National Health Insurance and Health Inequality in Taiwan*

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ABSTRACT

Health care reform is under heated debate in the United States. Although prior research shows that having public health insurance improves individual health (e.g., Quesnel-Vallée 2004), not everyone is convinced that a universal insurance coverage will improve population health and reduce health inequality. The National Health Insurance of Taiwan implemented in 1995 that provides a universal coverage to all citizens provides a natural experiment to address this issue. Using eight waves (from 1990 to 2005) of repeated cross-sectional data from the Taiwan Social Change Survey and an identifiable age-period-cohort model with a linear spline specification, we find that the National Health Insurance improves population health and especially health of those with low education, which thus reduces health inequality by education.

INTRODUCTION

The demand for universal access to health care in Taiwan led to the legislation and implementation of a National Health Insurance program in 1995. The program turned a few independent health insurance systems (e.g., Labor Insurance, Farmer Insurance, and so forth) covering different segments of the population while leaving out a nontrivial proportion of the population uninsured into a system that provides universal health care for all citizens.

If one were to believe that health insurance is beneficial for individual health (e.g., Quesnel-Vallée 2004), one would expect that the implementation of the National Health Insurance System improves population health and reduces health inequality by providing better health care for disadvantaged individuals who were not covered in the previous health insurance regime. However, prior research has shown that the population health in Taiwan has declined from the 1980s onwards (e.g., Chang 2009; Wu 2006)—a finding that is at odds with the expectation. This finding immediately raises the question whether or not a universal health insurance fulfills its promises and whether or not it should be the desired policy for countries, such as the United States, that are debating the choice between a private health insurance system or a universal health insurance system.

In this paper, we examine the effects of the National Health Insurance program

on population health and health inequality by education. Using eight waves (from 1990 to 2005) of repeated cross-sectional data from the Taiwan Social Change Survey and an identifiable age-period-cohort model with a linear spline specification, we find that the National Health Insurance improves population health and especially health of those with low education, which thus reduces health inequality by education.

DATA AND VARIABLES

Taiwan Social Change Survey Data

We use data from eight waves of the Taiwan Social Change Survey (TSCS), a repeated cross-sectional survey of national representative samples of non-institutionalized individuals age 15 and above residing in Taiwan. [1] The questionnaires of eight waves of survey included information about the respondents' health, and were administered via face-to-face interview in 1990, 1991, 1995, 1996, 2000, 2002, 2004 and 2005.

We use listwise deletion to exclude cases with missing data on any of the independent and the dependent variable for each of the two analyses. The analytic sample size for self-rated general health (including six waves of survey) is 12,522, and that for health-related daily activity impairment (including a total of eight waves)

[1] The TSCS has been conducted by the Institute of Sociology, Academia Sinica, Taiwan, with funding from the National Science Council, Taiwan.

is 15,574.

Dependent Variable: Self-rated Health

We use two questions to construct the dependent variables of self-rated health. In all but the 1991 and 1996 surveys, the questionnaire included the question, "In general, would you say your own health in the past two weeks is excellent, good, fair, or poor?" We code the respondent's answer to 4 for "excellent," 3 for "good," 2 for "fair," and 1 for "poor." In all surveys we use the following question—"During the past two weeks, have you had any problems with your regular daily activities (e.g., schoolwork, work, housework) as a result of your physical health?"—to construct a second dependent variable. We code the respondent's answer to 4 for "not at all," 3 for "a little bit," 2 for "quite a bit," 3 for "extremely." These two questions are comparable to those questions asked in the U.S. General Social Survey.

Independent Variables

We construct indicators for the three time dimensions to estimate the Age-Period-Cohort model. We construct a series of dummy variables to indicate the following age groups: 16-24, 25-34, 35-44, 45-54, 55-64, 65-74, 75-84, and 85 and above, assuming their effects on health would be discrete. We use a continuous variable to indicate birth cohort (i.e., the calendar year in which a respondent was born) centered at 1950. We use two different specifications for the period effect: The

first one is to use a continuous variable to indicate calendar year centered at 1995 for a linear trend; and the second is to allow for the effects to vary before and after the implementation of the National Health Insurance Program using a spline function with a node at 1995 (and centered also at 1995).

We use dummy variables to indicate the following educational attainment categories: (a) elementary school or lower, (b) junior high school, (c) high school graduate, (d) 2-year-, 3-year- and 5-year-junior/community-colleges, and (e) bachelor's degree and above.[2]

The control variables (in this version of the paper) include gender (coded 1 for male), marital status (using a set of dummy variables to indicate never married, married, divorced or separated, and widowed), and ethnicity (Fujianese, Hakka, Mainlanders, Taiwanese Aborigines).

MODELS

We specify an age-period-cohort model with an estimable function approach. We discretize age into dummy variables to identify the three parameters for age, period, and cohort that are unidentified if included all as continuous specifications. To estimate effects of the implementation of the National Health Insurance on health,

[2] In four waves (i.e., 1991, 1995, 1996, 2000), the questionnaire did not include sufficient information to discern graduates from dropouts.

we exploit exogeneity of the legislation treating the policy as a natural experiment. Hence, we compare the trajectories before and after its implementation and compare the changes in slope as the effect of the National Health Insurance. To compare the slope, we use a linear spline specification so that, across these waves of surveys we analyze, there are two different slopes before and after 1995—the year in which the National Health Insurance program was implemented. Specifically, we estimate the following equation for population health:

$$Health = b_0 + b_{1 \cdot pre} \cdot Yr_{\leq 1995} + b_{1 \cdot aft} \cdot Yr_{>1995} + \sum b_{2 \cdot k} \cdot Age_k + b_3 \cdot Cohort + \sum b_m \cdot X_m + e$$

For the analysis of health inequality by education, we add interactions between the period slopes and education:

$$Health = b_0 + b_{1 \cdot pre} \cdot Yr_{\leq 1995} + b_{1 \cdot aft} \cdot Yr_{>1995} + \sum b_{2 \cdot k} \cdot Age_k + b_3 \cdot Cohort$$
$$+ \sum b_{4 \cdot l} \cdot Edu_l + \sum b_{5 \cdot p} \cdot Edu_l \times Yr_{\leq 1995} + \sum b_{5 \cdot q} \cdot Edu_l \times Yr_{>1995} + \sum b_m \cdot X_m + e$$

The comparison between $b_{1 \cdot pre}$ and $b_{1 \cdot aft}$ provides the estimate for the effect of the National Health Insurance on population health, and the comparison between $b_{5 \cdot p}$'s and $b_{5 \cdot q}$'s provides the estimate for the effect of National Health Insurance on health inequality by education.

RESULTS

Table 1 presents the descriptive statistics.

Table 2 presents the coefficient estimates predicting general health status. In Model 1 where we use only one slope to indicate the overall period trend from 1990 to 2005, we see a decline in population health as did other prior researchers (Chang 2009; Wu 2006). However, when we allow the slope to change before and after 1995, the year in which the National Health Insurance program was implemented, the results show that after 1995, the decline in population health stopped.

Table 3 examines the health inequality by education. Model 1 in Table 3 provides a baseline model. The main findings are shown in Model 2 of Table 3. Compare the pair of coefficients for the same educational level before and after 1995 when the National Health Insurance program was implemented, the slopes converge. The convergence comes mainly from the lowest educated groups whose health status gradually improves since 1995, and therefore indicates that health inequality by education has reduced in Taiwan after the implementation of the National Health Insurance program.

CONCLUSION

Does universal health insurance coverage improve population health and reduce health inequality? Exploiting the natural experiment of a National Health Insurance program in Taiwan, we seek to answer this question with repeated cross-sectional data

that spanned across 1990 and 2005 and an age-period-cohort model with a linear spline specification that allows the slope to differ before and after the implementation of the Health Insurance Program in 1995. Our results show that the transition from a number of independent insurance programs that left out a nontrivial proportion of the population uninsured to the universal coverage system stopped the downward trajectory of population health and improved the health of lower educated individuals. We believe that our findings provide additional evidence that supports the case for a universal health insurance system.

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Table 1. Descriptive Statistics (Means and Standard Deviations)

	General Health Status		Problems with Daily Activities	
	N = 12,477		N = 15,497	
	Sample Mean	Sample S.D	Sample Mean	Sample S.D
General Health Status	3.09	0.72	--	--
Problems with Daily Activities	--	--	3.68	0.67
Birth Cohort (centered at 1950)	5.91	15.60	5.41	15.22
Age	43.01	15.47	42.58	15.16
Elementary School or Lower	0.31	0.46	0.32	0.47
Junior High School	0.14	0.35	0.14	0.35
High School Graduate	0.27	0.44	0.27	0.44
Junior/Community-Colleges	0.13	0.34	0.13	0.33
Bachelor's Degree and Above	0.15	0.35	0.14	0.34

Table 2. Regressions Predicting General Health Status (Population Health)

Variables	**Model 1**		**Model 2**	
Calendar Year	-0.012	***		
Before Insurance (before 1995)			-0.012	***
After Insurance			0.001	
Cohort	0.003		0.003	
Age				
0~24	---		---	
25~34	0.074	**	0.075	**
35~44	0.071		0.071	
45~54	0.032		0.032	
55~64	-0.030		-0.030	
65~74	-0.128		-0.128	
75~84	-0.211		-0.212	
85 and above	-0.139		-0.139	
Intercept	3.103	***	3.101	***

***P<0.01 ; **P<0.05

Table 3. Regressions Predicting General Health Status (Health Inequality by Education)

Variables	**Model 1**	**Model 2** Interactions of Education with Time Trend
Education		
Elementary School or Lower	-0.179 ***	-0.171 ***
Junior High School	-0.002	-0.018
High School Graduate	---	---
Junior/Community-Colleges	0.004	0.042
Bachelor's Degree and Above	0.029	0.072
Time Trend		
Before Insurance	-0.012 ***	-0.008
After Insurance	0.001	0.000
Elementary x Before Insurance		-0.018 *

Junior High	x Before Insurance			-0.014	
High School	x Before Insurance			---	
Community-Colleges	x Before Insurance			0.022	*
Bachelor	x Before Insurance			0.011	
Elementary	x After Insurance			0.012	
Junior High	x After Insurance			0.015	
High School	x After Insurance			---	
Community-Colleges	x After Insurance			-0.027	
Bachelor	x After Insurance			-0.019	
Cohort			0.000	0.000	
Age					
0~24			---	---	
25~34			0.061	**	0.058	**
35~44			0.063		0.055	
45~54			0.048		0.040	
55~64			0.000		-0.002	
65~74			-0.100		-0.089	
75~84			-0.203		-0.189	
85 and above			-0.152		-0.137	
Intercept			3.165	***	3.159	***

***P<0.01 ; **P<0.05 ; *P<0.05