Does a National Health Insurance Program Correlate with Life Satisfaction among Older Adults? Longitudinal Findings from a Natural-Experimental Design in Taiwan

INTRODUCTION

As a top priority in public health on reducing health disparities, implementing national health insurance (NHI) to provide universal health insurance coverage and reduce economic barriers of access to medical care has been considered the major path to reach this goal.[1] Taiwan's NHI has been attracted worldwide attention due to its success on both stabilizing medical expenses[2,3] and continuing efforts to narrow health gaps across various socioeconomic groups.[4-6] However, increased medical coverage and utilizations, decreased morbidity, and prolonged lives do not necessarily accompany improving a person's well-being. Public health concern for the maintenance of a good quality of life is critical as NHI encompasses broad political and social demands. Therefore, of particular concern is the extent to which NHI contributes to improve well-being. Furthermore, examining whether NHI narrows gaps in the perceived well-being between NHI insured and uninsured groups is of major interest to public health scholars and policy makers.

Life satisfaction is one of most commonly measures of subjective well-being.[7-9] Its stability and validity as a measurement has been well documented.[10-14] The higher the life satisfaction of a population, the better the quality of life for that population.[15] In order to improve the social development and to ensure happiness and life satisfaction of the people, there are some subjective social indicators that need to be considered by the government policy.[16-18] The proportion of persons over age 65 has increased steadily in recent decades in Taiwan, as it has in

many other developed countries. Therefore, life satisfaction for the older people in countries with an aging population is inevitably crucial. Understanding life satisfaction of the aging population is an essential element in evaluating *effective* government policies such as NHI.

Taiwan established the NHI program since 1995. Before the NHI about half of the population was uninsured and among this uninsured population the children and older population (65+ years old) were the majority.[19] Using the Taiwan Longitudinal Study on Aging (TLSA) provides a rare opportunity to examine whether the NHI improves life satisfaction and closes its gaps over time across various pre-NHI insurance groups among older adults in a natural experimental design. The TLSA began its data collection before the NHI establishment, 1989 and 1993, and then continued for 14 years, which allows us to identify the causal effect of the NHI. The present study thus aims to address whether NHI plays a contributing factor in the pre-NHI assessment and change of life satisfaction among older Taiwanese adults across various pre-NHI insurance groups. The goal of this study is to specifically examine the overall trend of life satisfaction as well as estimate the long-term effect of NHI on life satisfaction trajectories, both before and after implementing NHI over the 18-year period. We will also evaluate whether NHI narrows the gaps in life satisfaction between various insurance groups over time, after taking medical utilizations and health status into consideration.

METHODS

Data and Sample

Data for this analysis are from the Taiwan Longitudinal Study on Aging (TLSA), a nationally representative survey designed to study the impact of socioeconomic development on the

physical and emotional health of older Taiwanese adults. Data were collected by the Bureau of Health Promotion of the Taiwan Public Health Department from 1989 to 2007. The baseline sample was derived using a 3-stage sampling framework. A total of 4,049 older adults were first interviewed in-person in 1989, with four follow-up interviews conducted between 1996 and 2007 for surviving participants. Information on TLSA can be found at www.bhp.doh.gov.tw. Additional details on the TLSA sampling framework and design are reported elsewhere.[20,21] For this study, the analytic sample was restricted to 3,778 older adults at the baseline, with complete data on insurance status and life satisfaction. The study protocol was approved by the Ethical Committee of National Yang-Ming University.

Measures

The Life Satisfaction Index (LSI) is a 10-item scale adaptation of the original 20-item LSI[22]. LSI items include, "Has your life been better than most people's lives?", "Are you satisfied with your life?" and were dichotomously rated yes or no. Items were reverse-scored when necessary and summed so that higher LSI scores corresponded with better life satisfaction. The 10 items were summed to generate an LSI score ranging from 0-10 (Cronbach's α=0.73-0.81). Higher scores represent higher levels of life satisfaction.

Pre-NHI insurance status was assessed by pre-NHI surveys in 1989 and 1993. Taiwan had three separate insurance occupation-based programs before 1995: Government Employee Insurance, Farmers Insurance, and Labor Insurance. Information on health insurance was not collected until 1993, but the stable insurance status through 1989 to 1993 was established through prior research.[23] Therefore, we assigned pre-NHI insurance status for those without 1993

reports by their 1989 occupations. Four categories of pre-NHI insurance status were identified: pre-NHI insured (government employee insurance, farmers' insurance, and labor insurance) and pre-NHI uninsured.

Time period is an important indicator to this inquiry. This study seeks to explore longitudinal trends in life satisfaction by using five longitudinal population-based surveys conducted over an 18-year timeframe. Data from pre-NHI, 1996, 1999, 2003 and 2007 was utilized and a categorical variable was created to distinguish data collected from these five time points.

Covariates. The analyses were adjusted for time-varying covariates of concurrent medical utilizations and several indicators of health status. Medical utilizations included whether they used outpatient care, pharmacy services, and/or emergency room services in the past year with dichotomous responses. Health status was measured by 5-point self-reported health rating (DESCRIBE THE RATING HERE), presence of a physical disability (e.g., the Instrumental Activities of Daily Living, IADLs), evidence of a cardiovascular related disease (CVD-related disease), ever cigarette smoking (yes/no), and ever participation in social activities (yes/no). The IADL scale assessed if respondents had difficulty with shopping, managing money, using transportation, doing heavy housework, or using telephone. The IADL measure ranged 0 to 5, based on approaches used in prior studies.[24-28] Respondents indicated a history of cardiovascular disease (CVD) if: (1) a doctor ever told respondents they had a heart attack, coronary heart disease, or other heart problems; (2) had a stroke; and (3) have diabetes. An indication of any of these conditions was dichotomously coded as 1; absence of CVD was coded as0.[29]

Statistical analysis

All analyses were conducted using Stata 11.[30] Two-level growth curve models were employed in which the models were specified with age at Level 1, and nested within individuals at Level 2 to assess effects of pre-NHI insurance status on trajectories of life satisfaction.[31] In the growth curve, the intercept and the slope represent the pre-NHI level and change rate of life satisfaction of an individual. The interaction of the slope with pre-NHI insurance status at Level 2 described group difference of pre-NHI insurance status in satisfaction change. To assess our research purposes, a sequential modeling strategy was used for the multivariate portion of the analysis, progressively adjusting our growth curve models.

The first null model was created to explore whether life satisfaction varies across individuals over time. The gross variance in life satisfaction associated with individuals was estimated with a null model containing only random persons and random variation within these persons over time (i.e., an intercept and a slope term).[31] As suggested by prior research,[32,33] life satisfaction decreased with age as experiences advanced with age; therefore, we included a linear term in all growth curve models. Model 1 also included pre-NHI insurance status, its interaction with slope, time period, and time-varying utilization of medical care to examine life satisfaction changes across various pre-NHI insurance groups from the pre-NHI period to post-NHI assessments. Of particular interest is assessing whether changes in life satisfaction differ across various groups of pre-NHI insurance status, even controlling for a set of time-varying variables in medical care utilization. The final Model 2 adds another set of time-varying variables in personal health status

to elaborate how much of the effect of pre-NHI insurance status in life satisfaction is accounted for by the differential distribution of these health variables.

RESULTS & PRELIMINARY DISCUSSION

Table 1 shows individual characteristics of the analytic sample. As shown in the first column, the pre-NHI uninsured make up one-fourth of the total sample, with 38% Famer insurance, 27% Government Employee insurance, and 9% Labor insurance comprise the rest. Over one-third ever utilized outpatient care and pharmacy services in the past year, and about 6% used emergency care. Over half of the sample (57%) is male, and more than 40% are illiterate. Sixty-three percent of the sample live with family. The average level of life satisfaction is 6.21 with standard deviation of 2.47, with a possible range of 0 to 10.

Table 1 also shows these characteristics stratified by pre-NHI insurance status. The pre-NHI insured are more likely to utilize outpatient and emergency care; in contrast, the pre-NHI uninsured are the second largest group utilizing pharmacy services. While the average self-rated health across groups is similar to the total sample, other indicators in health status are relatively poorer among the pre-NHI uninsured than the insured. For example, the pre-NHI uninsured group has the largest proportion of CVD-related disease (32%). and the lowest lifetime participation in a social activity (26%). Socioeconomic backgrounds also differ between the pre-NHI insurance groups. About three-fourths of those with Government employee insurance are male, compared to 40% of the pre-NHI uninsured. Less than 18% of those covered by government employee insurance are illiterate, compared to over half of the pre-NHI uninsured

(56%). The pre-NHI insured group report higher levels of life satisfaction than the pre-NHI uninsured group.

[Insert Table 1 Here].

Table 2 presents growth curve models that sequentially elaborate the longitudinal NHI effects on life satisfaction among older adults. The null model indicates significant variation in life satisfaction among older people over time and the overall shape of the satisfaction trajectories indicates that life satisfaction gradually decreases with age (β=-0.02; p<0.001). Model 1 includes the following major explanatory variables: pre-NHI insurance status, time period, time-varying concurrent medical care utilization, and interactions of random slopes with the pre-NHI uninsured status. Life satisfaction still decreases with age. Independent of aging and covariates, older adults with a lower level of life satisfaction are more likely to be the pre-NHI uninsured than the pre-NHI insured with Government Employee insurance (β=-2.22; p<0.001). In contrast, an increase of life satisfaction over time is found among the previously uninsured (β=0.02; p<0.05). In addition, another major interest here is the life satisfaction trend before and after the NHI establishment. The analyses show significant overall increases in life satisfaction in 1996 (β=0.15; p<0.05), 2003 (β=0.19; p<0.10), and 2007 (β=0.51; p<0.001), after the establishment of NHI, even adjusting for the concurrent time-varying medical care utilization.

Model 2 adds other time-varying indicators of concurrent health status (i.e., self-rated health, IADL, CVD-related disease, cigarette smoking, and participating in a social activity). Compared to Model 1, the coefficient for the previously uninsured is still significant (β=-1.78; p<0.01), but

its magnitude is reduced by about 31%, indicating some effects of pre-NHI insurance status are redundant with personal health-related characteristics. This analysis also produces an appreciable change in the significance of the period effect. After controlling for concurrent health variables, an overall decrease in life satisfaction is found in 1999 (β=-0.15; p<0.10), and then an increase is observed in 2007 (β=0.27; p<0.05), after NHI is established. Coefficients of concurrent medical care utilization largely decrease their magnitudes; in contrast, significant associations of concurrent health status are demonstrated. Low levels of life satisfaction are associated with poor self-rated health, poor IADL, and cigarette smoking; participating in a social activity is associated with a higher level of life satisfaction. Interestingly, the significant slope in the trajectories on life satisfaction is found to be positive (β=0.01; p<0.05); the levels of life satisfaction increases gradually after controlling for concurrent health status.

[Insert Table 2 Here]

Our analyses reveal that the NHI policy reduces the barriers to medical care utilization and improves life satisfaction, particularly salient for individuals who were pre-NHI uninsured. Given a long-term increase in life satisfaction, the NHI efforts to promote life satisfaction among older adults should be recognized.

REFERENCES

1. Emanuel EJ, Fuchs VR. Health care vouchers—a proposal for universal coverage. *New England Journal of Medicine.* 2005;352(12):1255-1260.
2. HOPE P. Universal coverage in Taiwan. *Health Affairs.* 2003;22:60.
3. Lu JFR, Hsiao WC. Does universal health insurance make health care unaffordable? Lessons from Taiwan. *Health Affairs.* 2003; 22(3):77-88.
4. Chen L, Yip W, Chang MC, et al. The effects of Taiwan's National Health Insurance on access and health status of the elderly. *Health Economics.* 2007;16(3):223-242.
5. Keng SH, Sheu SJ. The effect of national health insurance on mortality and the SES-health gradient: evidence from the elderly in Taiwan. *Health Economics.* 2012.
6. Wen CP, Tsai SP, Chung WSI. A 10-year experience with universal health insurance in Taiwan: measuring changes in health and health disparity. *Annals of internal Medicine.* 2008;148(4):258-267.
7. Campbell A. Subjective measures of well-being. *American Psychologist.* 1976;31(2):117.
8 Diener E, Suh EM, Lucas RE, Smith HL. Subjective well-being: Three decades of progress. *Psychological Bulletin.* 1999;125(2):276.
9. Diener E. Subjective well-being: The science of happiness and a proposal for a national index. *American Psychologist.* 2000;55(1):34
10. Atkinson T. The stability and validity of quality of life measures. *Social Indicators Research.* 1982;10(2):113-132.
11. Chamberlain K, Zika S. Stability and change in subjective well-being over short time periods. *Social Indicators Research.* 1992;26(2):101-117.
12. Horley J, Lavery JJ. The stability and sensitivity of subjective well-being measures. *Social Indicators Research.* 1991;24(2):113-122.
13. Kevin McNeil J, Stones M, Kozma A. Subjective well-being in later life: Issues concerning measurement and prediction. *Social Indicators Research.* 1986;18(1):35-70.
14. Larson R. Thirty years of research on the subjective well-being of older Americans. *Journal of Gerontology.* 1978;33(1):109-125.
15. Diener E, Sapyta JJ, Suh E. Subjective well-being is essential to well-being. *Psychological Inquiry.* 1998;9(1):33-37.
16. Cummins R, Woerner J, Tomyn A, Gibson A, Knapp T. Australian unity wellbeing index: Report 16.0—The wellbeing of Australians—Mortgage payments and home ownership. *Melbourne: Australian Centre on Quality of Life, School of Psychology, Deakin University, ISBN.* 2006;1(7415):6071.
17. Levy H, Meltzer D. *What do we really know about whether health insurance affects health*2004.
18. Schilling O. Development of life satisfaction in old age: another view on the" paradox". *Social Indicators Research.* 2006;75(2):241-271.
19. Cheng SH, Chiang TL. Disparity of medical care utilization among different health insurance schemes in Taiwan. *Social Science & Medicine.* 1998;47(5):613-620.
20. Chiao C, Weng LJ, Botticello AL. Economic strain and well-being in late life: findings from an 18-year population-based longitudinal study of older Taiwanese adults. *Journal of Public Health.* 2011.
21. Glei DA, Landau DA, Goldman N, Chuang YL, Rodríguez G, Weinstein M. Participating in social activities helps preserve cognitive function: an analysis of a longitudinal, population-based study of the elderly. *International Journal of Epidemiology.* 2005;34(4):864-871.

22. Neugarten BL, Havighurst RJ, Tobin SS, Neugarten D. The measurement of life satisfaction. *The Meanings of Age.* 1961:296-306.
23. Chen L, Yip W, Chang MC, et al. The effects of Taiwan's National Health Insurance on access and health status of the elderly. *Health Economics.* 2007;16(3):223-242.
24. Freedman VA, Crimmins E, Schoeni RF, et al. Resolving inconsistencies in trends in old-age disability: report from a technical working group. *Demography.* 2004;41(3):417-441.
25. Manton KG, Corder LS, Stallard E. Estimates of change in chronic disability and institutional incidence and prevalence rates in the US elderly population from the 1982, 1984, and 1989 National Long Term Care Survey. *Journal of Gerontology.* 1993;48(4):S153-S166.
26. Ofstedal MB, Zimmer Z, Hermalin AI, et al. Short-term trends in functional limitation and disability among older Asians: A comparison of five Asian settings. *Journal of Cross-cultural Gerontology.* 2007;22(3):243-261.
27. Pavalko EK, Mossakowski KN, Hamilton VJ. Does perceived discrimination affect health? Longitudinal relationships between work discrimination and women's physical and emotional health. *Journal of Health and Social Behavior.* 2003:18-33.
28. Schoeni RF, Liang J, Bennett J, Sugisawa H, Fukaya T, Kobayashi E. Trends in old-age functioning and disability in Japan, 1993–2002. *Population Studies.* 2006;60(1):39-53.
29. Expert panel on detection, evaluation, and treatment of high blood pressure in adults. Executive summary of the third report of the National Cholesterol Education Program (NCEP) expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (Adult Treatment Panel III). *JAMA* 2001; 285(19): 2486-97.
30. Corporation S. *Stata Statistical Software: Release 11*: College Station, Tex.: Stata Press;2010.
31. Raudenbush SW, Bryk AS. *Hierarchical Linear Models: Applications and Data Analysis Methods.* Vol 1: Sage Publications, Inc; 2002.
32. Chen C. Age increase and life satisfaction among the elderly in Taiwan. *Journal of Population Studies.* 2000;21:37-59.
33. Chen C. Aging and life satisfaction. *Social Indicators Research.* 2001;54(1):57-79.

Table 1. Sample profile of study population at baseline [mean (SD) or percentage]

Explanatory variables	Total	Government Employee insurance	Farmer insurance	Labor insurance	No pre-NHI insurance
	N = 3,778	*N* =1,032	*N* =352	*N* =1,430	*N* = 964
Pre-NHI insurance status (%)					
Government Employee insurance	27.32	—	—	—	—
Labor insurance	9.32	—	—	—	—
Farmer insurance	37.85	—	—	—	—
No pre-NHI insurance	25.52	—	—	—	—
Utilizations before NHI (%)					
Outpatient care	36.92	60.47	28.74	41.19	22.30
Pharmacy	35.31	26.74	40.42	33.81	37.45
Emergency	6.14	8.91	5.10	6.25	4.67
Health related variables before NHI					
Self-rated health, range 1-5	2.68 (1.08)	2.49 (1.11)	2.75 (1.03)	2.59 (1.13)	2.83 (1.06)
IADL, range 0-5	0.76 (1.20)	0.45 (0.90)	0.85 (1.25)	0.67 (1.13)	1.00 (1.35)
CVD related disease	29.04	30.99	25.63	27.92	32.40
Ever cigarette smoking (%)	35.19	35.95	36.60	39.77	30.60
Ever participating in a social activity (%)	38.59	47.87	40.70	36.36	26.35
Background characteristics					
Age (in years)	67.86 (6.24)	66.60 (5.41)	68.55 6.47)	66.25 (6.23)	68.75 (6.41)
Male (%)	57.44	72.97	55.45	67.61	40.04
Education (%)					
Illiterate	44.17	17.99	57.39	31.43	56.20
Incomplete primary education	34.72	30.53	37.07	40.95	33.33
Completed primary education	9.18	19.52	3.79	12.70	5.23
High school graduates and above	11.92	31.95	1.74	14.92	5.23
Living with family (%)	63.62	66.37	69.15	64.29	52.20
Life satisfaction, range 1-10	6.21 (2.47)	6.53 (2.44)	6.41 (2.35)	6.02 (2.54)	5.65 (2.55)

Table 2. Growth curve models of life satisfaction on pre-NHI insurance status, medical care utilization, and health status at two levels, 1989-2007 TLSA

	Null Model		Model 1		Model 2	
	β	SE	β	SE	β	SE
Intercept, satisfaction level	7.26 ***	0.25	8.47 ***	0.41	7.28 ***	0.39
Slope, mean change rate	-0.02 ***	0.003	-0.02 ***	0.01	0.01 *	0.01
Major explanatory variables						
Pre-NHI insurance status						
(ref=Government Employee insurance)						
Farmer insurance			-0.40 **	0.12	-0.24 *	0.10
Labor insurance			-0.32 **	0.08	-0.09	0.07
No pre-NHI insurance			-2.59 ***	0.59	-1.78 **	0.56
No pre-NHI insurance × slope			0.02 **	0.01	0.02 *	0.01
Time period (ref=before NHI period)						
1996			0.15 *	0.07	0.08	0.06
1999			-0.04	0.08	-0.15	0.08
2003			0.19	0.10	0.12	0.09
2007			0.51 ***	0.12	0.27 *	0.11
Time-varying covariates						
Medical care utilization						
Outpatient care			-0.30 ***	0.05	-0.08	0.05
Pharmacy			-0.31 ***	0.05	-0.20 ***	0.05
Emergency			-0.52 ***	0.07	-0.11	0.07
Health related variables						
Self-rated health					-0.57 ***	0.02
IADL					-0.28 ***	0.02
CVD related disease					-0.08	0.05
Cigarette smoking (ref=no)					-0.21 ***	0.06
Participating in a social activity (ref=no)					0.33 ***	0.05

* $p<0.05$; ** $p< 0.01$; *** $p<0.001$