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# Socioeconomic and Health Resources Factors for Operations of a Health System

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## ABSTRACT

This paper is to assess the effect of health resources on state-level infant mortality and to assess the effect of socioeconomic characteristics on state-level infant mortality, i.e., to assess what change in the health status of a population can be identified as a function of socioeconomic characteristics and health resources. Some results are contrary to the common health strategy improving health status of a target population and suggest promoting individual level of health resources. This study suggest that changes in health resources or socioeconomic variables alone may not reduce the state level infant mortality, and both categories of health indicators do influence other health outcome as well as influence to each other.

*Keywords: Health Resources, Health Performance, Health System Operations.*

## INTRODUCTION

The health status of a target population can be identified by many factors, like health resources, environmental conditions, and/or socioeconomic characteristics (Miller and Stokes, 1987; Wehler, et al., 2004). A population of defined scope, which may be a city, state, nation or other target areas can be conceptualized the target of a particular health system. The functioning of such systems and even their structural forms may be affected by

available resources in a given area (Bird and Bauman, 1995; Mays, et al., 2006). Therefore, it is necessary to examine the impact of a health system within a given structure. Such structure constrains the operation of the health system, and thus influences the health status of a population, while structure also has a direct impact on health status. Because of its pervasive influence, the structural setting of a location must be examined and controlled before the net impact of health indicators on health can be assessed (Fiscella and Franks, 2000). Thus, this study focuses on structural differences to the infant mortality and how those differences constrain the operation of the health system and eventually affect health status of a target population.

The objectives of this study are to assess the effect of health resources on state-level infant mortality and to assess the effect of socioeconomic characteristics on state-level infant mortality, i.e., to assess what change in the health status of a population can be expected as a function of socioeconomic characteristics and health resources. Hypothesis is that health resources variables account for more of the variance in state-level infant mortality than do socioeconomic variables. It is also hypothesized that an aggregated mode with socioeconomic variables and health resources variables has more predictive power to infant mortality rates than separated models have.

In the first section, an introduction deals with the rationale for doing a study on health status of a given target population. In section two, a literature review related to the current study is addressed. Then, in section three, a method section discusses study population, and study design, which covers study variables being interested and the method of statistical analysis. Section four shows a result of analysis for this study. A discussion section deals with implication to examine the relative importance of health resources and socioeconomic factors in predicting state-level infant mortality. In a final section, a conclusion gives some future directions and summary.

## BACKGROUND

Generally accepted assumption is that increasing health resources will improve the health status of a target population due to the increased accessibility (Idler and S. Kasl, 1991). The US Department of Health and Human Services has established a framework for developing prevention programs aimed at making a difference in US health by the year 2000. Many programs financed by state governments have been developed to improve the access of the poor to health care (Duncan 2002; Singh and Yu, 1995).

Many government and private-sponsored programs, which are designed to improve the health status of a population, are based on the assumption of a close relationship between the health status of a target population and the amount of available health resources (Goldsmith, 1973). Based on this assumption, efforts for increasing the amount of health resources in every state throughout the nation is opted without any doubt about contributions of health resources to the outputs of those services. It is suggested that the impact of health programs on the health of a population is a complex and poorly understood issue, and that increasing access to health care may not be an effective way to improve health (Laaksonen, et al., 2005).

Therefore, some studies have revealed that the health status is not directly related to more health resources (Haveman, et al., 1994). Most of the decline in mortality is attributed to improvements in environmental conditions rather than to the expansion of health services (Fuchs, et al., 1995; McLeod, et al., 2003). Moreover, health interventions appear to have contributed a little to the decline in the age-sex adjusted death rates in the United States between 1900 and 1973. There is not a clearly established relationship that more health resources lead to better health status of population (Mackenbach, et al., 1994). In a number of recent studies socioeconomic characteristics and typical risk factors affecting health status show the different

predictive power between different target population (Lochmer, et al., 2001; Poilolainen and Eskola, 1988). Selective survival is well illustrated in the racial mortality and associated with environmental inequality while substantial disparity in infant mortality among different racial groups have been well observed. Changes in the social services and economic activities will be critical to controlling health issues and increasing the well-being of minority (Buck and Bull, 1986).

Whereas there has been interest in the lower predictive power of race as a health-affecting factor for mortality, researchers have failed to identify the extent to which other socioeconomic factors decline in their importance as predictors of mortality (Barbeau, et al., 2000; Diehr et al., 1979). A few studies have analyzed the determinants of health, focusing on the role of education (Leigh, 1983). Those studies show poverty and education can make large contributions toward improving the health status of the population, since life expectancy has been strongly related to income per capita (Hansluwka, 1985). Being covered by Medicaid is strongly related to access to health care. The most apparent explanation for this finding is that people in poverty and in the near-poor faces economic barriers to access because of the co-payments and deductibles that are typically part of private health insurance coverage (Branch, L. G. and A. Jette, 1985).

## METHODS

The two most widely used health indicators are the infant mortality rate and life expectancy at birth. The importance of infant mortality as a significant indicator for assessing a heath status of a target population has been well recognized (Singh, 1995). Despite some limitations, mortality rates assume to be useful in comparative analysis at regional, national, and international level (Hansluwka, 1995). Infant mortality is considered the most sensitive index of the level of health existing in an area (Diehr, et al., 1975).

Each dummy variable has been derived by computing if a target population in a state is more than that of nation's average, the state is given as 1, otherwise assigned as 0. During the elimination of multicolineality problem, male population, female population, white population, total number of physicians, smoking, and alcohol variables were excluded for subsequent analysis. And also, OBGYN, PEDIATI, GENFAM were excluded because of high VIF problems each other so that DOCTOR1 for total rate of physicians in OB/GYN, Pediatrician, general/family practitioners was included for this study. Multiple regression analyses(OLS) using enter method to produce a full and reduced regression models will be performed.

Table 1 Indicators of Health Resources as Independent Variables

| Factors | Descriptions |
|---|---|
| NPHYSI | Total physicians in 1992 |
| OB/GYN | Rate of Physicians in Obstetrics and Gynecology per 100,000 female population in 1993 |
| PEDIATRI | Rate of physicians in per 100,000 population 17 years and younger |
| GENFAMI | Rate of physicians in general/family practice per 100.000 population in 1993 |
| PNCHI | Per Capita Number Covered by health insurance in 1992 |
| AVGBED | Average hospital beds per 100,000 population in 1992 |
| FEESERV | Per capita expenditures for physician services in 1991 |
| EXPENDI | Per capital state government expenditures for health programs in 1992 |
| MEDICAID | Medicaid expenditures in 1992 (100,000,000 dollars) |

Table 2 Indicators of Socioeconomics as Independent Variables

| Factors | Descriptions |
|---|---|
| BLACK | Black population per 10,000 in 1992 |
| BLACK1 | Dummy variable of Black population |
| HISPANI | Hispanic population per 10,000 in 1992 |
| HISPAN1 | Dummy variable of Hispanic population) |
| ASIAN | Asian population per 10,000 in 1992 |
| ASIAN1 | Dummy variable of Asian population |
| INCOME | Median household income in 1992 (1,000 dollars) |
| EDUC | Public high school graduate rate in 1991 |
| POVERTY | Poverty rate in 1992 |
| SMOKE | Percent of adult who smoke in 1991 |
| ALCOHOL | Adult per capita alcohol consumption in 1992 (gallon of absolute consumed per adult age 21 years and older) |

Following are three equations for the analysis:

$$IM_{Model\ 1} = f\ (BLACK1, HISPANIC1, ASIAN1, EDUC, INCOME, POVERTY, AVGBED, DOCTOR1, FEESERV, MEDICAID, EXPENDI, INSURE)$$

$$IM_{Model\ 2} = f\ (BLACK1, HISPANIC1, ASIAN1, EDUC, INCOME, POVERTY)$$

$$IM_{Model\ 3} = f\ (BLACK1, HISPANIC1, ASIAN1, AVGBED, DOCTOR1, FEESERV, MEDICAID, EXPENDI, INSURE)$$

## RESULTS

Table 3 presented descriptive analysis and Table 4 shows values of multiple regression models of infant mortality. Of socioeconomic variables all but POVERTY have consistent directions of relationship with infant mortality rates in model 1. Both EDUC and INCOME are inversely related with infant mortality rates in both model 1 and model 2, whereas POVERTY is positively related with infant mortality in model 1, while in model 2 POVERTY has positive direction to infant mortality.

Table 3. Descriptive analysis for each variables of study

| Variable | Mean | Std Dev | Minimum | Maximum |
|---|---|---|---|---|
| ALCOHOL | 2.62 | 0.56 | 1.63 | 4.71 |
| ASIAN1 | 0.20 | 0.40 | 0.00 | 1.00 |
| BLACK1 | 0.36 | 0.48 | 0.00 | 1.00 |
| EDUC | 74.42 | 7.60 | 54.26 | 89.55 |
| FEESERV | 557.48 | 108.06 | 337.00 | 806.00 |
| HISPAN1 | 0.16 | 0.37 | 0.00 | 1.00 |
| INCOME | 30.72 | 5.17 | 20.30 | 42.17 |
| INFANMOR | 8.41 | 1.42 | 5.40 | 11.60 |
| MEDICAID | 18.03 | 24.95 | 1.14 | 152.81 |
| NPHYSI | 12.70 | 15.98 | 0.18 | 84.56 |
| POVERTY | 13.91 | 4.04 | 7.60 | 24.50 |
| PCSGEHP | 91.71 | 43.53 | 41.42 | 291.12 |

The relative magnitude of regression coefficient in each independent variable in each model indicates relative effect of that independent variable on variance in infant mortality rates. The negative effect of EDUC on infant mortality rates is greater in model 2 than model 1, as well as it also is statistically significant difference in both model 1 and 2. Relative net effect of INCOME variable on infant mortality rates between model 1 and 2 is negligible, whereas POVERTY effect on infant mortality rates is greater in model 1 than in model 2. Among health resources

indicators, AVGBED for average bed in population and PCSGEHP for state government expenditures for health program have all positive direction to the infant mortality rates in model 1 and model 3.

These two health resources variables have statistically significant relationship with infant mortality rates in model 1 and model 3. while PNCHI for per capita peoples covered by health insurance has positive direction in model 1, it has negative direction in model 3. DOCTOR1, FEESERV, and MEDICAID variables are negatively related with infant mortality rates in model 1 and model 3. DOCTOR1 and FEESERV have statistically significant relationship with infant mortality rates in both model 1 and model 3. Meanwhile, the relationship between MEDICAID and infant mortality rates is statistically significant in model 1, but not in model 3.

The relative degree of regression coefficient in each health resources variable between model 1 and model 3 indicates relative effect of that health resources variable on variance in infant mortality rates. Positive effect of AVGBED on infant mortality rates is greater in model 3 than in model 1, whereas positive PCSGEHP effect on dependent variable is greater in model 1 than model 3. Negative effects of DOCTOR1 and FEESERV variables on infant mortality rates is greater in model 3 than in model 1, whereas MEDICAID effect on dependent variable is greater in model 1 than model 3.

## DISCUSSION

Primary concern of this study is to examine the relative importance of health resources and socioeconomic characteristics in predicting state-level infant mortality. Previously showed evidences in role of socioeconomic condition to improve the health status of a target population are not consistent with this study. Rather, an aggregated model as a whole do make a significant contribution to accounting for the variance of infant mortality

rates over and above the variance accounted for by socioeconomic characteristics or by health resources only. That is, the contribution of an aggregated model predicting the health status of a target population as a whole is rather big in comparison to the roles of socioeconomic characteristics or health resources model respectively.

Table 4. The Effects of Health Indicators with Three Dummy Variables of ASIAN1, HISPAN1, and BLACK1 (Dependent Variable: Infant Mortality)

| Variable | Model 1 | | Model 2 | | Model 3 | |
|---|---|---|---|---|---|---|
| | B | T | B | T | B | T |
| (Constant) | 10.745 | 2.248 | 13.606 | 3.349 | 13.773 | 4.903 |
| BLACK1 | 1.524 | 3.475*** | 1.473 | 3.625*** | 1.700 | 4.560*** |
| HISPAN1 | .026 | .044 | -.388 | -.739 | -.289 | -.466 |
| ASIAN1 | -.655 | -1.450 | -.517 | -1.029 | -1.032 | -2.150*** |
| EDUC | -.004 | -.119 | -.029 | -1.009 | | |
| INCOME | -.108 | -1.982** | -.105 | -2.017** | | |
| POVERTY | 033 | .446 | -.007 | -.086 | | |
| AVGBED | .0136 | 3.182*** | | | .015 | 3.254*** |
| DOCTOR1 | -.014 | -1.805* | | | -.023 | -2.834*** |
| FEESERV | -.003 | -1.764* | | | -.004 | -2.523** |
| MEDICAID | -.016 | -2.051*** | | | -.012 | -1.418 |
| EXPENDI | .011 | 2.803*** | | | .007 | 2.020** |
| INSURE | .005 | .136 | | | -.045 | -1.366 |
| Multiple R | .84047 | | .73398 | | .78434 | |
| R Square | .70638 | | .53873 | | .61519 | |
| Adj R Square | .61116 | | .47437 | | .52861 | |
| Standard Error | .88754 | | 1.03191 | | .97722 | |
| F | 7.4178 | | 8.37018 | | 7.10529 | |
| Sig. F | .0000 | | .00000 | | .00000 | |

*** p < 0.01; ** p < 0.05; * p < 0.1

The direction of the relationship between each variable and infant

mortality is a criterion in describing association among variables. The negative relationship between INCOME and infant mortality rates means that more income do play important role in reducing infant mortality rates in all states. The degree of regression coefficient on DOCTOR1 indicates that the role of doctors of OB/GYN, Pediatrics, and family practitioners do play important role in reducing infant mortality rates in all states. The negative association of MEDICAID to infant mortality rates reflect that higher Medicaid allow people more to access to health services, resulting in improving health status of population.
Since the study about causal relationship of the physicians to infant mortality rates was expected, this association obviously explained by using data about OB/GYN, Pediatricians, and family practitioners instead of total number of physicians in population. The positive relationships of AVGBED and PCSGEHP to infant mortality do not indicate detrimental impact of the health resources indicators to health status of the target population. Rather, health status may be impacted by how hospital beds and governmental expenditures for health programs will be utilized, instead of how much amounts of expenditure of health program by state governments will finance or how many numbers of current beds in hospitals will provide.

In this study, PNCHI does not make any direct significance of contribution to reducing infant mortality rates, while health insurance is positively related with infant mortality rates in model 1 and negatively in model 3. The negative association of FEESERV to infant mortality rates may reflect that higher fee for services makes better quality in services, resulting in better health status of the population, or reducing the infant mortality rates.

In model 3, MEDICAID is not statistically significant with infant mortality rates, while ASIAN1, a dummy variable of Asian population, is statistically significant. In model 2, INCOME variable is significantly related to infant mortality, along with BLACK1, a dummy variable of Black population, significant with

infant mortality rates. Notably, in model 1, an aggregated model, BLACK1, INCOME, and MEDICAID are significant with infant mortality rates. It may reflect that utilization of MEDICAID is not significant by ASIAN1, but significant by BLACK1. MEDICAID in model 1 is significant but PNCHI, per capita covered by health insurance, is not significant. It may support that some hospitals selectively retain privately insured people for high risk health care deliveries. White people without Medicaid coverage, most of them were determined to have private coverage. But refer less well-insured people to sub-specialty regional centers, to avoid financial losses.

## CONCLUSION

This study indicates that state-level infant mortality can be reduced by controlling state level socioeconomic characteristics and health resources correlates of infant mortality. Some results are contrary to the common health strategy improving health status of a target population and are, maybe, suggesting to promote individual level of health resources.
In sum, our study suggest that changes in health resources or socioeconomic variables alone may not reduce the state level infant mortality, and both categories of health indicators do influence other health outcome as well as influence to each other. That is, this is to say that health resources and socioeconomic characteristics should be simultaneously considered as interventions of health outcomes for reducing infant mortality.

## REFERENCE

Barbeau, E. M., N. Krieger and M. J. Soobader (2000) 'Working Class Matters: Socioeconomic Disadvantage, Race/Ethnicity, Gender, and Smoking in NHIS 2000' American Journal of Public Health, 94(2): 269 - 278.

Bird, S. T. and K. E. Bauman (1995) 'The Relationship between Structural and Health Services Variables and State-Level Mortality in the United States,' *American Journal of*

*Public Health*, 85(1): 26-29.

Branch, L. G. and A. Jette (1984), 'Personal Health Practices and Mortality among the Elderly,' *American Journal of Public Health*, 74(10): 1126-1129.

Buck C. and S. Bull (1986), 'Preventable Causes of Death versus Infant Mortality As an Indicators of the Quality of Health Services,' *International Journal of Health Services*, 16(4): 553-562.

Diehr, P. K., W. C. Richardson, S. M. Shortell, ,and J. P. LoGerfo, (1979), 'Increased Access to Medical Care: The Impact on Health,' *Medical Care*, 17(10): 989-999.

Duncan, G.J., M. C. Daly, P. McDonough and D. R. Williams (2002) 'Optimal Indicators of Socioeconomic Status for Health Research' *American Journal of Public Health*, 92(7): 1151 - 1157

Fiscella, K. and P. Franks (2000) 'Individual income, income inequality, health and mortality: What are the relationship?' *Health Services Research*, 35:307-318.

Fuchs, C. S., M. J. Stampfer, G. A. Colditz, E. L. Giovannucci, J. E. Manson, I. Kawachi, D. J. Huinter, S. Hankinson, C. H. Hennekens, B. Rosner, F. Speizer, and W. C. Willett (1995), 'Alcohol Consumption and Mortality Among Women,' *The New England Journal of Medicine*, 332(19): 1245-1250.

Goldsmith, S. B. (1973) 'A Reevaluation of Health Status Indicators,' *Health Services Report*, 88(10): 937-941.

Hansluwka, H. E. (1985), 'Measuring the Health of Populations, Indicators and Interpretations,' *Social Science & Medicine*, 20(12): 1207-1224.

Haveman, R., B. Wolfe, B. Kreider, and M. Stone (1994) 'Market Work, Wages, and Men's Health,' *Journal of Health Economics*, 13: 163-182.

Idler, E. L. and S. Kasl (1991) 'Health Perceptions and Survival: Do Global Evaluations of Health Status Really Predict Mortality?,' Journal of Gerontology: *Social Sciences*, 46(2): S55-65.

Laaksonen, M., O. Rahkonen, P. Martikainen and E.Lahelma

(2005) 'Socioeconomic Position and Self-Rated Health: The Contribution of Childhood Socioeconomic Circumstances, Adult Socioeconomic Status, and Material Resources', *American Journal of Public Health*, 95(8):1403 - 1409.

Leigh, J. Paul (1983), 'Direct and Indirect Effects of Education on Health,' *Social Science & Medicine*, 17(4): 227-234.

Lochmer, K., E. Pamuk, D. Makuc, B. Kenney and I. Kawachi (2001) 'State-level income inequality and individual mortality risk: a prospective multilevel study', *American Journal of Public Health*, 91:385-391.

Mackenbach J. P., J. V. D. Bos, I. M. A. Joung, H. V. D. Mheen, and K. Stronks (1994), 'The Determinants of Excellent Health: Different from the Determinants of Ill-Health?,' *International Journal of Epidemiology*, 23(6): 1273-1281.

Mays, G. P., M.C. McHugh, K. Shim, N. Perry, D. Lenaway, P.K. Halverson and R. Moonesinghe (2006), 'Institutional and Economic Determinants of Public Health System Performance' *American Journal of Public Health*, 96(3): 523 - 531.

McLeod, C. B., J. N. Lavis, C. A. Mustard and G. L. Stoddart (2003) 'Income Inequality, Household Income, and Health Status in Canada: A Prospective Cohort Study', *American Journal of Public Health*, 93(8): 1287 – 1293.

Michael K. Miller and C. Shannon Stokes, (1987) 'Health Status, Health Resources, and Consolidated Structural Parameters: Implications for Public Health Care Policy,' *Journal of Health & Social Behavior*, 19: 263-279.

Poilolainen K. and J. Eskola (1988), 'Health Services Resource and their Relation to Mortality from Causes Amenable to Health Care Intervention: A Cross-National Study,' *International Journal of Epidemiology*, 17(1): 86-89.

Singh G. K. and S. M. Yu (1995) 'Infant Mortality in the United States: Trends, Differentials, and Projections, 1950 through 2010,' *American Journal of Public Health*, 85(7): 957-964.

Wehler, C., L. F. Weinreb, N. Huntington, R. Scott, D. Hosmer, K. Fletcher, R. Goldberg, and C. Gundersen (2004) 'Risk and Protective Factors for Adult and Child Hunger Among

Low-Income Housed and Homeless Female-Headed Families' *American Journal of Public Health*, 94(1): 109 - 115.