

Antecedents of Population Health across US States: An Empirical Investigation

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The state of health of the general population is an important issue for policy makers. This variable is impacted by several lifestyle variables. These include access to healthcare, education, traffic, weather conditions etc. The key objective of this paper is to investigate the effects of these variables on the average health of a state's population. We develop a predictive model and test it with state-level data. We discuss the results and possible implications for policy makers.

INTRODUCTION

The state of health of the general population of the United States is an important issue for U.S. policy makers, especially given the public perception that policy makers “do something” about the healthcare crisis in this country. There has been a significant decline in the health of the general population in the United States (Darling, 2010; Freebairn, 2010; Levin-Scherz, 2010; Mango & Riefberg, 2009). According to the Center for Disease Control (CDC) report, Health, United States, 2008, national health care expenditures increased from \$1,353.6 Billion in 2000 to \$2,105.5 Billion in 2006 (National Center for Health Statistics Health, United States, 2008). During this same time period private healthcare coverage provided by employers decreased from 162.5 million to 157.6 million. Poor health has significant financial and societal implications for individuals, businesses, and governments.

A person's state of health is likely to be influenced by his/her genetic predisposition to disease, the amount of exercise he/she gets, and his/her diet. Although life-style variables do not affect genetic predisposition, they can influence an individual's exercise and diet. Previous programs have focused on informing the public that the key to good health is through eating healthy foods and exercise. Despite the media blitz about the route to good health, the overall state of health in the United States continues to decline. This continued downward trend indicates the need for a change in the emphasis of health programs. By examining life-style variables it may be possible to re-design public programs so that they address the underlying reasons why U.S. citizens fail to achieve a satisfactory level of personal health.

The key objective of this paper is to investigate how significantly life-style variables affect the overall health rankings of the fifty US states and Washington DC. Based on preliminary research, several lifestyle variables influence its residents' state-of-health. In order to measure the impact of these variables we develop a predictive model and test it with state-level data. The rest of the paper is organized as

follows. The next section provides a summary of the research methodology and describes the data sources. The concluding section provides a summary of the results and the ensuing implications.

Research Methodology

This paper looks at five (5) life-style variables that have a statistically significant impact on the quality of health of a state's population.

Dependent Variable

The selected dependent variable is the average state of health in a US state. It is measured by using the percentage of population with good health or better.

Independent Variables

- a. **Household Size.** Household size is likely to play an important role in the overall health of household members because of its relationship with the amount of time available to spend on an individual family member's health. Family size also has an impact on education which in turn affects health awareness and habits(De Haan, 2005). As smaller households have less family members to look after, the health issues of individual family members should gain more timely attention than in larger households. Hence, we hypothesize a negative relationship between household size and the quality of health of a state's population.
- b. **Annual Mean Temperature of a State.** The average temperature of the state has an impact on the overall exercise rate and eating habits(Ebi, Mills, Smith, & Grambsch, 2006; Haomiao & Lubetkin, 2009; Zick et al., 2009). Temperatures at both extremes are likely to reduce opportunities for outdoor exercise. However, the impact of temperature might also be manifest through its influence on the geography and the cultures of its people. For example, within the USA, Southern states have a prevalence of fried and rich (leading to higher cholesterol) foods. This might affect the health of the general population living in these states. Hence, the impact of annual mean temperature can be in either direction.
- c. **Average Divorce Rate.** Census data shows that the divorce rate in the United States has tripled in the last decade, as has the decrease in over-all health of U.S. citizens. This increase in the divorce rate has resulted in the loss of the primary care-taker within the family unit. As single-parents focus on providing financial support for their family unit, they have less time to exercise. Divorce rates also affect stress levels(Cohen, Klein, & O'Leary, 2007; Gardner & Oswald, 2004; Kiecolt-Glaser & Newton, 2001; Sbarra & Nietert, 2009; Zheng & Zhen, 2008). Single heads of households might also find neither the time nor inclination to cook healthy dishes, but depend on relatively unhealthy, fast food instead. Hence, we hypothesize a negative relationship between divorce rate and quality of health of a state's population.
- d. **Median Income.** Past research indicates that overall health reduces with a decrease in as median income(Auguste, Laboissi re, & Mendonca, 2009; Elbel, Kersh, Brescoll, & Dixon, 2009; Lenk, Schulz, & Odoms-Young, 2009; Woodcock & Aldred, 2008). This is most likely due to the fact that unhealthy food alternatives tend to be cheaper than their healthy counterparts. Also, households on lower incomes might have to work longer hours in an attempt to maintain their standard of living. The resulting time poverty might result in reduced opportunities to cook healthy dishes. On the other hand, higher incomes households can afford to pay higher prices to have healthier food on their tables. Hence, we hypothesize a positive relationship between median income and quality of health of a state's population.
- e. **Average Travel Time to Work.** Travel time to work has a distinct impact on the health of an individual. Longer commute times lead to greater stress, poor eating habits, and relatively lesser time for exercise(Kluger, 1998; Shephard, 2008; Zick et al., 2009). This has a detrimental effect on health. On the other hand, shorter commute times will allow for more time to exercise and eat healthy. Hence, we hypothesize a negative relationship between average travel time to work and quality of health of a state's population.

Data Sources

Secondary data sources are used to collect the data. The following are the sources of the data for the various variables. Table 1 provides a summary of the data sources.

**TABLE 1
SUMMARY OF VARIABLES**

Variables	Data Source
1. % of people with good health or better	Information Obtained from www.cdc.gov
2. Median Income	Information Obtained from www.census.gov
3. Average Travel Time To Work	Information Obtained from www.census.gov
4. Average Household Size	Information Obtained from www.census.gov
5. Average Annual Temperature by State	Information Obtained from www.cdc.noaa.gov
6. Average Divorce Rate	Information Obtained from www.statemaster.com

Results

A regression analysis was used to find which independent variables, if any, had a significant impact on a state's average level of health. The variables were all continuous. Hence, a least squares approach was employed. The SPSS statistical package is employed for the analysis. Descriptive statistics for the relevant variables are shown in Table 2.

**TABLE 2
DESCRIPTIVE STATISTICS**

	N	Minimum	Maximum	Mean	Std. Deviation
Average Travel Time to Work	51	16.1	31.5	23.478	3.6041
Average Divorce Rate	48	.0	.1	.038	.0148
Average Household Size	51	2.20	3.11	2.5524	.15942
Annual Mean Temperature Fahrenheit	48	40.43	70.73	52.0948	7.63361
% of Population with Good Health of Better	51	76.900%	89.100%	84.45490%	3.095307%
TOTAL MEDIAN INCOME \$US	51	\$36,533	\$63,989	\$48,961.98	\$7,211.546
Valid N (listwise)	45				

The regression results are summarized in Table 3. As seen from Table 3, the analysis of variance demonstrates the overall model significance. Table 3 also shows the beta coefficients along with the levels of significance reached by them.

**TABLE 3
REGRESSION RESULTS**

	Dependent Variable : Percentage of population with good health or better			
Independent Variable	Parameter Estimates	Standardized Estimates	t-statistic	Significance
Constant	91.083			
Average Household Size	-1.413	-0.07	-0.71	0.482
Annual Mean Temperature*	-0.102	-0.246	-2.397	0.021
Average Divorce Rate*	-44.831	-0.195	-2.345	0.024
Total Median Income*	0	0.646	6.305	0
Average Travel Time to Work*	-0.427	4.127	22.072	0
F statistic	24.728			
R- square	0.872			
Adjusted R- square	0.76			
N	45			

Findings

The following variables emerged as significant predictors of Health of a state.

a. Total Median Income

The average median income of the state has a positive influence on average health. This is ostensibly because of the availability of healthier food choices to higher income households.

b. Average Travel Time to Work

As per our prediction, an increase in travel time to work has a negative impact on a state's average health. This is perhaps because of the lack of time available to exercise and search for healthier food options for populations that have large commute times.

c. Average Divorce Rate

States with higher divorce rates have lower average health. The underlying reasons for this might be related to time poverty and increased stress for divorced individuals, who are often also single parents.

d. Annual Mean Temperature

Annual mean temperature has a negative impact on average health. Thus, states with lower temperatures appear to have better average health. Thus, while both extremes should theoretically lead to fewer opportunities for exercising, the results show states with warmer climates have unhealthier populations. In addition to the lack of opportunities to exercise in extreme warm climates, this could also occur because of the preference for fried, richer types of food in the Southern states, discussed in the earlier section.

Discussion

Average Household Size does not have a significant impact on a state's average health. Overall, the results suggest that the underlying constructs that determine a state's average health are rooted in income and life styles. Expenditure on infrastructure that reduces commute time should have an impact on a state's health. Similarly, education about healthy food options should gradually lead a state's population to make better choices about what is available in their kitchens. However, individual households should

still remain the ultimate decision makers about their health as it is related to personal choices about marital status, place of residence, etc., which in the long run also influences a household's health.

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