

Contributions of Surrounding Nature to Household Health Expenditure: Empirical Evidence from Japan

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1. Introduction

The growing number of academic works have presented empirical evidence on the positive impacts of nature exposure on human health. Despite such research advancement for the past few decades, only a limited number of studies have investigated associations between nature and health expenditure up until now. The objective of this paper is to explore the evidence of nature's contribution to health expenditure using household level data in Japan.

2. Econometric Specification

In the econometric specification, heavy tail and zero spike observed in the distribution of household health expenditure needs to be fully taken into account. The present study follows traditional approaches and opts to employ a two-part model with a generalized linear model specification (2PM-GLM). The first part of this model considers the probability that a household needs medical care during a certain period (i.e. one year in this analysis), and the second part explains the levels of health expenditure among those who have taken medical treatments. The other approaches (e.g. one-part models and a sample selection model) are also tested to check the robustness of the results.

3. Data

An internet survey of general Japanese citizens (aged between 18 and 69) was conducted between July and October in 2022 to collect household health expenditure and associated household characteristics. With a view to obtaining accurate values, I asked them to refer to the payment notification that has recorded all healthcare related actual spendings for a certain period of time. In total, 655 valid responses were collected.

Measurement of surrounding natural environments began with identifying respondents' locations, which were proxied by the postal codes. The surrounding areas around residence were then defined by the four different radiuses (i.e. $r = 0.5, 1.0, 1.5, 2.0$ km). Using fine-scale land cover information, I computed the share of four representative natural areas, namely, deciduous forests, evergreen forests, inland freshwater and coastal saltwater, in addition to an urban area.

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4. Results

Table 1 presents the estimation results using the 2PM-GLM and the log-link function. The radius was set at 1.5 km based on two information criterion (i.e. AIC and BIC). The family size as well as the number of families who were male or had health problems were statistically significant in the first-part of the model. Meanwhile, the surrounding natural environments were insignificant in determining the probability that a household needs medical care. Moving our eyes to the second-part, the estimation result suggested that the household having more elderly persons and more members with health problems would be likely to spend more for healthcare. Focusing on the surrounding natural environments, it could be found that the inland freshwater coverage was statistically significant at the 5% level. What should be noted here is that the sign was negative, suggesting that those who reside in the area with more freshwater environments would be prone to spend less for medical care. Computing a marginal effect, increase in 1% point of inland freshwater in surrounding environments would decrease household health spending by approximately JPY1000 on average. This finding was robust to the alternative specifications of surrounding buffer size (except 0.5km) as well as the other analytical approaches.

Table 1. Estimation results of household health expenditure

Variable	First-part		Second-part	
	Coef	S.E.	Coef	S.E.
Family	0.183**	(0.072)	0.117	(0.076)
Elder	-0.012	(0.128)	0.279***	(0.105)
Male	-0.228**	(0.096)	-0.131	(0.108)
Chronic	1.277***	(0.133)	0.436***	(0.073)
Income	0.013	(0.014)	0.028*	(0.017)
Deciduous	-0.012	(0.010)	0.012	(0.011)
Evergreen	0.010	(0.009)	-0.003	(0.008)
Freshwater	0.011	(0.015)	-0.036**	(0.017)
Saltwater	-0.004	(0.008)	0.009	(0.008)
Urban	-0.002	(0.004)	0.002	(0.004)
Constant	-0.065	(0.346)	2.704***	(0.365)
Log-likelihood		-2416.1		
AIC		4876.2		
BIC		4974.9		

5. Conclusion

The freshwater coverage around residence would have a significantly negative impact on household health expenditure. Although no empirical evidence was found for the effects of surrounding forests and coastal zones, this consequence is far from conclusive, considering the small sample size and the specific sample characteristics of this study. Also, one should keep in mind that the association revealed from this study was correlational rather than causal.