various definitions for urban environment; the simplest one is environmental pollution, i.e. environmental damage, while the

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commonest external performance contains building design, conservation, landscape, open space, green land, and plan practice. Broader definitions cover traffic safety, building conditions, and public facilities, and sustainable development, such as resource conservation, public participation, cultural heritage, and social structure, could be included (Hsu et al. 2012). Ma et al. (2013) indicated that all factors related to life, including physical facilities and indirect conditions and background, were covered. Sun et al. (2012) classified environment quality into human environment and natural environment. The former contained economic environment, social environment, cultural environment, spatial environment, and other environment, while the latter included organic composition and inorganic composition. Balasubramanian et al. (2012) regarded environment quality as real environment (e.g. water quality, air quality, waste disposal, noise, green land, and open space), living environment, entertainment opportunities, building and landscape aesthetics, and urban comfort (pleasure, harmony, standardization). Miletto and Lindow (2015) inferred urban environment as living environment (inside residence and outside residence), work environment (business environment and industrial environment), and other environment.

There are plenty of factors in environment quality; one is the original environmental conditions in the beginning of the city development, and the other is the environmental conditions gradually formed in the city development process. The function of such two factors comprises the current living environment. Favorable natural and artificial environments are the security of health and survival. Referring to Chang and Wang (2015), the following dimensions are used in this study.

(1) Urban ecological management: The governed and maintained environment quality in the original environmental conditions in the beginning of the city development.

(2) Urban pollution management: The environment quality resulted from environmental pollution in the city development process.

Medical & Health Service

From general ideas, Mao et al. (2015) considered that medical & health service contained the factum juridicum of diagnoses and treatments of diseases and injuries, judgment after the treatment, and convalescence guide. Han and Zhao (2012) pointed out the specific content of medical & health service, including inquiry, auscultation, and examination for diagnoses, injection, medication, topical application of drug (traumatic drugs), surgery, and rehabilitation for treatment, and track and inspection for judging the treatment. However, so many types of medical & health service could not be covered by traditional ideas because of the changes of time and space, the advance of medical technology, and the changes of social value (Tang 2015). As a result, the contents of medical & health service were not restricted to diagnoses or treatment, while prevention, healthcare, and rehabilitation were covered (O'Lawrence and Martinez 2018, Pontes and Albuquerque 2017, Tang 2017). Oshio and Urakawa (2012) pointed out the difference between special and general senses of medical & health service. Cadigan et al. (2012) explained that special sense of medical & health service, also called "clinical medical treatment" or "medical treatment for diagnosis", referred to medical treatment methods and techniques with the treatment effect being proven through animal or human experiments, and such clinical medical & health service was accepted in medical circles. Kelley and Gilbert (2013) stated that diagnoses and treatment, disease prevention, deformity correction, midwifery, abortion, and various experiments based on treatment and the promotion of medical technologies were covered in medical & health service. Wang et al. (2014) explained general medical & health service as directly or indirectly aiming to treat, correct, and prevent human illnesses, injuries, and healthcare. According to distinct medical effects, Cole (2012) divided medical & health service into "clinical medical treatment" and "experimental medical treatment".

Health is essential for the comprehensive development of people. Enhancing people's health standard and realizing the ideal of extending life and physical and mental health are the common pursuit in human society. Referring to Du et al. (2012), the following dimensions are applied to this study.

(1) Medical resource: The medical & health service conditions of a city.

(2) Medical investment: The government's investment in medical & health service.

Research Hypothesis

Marrocu and Paci (2013) pointed out a higher entry threshold required for large hospitals that they were generally located in places close to downtowns, with high population density, and business areas with more crowds; most middle hospitals, under the competition of physicians, patients, and capitals, were located in

shopping centers in cities or surrounding cities; and, small hospitals were everywhere in the metropolitan area. Carla Silva et al. (2013) mentioned that there were middle and small hospitals located in the satellite areas surrounding cities and the size depended on the population in the serving areas and the capital provided. Pijanowski et al. (2014) discovered that physicians did not care much about the location in the countryside or a city, but were often affected the wills by the spouse. An urban practitioner and the spouse considered more about the environment quality in the city than the profession, while a rural practitioner and the spouse considered more about profession and income. Kok et al. (2013) indicated that traditional therapists in India tended to concentrate on medium- and high-density residential districts and older business or manufacturing areas in cities. Valdivia et al. (2012) proposed the factors in the distribution of medical resource in Taiwan, including environment quality, socioeconomic conditions, and medical environment conditions in the area. Hewit et al. (2012) pointed out the significant correlation between medical & health service sources and the organizational characteristics of hospitals and environment. The following hypotheses are therefore proposed in this study.

H1: Urban ecological management presents positive correlations with medical resource.

H2: Urban pollution management shows positive correlations with medical resource.

Li et al. (2012) mentioned that the rapid development of cities worsened the environmental health, because of environmental pollution resulted from population and emitted by factories in cities, and seriously affected the quality of life and environment. For this reason, the government would precede evaluation plans aiming at ecology management and pollution conditions in cities, propose management plans and increase medical investment to enhance the medical & health service quality and promote the environment quality, in order to effectively solve urban problems in environment (Meadow et al. 2014). Delmelle et al. (2012) proposed two costs for enhancing environment quality, namely damage cost for environment destroy and prevention cost for environment quality improvement. Reanprayoon and Yoonaiwong (2012) indicated that exposing in environmental pollution could result in short-term and long-term effects on human health. Hospodsky et al. (2012) stated that shortly exposing in environmental pollutant would seriously affect allergy-sensitive patients, while exposing in environmental pollution for a long period of time might result in cancers and other unknown effects. Wu and Niu (2012) stated that the government's investment in and application of medical & health service resources were primary for the maintenance of environment quality; besides, the ecology management in cities, the operation of monitoring stations, and the practice of other plans to maintain environment quality also required funds. The following hypotheses are further proposed in this study.

H3: Urban ecological management reveals positive correlations with medical investment.

H4: Urban pollution management appears positive correlations with medical investment.

SAMPLE AND MEASUREMENT INDICATOR

Research Sample and Objective

Aiming at 289 cities (municipal districts) in China as the research objects, all cities are basically covered. The data sources are 2014 China City Statistical Yearbook and the statistical communique and statistical yearbook of cities.

Establishment of Evaluation Indicator

The questionnaire is sent to experts in various fields through email. Measurement indicators considered for urban ecological management, urban pollution management, medical resource, and medical investment are organized from the first feedback. Such considered measurement indicators with similar properties are classified into same categories and sent back to the experts for opinions. The final major categories are achieved after several runs of email enquiries. The experts are invited to a conference to set the measurement indicators for urban ecological management, urban pollution management, medical resource, and medical investment. **Table 1** shows the measurement indicators modified with Delphi Method.

Table 1. Environment quality and medical & health service indicators

Evaluation goal	Secondary indicator	Third-level indicator	Code
environmental health indicator	urban ecological management	Green coverage in built-up area	X_1
		Garden green area per capita	X_2
	urban pollution management	Comprehensive utilization rate of industrial solid and waste	X_3
		Sewage treatment rate in city	X_4
		Living garbage treatment rate	X_5
		Industrial dust removal rate	X_6
		Sulfur dioxide concentration	X_7
medical and health indicator	medical resource	Number of hospitals per 10 thousand people	Y_1
		Hospital sick bed possessed per thousand people	Y_2
		Medical physicians possessed per thousand people	Y_3
		Health technicians possessed per thousand people	Y_4
		Registered nurses possessed per thousand people	Y_5
	medical investment	Proportion of health business expenses to financial expenditure	Y_6

Table 2. Overall LISREL model analysis result

Evaluation item	Parameter / evaluation standard		Result
preliminary fit criteria	urban ecological management	X_1	0.715**
		X_2	0.722**
	urban pollution management	X_3	0.668*
		X_4	0.692*
		X_5	0.708**
		X_6	0.711**
		X_7	0.683*
	medical resource	Y_1	0.731**
		Y_2	0.726**
		Y_3	0.718**
		Y_4	0.699*
		Y_5	0.702**
	medical investment	Y_6	0.858***
fit of internal structural of model	urban ecological management→medical resource		0.846**
	urban pollution management→medical resource		0.852**
	urban ecological management→medical investment		0.864***
	urban pollution management→medical investment		0.877***
overall model fit	X2/Df		1.416
	GFI		0.986
	AGFI		0.927
	RMR		0.006

Note: * stands for $p<0.05$, ** for $p<0.01$, and *** for $p<0.001$

Reliability and Validity Test

Validity refers to a measuring tool being able to really measure the problems which a researcher intends to measure. Generally speaking, validity is divided into content validity, criterion-related validity, and construct validity. The questions in this study are referred to those proposed by domestic and international researchers, and the pretest with the discussion with the tutor is preceded before the formal questionnaire that the questionnaire presents certain content validity. The cause-effect relations of the overall structure with the dimensions of urban ecological management, urban pollution management, medical resource, and medical investment are tested with Linear Structural Relations Model, and the data entry is based on the correlation coefficients of above observed variables. The Linear Structural Relations Model analysis results reveal that the overall model fit achieves the reasonable range that it presents favorable convergent validity and predictive validity. According to Kerlinger (1986), item-to-total correlation coefficients could be used for testing the construct validity of a questionnaire, i.e. reliability analysis, and the calculated item-to-total correlation coefficients could judge the questionnaire content. The item-to-total correlation coefficients of the dimensions in this study are higher than 0.7, revealing certain degree of construct validity of this questionnaire. To further understand the reliability and the validity of this questionnaire, reliability and validity analyses are preceded in this study. According to Cuieford's (1965) points of view, the higher Cronbach's α shows the better reliability. The formal questionnaire in this study is developed based on the standard, and the Cronbach's α reliability appears in 0.75~0.88, obviously conforming to the reliability range.

EMPIRICAL RESULT AND ANALYSIS

LISREL Model Evaluation Indicator

LISREL model (linear structural relation) combines Factor Analysis and Path Analysis in traditional statistics and includes simultaneous equations in econometrics that it could calculate multiple factors and multiple casual paths. Regarding the evaluation of model fit, Bagozzi (1998) proposed to evaluate from preliminary fit criteria, overall model fit, and fit of internal structural of model.

The research data in this study are organized in **Table 2**. The preliminary fit criteria, fit of internal structural of model, and overall model fit are explained as below.

Table 3. Hypothesis test

Research hypothesis	Correlation	Empirical result	P	Result
H1	+	0.846	P<0.01	Supported
H2	+	0.852	P<0.01	Supported
H3	+	0.864	P<0.001	Supported
H4	+	0.877	P<0.001	Supported

From **Table 2**, two measurement indicators (X1, X2) could remarkably explain urban ecological management, with the significance ($t>1.96$, $p<0.01$), five measurement indicators (X3, X4, X5, X6, X7) could notably explain urban pollution management, with the significance ($t>1.96$, $p<0.05$), five measurement indicators (Y1, Y2, Y3, Y4, Y5) could significantly explain medical resource, with the significance ($t>1.96$, $p<0.05$), and the measurement indicator (Y6) could remarkably explain medical investment, with the significance ($t>1.96$, $p<0.001$). Apparently, the overall model fit in this study presents favorable preliminary fit criteria.

In terms of fit of internal structural of model, urban ecological management shows positive and notable correlations with medical resource (0.846, $p<0.01$), urban pollution management reveals positive and significant correlations with medical resource (0.852, $p<0.01$), urban ecological management appears positive and remarkable correlations with medical investment (0.864, $p<0.001$), and urban pollution management shows positive and notable correlations with medical investment (0.877, $p<0.001$). H1, H2, H3, and H4 are therefore supported.

In regard to overall model fit, the standards $\chi2/Df=1.416$, smaller than the standard 3, and $RMR=0.006$ show that both $\chi2/DF$ and RMR are proper. Furthermore, chi-square value is sensitive to sample size that it is not suitable for directly judging the fit. However, the overall model fit standards $GFI=0.986$ and $AGFI=0.927$ are higher than the standard 0.9 (the closer GFI and AGFI to 1 reveal the better model fit) that this model presents better fit indicators.

CONCLUSION

The research results reveal the positive correlations between environment quality and medical & health service. With the enhancing living standard of people, residents gradually stress on the environment quality in cities. The enhancement of concerns about public environment could effectively promote local government's concerns about environmental problems and emphasis on the environment quality problem in urban construction. Urban construction is started from residents' living environment, including the effective improvement of environment indicators, e.g. green coverage in built-up area. Meanwhile, the improvement of environment quality and the construction of basic public service are synchronous. In comparison with late environment management, a complete public service system, including medical & health service, to release the health risk of environmental pollution could effectively reduce the probability of exposing in environmental pollution as well as the health risk and damage caused by environmental pollution to further enhance the entire social welfare. In this case, the government would stress on the development of medical & health service, when improving residents' living environment to reduce residents' environmental health risks by increasing medical expenses, enhancing the investment in medical resource, and completing medical insurance systems.

SUGGESTION

From the research results and findings, practical suggestions are proposed in this study.

1. Environment quality presents positive correlations with medical & health service; that is, the improvement of urban environment quality and the completion of medical & health service are synchronous. In comparison to late government management, a complete public service system, including medical & health service, to release the health risk of environmental pollution could effectively reduce the probability of exposing in environmental pollution and the health risk and damage resulted from environmental pollution as well as could further promote the entire social welfare. From a different aspect, environment quality presents positive correlations with medical & health service, meaning that areas with lower environment quality might appear lower medical & health service standard. Such a problem is worthy of emphases. Regarding areas with lower environment quality, on one hand, the environment management needs reinforcement and, on the other hand, the medical & health service standard needs promotion.

2. Industrial pollution management could not directly reflect city residents' environment quality. Since most industrial zones are distributed in suburban areas, the treatment of industrial dust and sulfur dioxide would directly affect the improvement of suburban environment, but presents less function on the improvement of city residents' living environment. It also explains that current industrial dust and sulfur dioxide have not caused great trouble for residents' life; however, pollution management should be reinforced in long term.

3. Increasing the number of hospitals is not the key to complete medical & health service. Purely the number of hospitals could not comprehensively reflect the richness of medical resource and the medical & health service standard in an area. The government should focus on the construction of medical & health service systems, where fair medical resource investment and system reform are the key points.

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