



Research Report

Comparative Study of Elderly in Asia

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Impact of National Health Insurance
on Treatment for High Blood
Pressure among Older Taiwanese

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The Impact of National Health Insurance on Treatment for High Blood Pressure among Older Taiwanese

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Abstract

In 1995, Taiwan implemented a national health insurance program (NHI) to provide equitable, affordable, and universal health care coverage to all its citizens. Prior to this, 43% of the population was uninsured and 57% was covered by one of three major insurance programs.

In this study, we examine the effect of NHI on the utilization of medical services (physician visits and medication use) for high blood pressure (HBP). We compare utilization before and after the introduction of NHI across three groups—those who were uninsured, covered by government insurance (GI), and covered by non-government insurance (NGI) prior to 1995. Analyses are based on data from the 1993 and 1999 waves of the Survey of Health and Living Status of the Middle-Aged and Elderly in Taiwan (1989-2003). The sample is restricted to persons age 70+ who have HBP. Multivariate logit regressions models are based on Andersen's behavioral model of health services utilization.

Results suggest that before NHI, insured respondents were more likely to visit a physician and use medications for their HBP compared to their uninsured counterparts. After NHI, these differentials are reduced, except that those with NGI remain more likely than those who were uninsured prior to NHI to visit a physician.

The results provide support for the effectiveness of NHI in increasing utilization of health care and reducing the gap in utilization between the previously uninsured and insured. Implications of these results provide potential guidelines in formulating health care policies in managing and reducing the adverse effects of HBP.

INTRODUCTION

High blood pressure, an insidious chronic condition, is one of the major risk factors for cardiovascular disease, kidney disease, vision problems, and dementia (Cheng, Chen, Wang, et al., 2005; Di Bari, Pahor, Franse, et al., 2001; Himmelmann, Hedner, Hansson, et al. 1998; Kannel, 1995; Kuller, Margolis, Gaussoin, et al., 2010; Lee, Lin, Sung, et al., 2000; NAAS, 2000; Vasan, Larson, Leip, et al., 2001). Lack of diagnosis and treatment of high blood pressure increases the risk of morbidity, disability, and mortality (Cheng, Chen, Wang, et al., 2005; Chobanian, Bakris, Black, et al., 2003; Lurie, Ward, Shapiro, & Brook, 1984; Wilper, Woolhandler, Lasser, et al., 2009). Fortunately, life-style modifications, early diagnosis and appropriate treatment have been proven to be very effective in preventing the lifelong adverse effects of high blood pressure, independent of age (Chobanian, Bakris, Black, et al., 2003; Epping-Jordan, Galea, Tukutonga, & Beaglehole, 2005; NAAS, 2000; Staessen, Gasowski, Wang, et al., 2000; Wilper, Woolhandler, Lasser, et al., 2009).

In Taiwan, high blood pressure (HBP) and cardiovascular disease (CVD) are among the ten leading causes of death (Taiwan Public Health Report, 2008). Increasing prevalence of HBP (Pan, Chang, Yeh, et al., 2001), worsening risk profiles of CVD (Cheng, Chen, Wang, et al., 2005; Lee, Lin, Sung, et al., 2000), and the increasing proportion of older persons in the population (Hermalin, 2006; Taiwan Public Health Report, 2008) pose an increasing social and economic burden on the population of Taiwan and on the nation's health care system (Rice & LaPlante, 1992; WHO, 2005). Access to health care is essential for reducing these burdens and improving the overall population health. On March 1, 1995, Taiwan expanded health care coverage for its citizens by introducing the National Health Insurance program (NHI) in an attempt to improve access to health care and the health of the population.

The major objective of this study is to examine the effect of universal health care on chronic disease care and management among older adults in Taiwan. An empirical policy evaluation of the effects of NHI on health care utilization for chronic diseases will be beneficial for the policy makers who are contemplating the introduction of universal health care, or reformulation of existing programs. This is particularly true given a lack of studies on the link between utilization of health care for chronic diseases and universal health care. Moreover, the studies that do exist tend to be focused on Western countries (Broyles, Manga, Binder, Angus, & Charette, 1983; Card, Dobkin, & Maestas, 2004; Decker & Remler, 2004; Donelan, Blendon, Schoen, Binns, Osborn & Davis, 2000; Hafner-Eaton, 1993; Ham, 2009). In the current study we focus specifically on care and treatment of high blood pressure.

BACKGROUND

Health care access ¹

Before the implementation of NHI, approximately 43% of the population (mainly children, housekeepers, and elderly) of Taiwan was uninsured, and the rest were covered by three major insurance programs. The Labor Insurance program (LI), which started in 1950, covered private employees between the ages of 15 to 60 years with optional coverage for their dependents. Government Employees' Insurance (GEI), which started in 1958, covered active public employees. Over time, GEI extended the coverage to include retired, as well as active employees, and the dependents (spouses, parents, and children) of both groups. The Farmers Health Insurance program (FI), which started in 1985, covered farmers, fishermen, and their family members. All three programs were financed by premiums collected from employees and employers. Even though a very similar package of medical services—outpatient care, inpatient care, preventive care, and prescription drugs—was available to all three groups, differences in administrative agencies and contractual agreements with health care providers created unequal access to health care services between insured groups. Access to health care providers was more limited for GEI beneficiaries compared to the LI and FI beneficiaries. (A detailed description of the three programs is provided in Peabody, Yu, Wang, & Bickel, 1995). The out-of-pocket cost for an outpatient visit, referred to as a registration fee, was NT \$50 for insured beneficiaries of all programs, compared to NT \$300 to NT \$427 for uninsured persons (Cheng & Chiang, 1997; Cheng & Chiang, 1998; Chiang, 1997). The out-of-pocket cost for medications was 10 percent of the total medication cost for insured beneficiaries, whereas those with no insurance were required to pay the full cost (Lu & Hsieh, 2000).

The government of Taiwan implemented NHI to provide equitable, affordable, and universal health care coverage to all its citizens, and established the Bureau of National Health Insurance (BNHI) to administer the program. The key structural components of the program are mandatory enrollment, a single payer government agency with a mixed method (private and public) of financing, comprehensive coverage, and freedom of choice in selecting health care providers and health care facilities (Chiang, 1997).

To avoid adverse selection into the program and to diversify the risk over the entire population, NHI made participation in the program mandatory. Approximately 92% of the population was enrolled at the end of policy implementation year of 1995, with a current enrollment of about 99%.² Based on the type of employment and socio-economic status, beneficiaries are insured under six different categories. The employed population is enrolled through the employers, whereas the non-working population is enrolled either as dependents or through the government.

¹ For this section, we draw heavily on the work of Cheng & Chiang, 1997; Cheng, 2003; Kan & Lin, 2007; Lu & Hsiao, 2003; Peaboy, Yu, Wang, & Bickel, 1995, and Wen, Tsai, & Chung, 2008.

² A small proportion of the population that is living outside the country does not participate.

To keep health care costs affordable, all the health care providers are reimbursed by the BNHI under a uniform payment policy. The revenue sources for health care providers are BNHI, copayments, registration fees, dispensing drugs, and other miscellaneous services that are not covered by the NHI. Financing of NHI is through payroll tax premiums, government, tobacco tax, and lottery funds. Payroll tax premiums are shared between employees and employers. The costs of the premiums are based on the insurance category, income level, and the number of dependents. The costs of the copayment differ across health care providers and facilities, with a ceiling price set by the BNHI. The premiums and the copayments are either subsidized or waived for the elderly, handicapped, temporarily unemployed, veterans, children under the age of three, and low-income population. In addition, copayments are also waived for catastrophic diseases, child delivery, and the services provided in remote regions. To receive health care, a beneficiary has to pay a monthly premium, a copayment, and a registration fee for each visit. For a physician visit, the copayment ranges between NT \$50 to NT \$100 and the registration fee ranges between NT \$100 to NT \$200 (Cheng & Chiang, 1997). Copayment for drugs depends on the amount of the total costs of the drugs for a visit. There is no copayment if drug costs are less than NT \$100, whereas the copayment ranges between NT \$20 to NT \$200 for drug costs of NT \$101 and higher, with a ceiling of NT \$200 (NHI). Overall, after NHI, the out-of-pocket expenses increased for previously insured beneficiaries and decreased for previously uninsured beneficiaries (Cheng & Chiang, 1997).

NHI provides comprehensive coverage for inpatient care, outpatient care, preventive care, diagnostics, prescription drugs, Chinese medicine, day care for persons with mental illness, home health care, and dental care (with some exclusions such as orthodontics, and prosthodontics). NHI allows complete freedom to its consumers in choosing a health care provider, and also to health care providers for choosing their work arrangements. Health care providers can either work in public health care facilities for fixed wages or in privately owned facilities on a fee-for-service basis. Health care services are provided in hospitals, in clinics, and in pharmacies. Physicians and pharmacies are both allowed to diagnose, prescribe, and dispense drugs (Cheng & Chiang, 1998; Kan & Lin, 2007; Lu & Hsiao, 2003; Wen, Tsai, & Chung, 2008).

LITERATURE REVIEW

In this section, we review the literature for the key factors in the utilization of medical care. Both financial and non-financial factors could motivate or deter individuals from utilizing medical care. Health care policies play a significant role in mitigating the effect of these factors. In providing access to health care, health care policies can be divided into two major categories: policies that provide universal access versus policies that restrict access to the insured beneficiaries only. In either case, health care insurance subsidizes the cost of health care and therefore reduces the financial burden in getting medical care.

Health Care Utilization and Access to Health Care

A handful of studies have examined the effect of universal health care on the utilization of medical services in Taiwan, by comparing levels of utilization before and after the implementation of NHI. The general findings of these studies show that universal access not only increased the overall utilization (Chen, Yip, Chang, et al., 2007; Cheng, 2003; Cheng & Chiang, 1997; Chi & Hsin, 1999), but also reduced the gap in utilization between previously uninsured and insured groups (Cheng & Chiang, 1997)

Environments where health insurance is not universally available show a strong association between health insurance status and the utilization of medical care. A majority of studies have established that, controlling for a range of sociodemographic and health factors, insured individuals are more likely utilize health care. Trevino, Moyer, & Valdez, Stroup-Benham (1991) studied the effect of insurance coverage among different Hispanic groups. Their results show that uninsured Hispanics were less likely to visit a doctor and have a physical examination. Hafner-Eaton (1993) examined the role of health insurance among the individuals under 65 years of age who had either chronic illness, acute illness, or no illness and found that overall utilization of physicians' services was higher among insured individuals. Moreover, the disparity in utilization among the three groups was the highest for individuals who did not have any illnesses and lowest for the group with acute illnesses. Hurd & McGarry (1997) used the Asset and Health Dynamics of the Oldest-Old Survey (AHEAD) to study the effect of having both public and private health insurances on physicians' visit, number of visits, and hospitalization among persons age 70 or older. Results suggest that "heavily insured" individuals who have both public and private health insurances are more likely to use health care than those with no private supplemental health insurance. Cheng & Chiang (1998) & Chi & Hsin (1999) examined the effect of health insurance in the older population (65 years or older) of Taiwan. Results of both studies show that, irrespective of the type of insurance program, insured beneficiaries were more likely to use hospital and/or physician services, compared to the uninsured.

Health Care & Management of Chronic Disease: High Blood Pressure

Besides the issue of access to affordable health care, management of a chronic disease with successful outcomes requires motivated health care providers and individuals (Chernew, Shah, Rosenberg, et. al., 2008; Ham, 2009; Jokisalo, Kumusalo, Enlund, & Takala, 2001; Leibowitz, Manning, & Newhouse, 1985; Nolan, 1993). In the current study, our main interest is to examine the effect of direct derivatives of NHI, such as access and costs, therefore, we limit our review to these two factors only. Hurd and McGarry (1997) studied the effect of presence of a diseases and visiting a physician. They found that among nine selected diseases high blood pressure and diabetes are the two most significant diseases which increase the need to visit a physician for proper management. Keeler, Brook, Goldberg, et al. (1985) studied the hypertensive individuals to examine the utilization pattern under four different cost sharing health insurance plans. Results suggested that respondents who did not incur any financial costs for their treatment are more

likely to utilize medical care and have lower blood pressure, compared to those who incurred any financial costs. In addition, free care not only increased the frequency of physicians visit but also helped in better detection and better compliance with modifications in health behaviors.

Shulman, Beverly, Brogan, et al. (1986) also found that costs of hypertensive treatment could discourage people to seek the treatment.

The effect of NHI on disease management has not been studied very widely. Our study further disaggregates the findings of the existing literature on health care utilization by focusing on a specific disease (HBP) and a segment of the population for which HBP is highly prevalent (persons age 70 years or older).

THEORETICAL FRAMEWORK

To examine the effect of NHI on medical care utilization, we draw upon the behavioral model of health services utilization (Aday & Andersen, 1974; Andersen, 1995; Wolinsky & Johnson, 1991). The model suggests that the utilization of medical care services is dependent on an individual's predisposing, enabling, and need characteristics. Predisposing characteristics are associated with individual demographic characteristics (age, sex, marital status, and family size), social structure (employment, education, and ethnicity), and health beliefs (unique outlook on diseases and the use of medical care). Enabling characteristics are associated with personal or family resources (income and health insurance status), and community structure (accessibility of health care). Need characteristics are represented by either subjective (self-rated health) or objective health status (number of physician diagnosed ailments).

As noted previously, several studies have shown that, before the introduction of NHI, utilization of health care in Taiwan was influenced by health insurance status. In the general population, those who had insurance coverage were more likely to utilize medical care services, compared to the uninsured. The introduction of NHI, which provides universal coverage for health services to the full population, should help reduce disparities in health care utilization for the previously insured versus uninsured groups, while stabilizing the effect of predisposing and need components in the long run.

Our interest is on the impact of NHI on chronic disease care and management and in this paper we focus specifically on high blood pressure. Based on the above rationale, we test the following hypotheses:

1. The introduction of NHI will result in an increase in treatment for high blood pressure among older persons with HBP, irrespective of pre-NHI insurance status.
2. Prior to the introduction of NHI, older hypertensive adults with health insurance will be more likely to receive treatment for their high blood pressure than those without health insurance.

3. The introduction of NHI will reduce the gap in the treatment for high blood pressure between previously uninsured and insured older adults.

METHODOLOGY

Data

We analyze data from the Survey of Health and Living Status of the Middle-Aged and Elderly in Taiwan. The study began in 1989 with a sample of 4,049 persons aged 60 years or over. The sample was drawn from the household registration system of the non-aboriginal areas of Taiwan. The register includes all regular households, as well as residents of nursing homes, long-term hospitals, and old-age homes. All persons aged 60 years or over had an equal probability of being selected into the sample. (For details of the sample design, see Taiwan Provincial Institute for Family Planning, 1989.) In-person interviews were conducted in 1989, 1993, 1996, 1999, 2003 and 2006. The panel design of this survey, and availability of measurements of health, health care utilization and a wide range of demographic and socioeconomic characteristics before and after the implementation of NHI in 1995, offers a natural experiment of sorts for evaluating the short-term impact of NHI on a variety of outcomes.

In this paper we focus on the older cohort (N=4,049) that was recruited in 1989. The baseline response rate for this cohort was 92 percent. Approximately 15 percent (n=591) of these respondents died between 1989 and 1993, and an additional 22 percent (1,486) died between 1993 and 1999. Among the survivors, the follow-up response rates were very high: 91 and 90 percent for the 1993 and 1999 waves, respectively.

The analysis sample is restricted to respondents who were interviewed in 1993 (for whom we have information on health insurance coverage prior to NHI) and who reported having high blood pressure in the 1993 and/or 1999 waves. Within each wave, the sample is further restricted to persons who were age 70 years or over at the time of the interview. This restriction is made to ensure comparability in the age range of the sample in the two waves that are being compared. Finally, we exclude a small number of cases with missing information on any variables used in the analyses. This resulted in exclusion of 24 cases from the 1993 sample (17 were missing data on physician visits or medication use, 6 on ethnicity and 1 on education) and 10 cases from the 1999 sample (8 missing on ethnicity and 2 on education). The final sample sizes for the 1993 and 1999 waves are 492 and 755, respectively.

Variables

Dependent variables

To measure the utilization of medical care services, we use two dependent variables—physician visits and medication use for the treatment of high blood pressure. In each wave, respondents are first asked if they have high blood pressure at present. Those who report high blood pressure are then asked a series of follow-up questions about the condition. One question asks if the

respondent has seen a doctor because of their high blood pressure during the past year. Another question asks if the respondent currently takes medication for treating their high blood pressure (yes/no) and, if yes, whether they take it “often or regularly” or “rarely or only when needed.”

For physician visits, we use a dichotomous variable (0 = No, 1 = Yes) for each wave. For medication use, we recoded the variable into a dichotomous variable by collapsing the “rarely or only when need to” category and the “no” category (0 = No, 1 = Yes).

Independent variable

Health insurance status is our main independent variable of interest. Respondents were first asked about health insurance coverage in the 1993 wave of the survey. We constructed an indicator of health insurance status based on the following two questions from the 1993 survey.

1. *Do you have health insurance?*
2. *If yes, what kind of insurance do you have? (Government employee’s, Laborer’s, Farmer’s, Retired government worker’s, Private school, Government elected representatives, Military, Low income, Veteran’s, Private, Government employee spouse, Retired government worker spouse, Military spouse, and veteran spouse).*

Following the approach of Lee, Lin, Sung, et al. (2000) and based on the similarities in the programs’ eligibility criteria, we collapsed the fourteen categories of insurance into three major insurance groups—Government Employee insurance (GEI), Non-Government (NGI), and Uninsured (UI). In the GEI group, we include respondents who have insurance coverage through either government (n=6), retired government workers (n=11), government employee spouse (n=60), spouse of retired government worker (n=2), government elected representative (n=2), military (n=7), veteran (n=55), and veteran’s spouse (n=9). In the NGI group, we include respondents who have insurance coverage thorough either laborer’s (n=13), farmer’s (n=200), low income or disabled group (n=7), private (n=1), or fisherman’s (n=1). Approximately, 90% of the NGI group is covered through Farmer’s insurance; therefore, we will discuss the results of this category based on the details of the Farmers insurance group. Two dummy variables for the NGI and the GEI groups are used in multivariate regression models, keeping the uninsured group as the reference group.

Covariates

In accordance with Andersen’s model and Chi & Hsin (1999), we select the following variables to represent enabling, need and predisposing characteristics.

For the *enabling* characteristics, in addition to health insurance status (as described above), we include monthly household income, and type of residential location. For type of residential location, we include two dummy variables for “urban location” and “large city”, with “rural location” as a reference group. Monthly household income is categorized in tertiles with the first

tertile as a reference group. Monthly income and type of locality are included as time variant variables and measured in 1993 and 1999 waves. We hypothesize that prior to NHI, respondents with higher income and/or who are living in urban locations will be more likely to utilize medical care. The introduction of NHI should weaken the association between enabling characteristics and the utilization of health care.

To represent *need* characteristics we include two indicators of health: self-rated health (0 = fair, poor, & proxy; 1 = excellent, very good, and good), and a measure of comorbidity (presence of diseases other than HBP). The comorbidity variable represents a count of eleven diseases (diabetes, heart, respiratory, arthritis, chronic back pain, kidney, cataract, liver or gall bladder, ulcer, gout, and cancer). In our analyses, it is included as three dummy variables to compare respondents with one additional disease, two additional diseases, and three or more additional diseases to those with no comorbid diseases. Both the self-rated health and comorbidity measures are time variant in nature. With respect to need characteristics, we hypothesize that pre and post-NHI, respondents with poor health, and/or a higher number of comorbidities, will be more likely to utilize medical care.

For the *predisposing* characteristics, we include age (70 -74 years = 0; 75 years or older = 1), gender (male = 0; female = 1), marital status (not married = 0; married = 1), ethnicity (Taiwanese = 0; Mainlander = 1), education (“less than seven yrs of education”, “seven years or higher”, with “no education “as a reference group) and occupation type (“government or other non family”, “family business”, with “never worked as a reference group). While gender, ethnicity, education, and occupation are time invariant, measured at baseline in 1989, age and marital status are time variant and are measured in 1993 and 1999. We hypothesize that women, unmarried persons, Mainlanders, individuals with higher education, and those employed in government or non-family occupations will be more likely to utilize medical care compared to their counterparts. To the extent that need is not adequately captured by the health characteristics described above, however, age may serve as a proxy for need, in which case we would expect older individuals to be more likely than younger ones to utilize services. Thus, the overall expected effect of age is unclear. We hypothesize that the association between predisposing characteristics and utilization will be similar before and after the NHI.

Analytic Approach

To address our research hypotheses relating to the impact of NHI on chronic disease care and management we conduct parallel cross-sectional analyses for the 1993 and 1999 waves, two years prior and four years following the implementation of NHI. The sample for the 1993 analysis is comprised of individuals who were age 70 or over and reported in the 1993 interview that they had high blood pressure. Likewise, the sample for the 1999 analysis is comprised of persons who were age 70 or over in 1999 and who reported in that wave that they had high blood pressure.

We first compare utilization levels for physician visits and medication use for high blood pressure in 1993 and 1999 and examine differentials by pre-NHI health insurance status in each survey year. We then estimate logistic regression models to predict physician visits and medication use for high blood pressure as a function of pre-NHI health insurance status, with and without controls for other enabling, predisposing and need factors. This approach allows us to compare the effects of pre-NHI health insurance and other factors on health care utilization before and after the implementation of NHI.

RESULTS

Sample Characteristics

Table 1 provides summary statistics for respondents' socio-demographic characteristics for the 1993 and 1999 waves. The last two columns focus on the analytic samples that are used in subsequent analyses, namely respondents who are age 70 years or older in the specified wave (1993 or 1999) and who reported in that wave that they currently have high blood pressure. In 1993, 29 percent of persons age 70 or older reported high blood pressure; in 1999 this figure had increased to 36 percent. For point of comparison, we also include all respondents age 70 years or older in 1993.

Focusing first on the middle two columns, on most of the characteristics shown here, 70+ year-olds with high blood pressure closely resemble the full age 70+ sample in 1993. Women, unmarried persons, and Mainlanders are slightly overrepresented in the high blood pressure sample compared to the full sample, indicating that high blood pressure is more prevalent for these groups. In addition, the proportions reporting fair or poor health and comorbid diseases are higher for those with high blood pressure than for the full 70+ sample. On all other characteristics, the distributions are very similar for the two samples.

Turning to a comparison of the last two columns, results show that in 1999, a higher proportion of respondents are in the older age group compared to 1993 (55% vs. 49%). The proportion of females is slightly lower in 1999 compared to in 1993 (50% vs. 55%). The proportion of unmarried respondents is very similar in both waves (52% in 1993 and 54% in 1999). For ethnicity, Taiwanese are predominant in both waves, but the proportion of Taiwanese is slightly lower in 1999 compared to 1993 (73% vs. 77%). The educational distribution shifts upwards between 1993 and 1999, with increases in the proportion with < 7 years and 7+ years between the two years. There was a slight shift in occupation type for those who ever worked, away from family-based occupations and toward government or non-family occupations. In 1993, three out of every five older persons rated their health as excellent very good or good; in 1999 this proportion dropped to just over one-half. In contrast, the distribution for diseases suggests an improvement in health between 1993 and 1999, with the proportion reporting no other diseases increasing by 5 percent and the proportion reporting 3 or more diseases dropping by the same amount. For health insurance, the proportion who were uninsured prior to NHI was lower in

1999 compared to 1993 (23% vs. 27%), and the proportions with GEI and NGI both showed a slight increase between 1993 and 1999.

Bivariate Analyses

Table 2 presents breakdowns for health insurance coverage in 1993 by socio-demographic and health characteristics. Results of Chi-square tests show statistically significant association ($p < 0.01$) between health insurance and gender, marital status, ethnicity, education, occupation status, income, and type of locality. Consistent with the Anderson framework, females, unmarried persons, Taiwanese, respondents with low education, low income, poor health, and those who never worked, are less likely to be insured. Somewhat surprisingly, persons living in rural areas were more likely than those residing in urban areas and large cities to be insured. This is likely due to the farmer's insurance program that was initiated in 1985 and was quite comprehensive in scope. With respect to the type of insurance coverage, we see sharp differences for some subgroups. In general, a larger proportion of males, Taiwanese, and respondents in low socioeconomic groups tend to have coverage through NGI, whereas females, Mainlanders, and respondents in high socioeconomic groups tend to have coverage through GEI.

Table 3 presents the association between health insurance status in 1993 and the utilization of health care services for the treatment of high blood pressure in the 1993 and in the 1999 waves. Utilization was higher in 1999 compared to 1993 for both physician visits (96% vs. 89%) and for medication use (79% vs. 67%). It is worth noting, however, that utilization of services to treat high blood pressure was already quite high in 1989, particularly for physician visits. Utilization increased for all three health insurance groups. Older adults who were uninsured in 1993 experienced the largest increase in utilization, but the increase was also fairly substantial for those with NGI in 1993.

For both types of treatment and in both waves, utilization is higher among respondents who had health insurance coverage in 1993 (and particularly those with GEI coverage) compared to those who were uninsured. However, the disparity in utilization between the uninsured and insured groups is reduced quite substantially after the introduction of the NHI. For example, in 1993 the proportion using medications to treat their high blood pressure was 58 percent for the uninsured compared to 77 percent for those covered by GEI, a difference of 19 percent. In 1999, this difference had shrunk to 4 percent (77% for uninsured vs. 81% for GEI). A similar pattern was observed for physician visits, for which the difference between the uninsured and GEI groups dropped from 13% in 1993 to 4% in 1999. The differences between the uninsured and NGI groups are not quite as striking, but they follow the same general pattern.

Multivariate Analyses

Table 4 presents the results of logistic regression models predicting physician visits and medication use for high blood pressure in 1993 and 1999 as a function of pre-NHI health insurance status, as well as other enabling, predisposing and need factors. In the four unadjusted

models (shown in the top panel), we estimate the bivariate effect of health insurance status on physician visits and medication use. In the four adjusted models, we include measures to control for the other enabling factors, as well as predisposing and need characteristics.

Physicians' visits for high blood pressure

Results of the unadjusted models show a statistically significant effect of health insurance on physician's visits. Respondents who had either type of health insurance in 1993 are more likely to visit a physician compared to their uninsured counterparts in both 1993 and 1999 (i.e., before and after the implementation of NHI). In 1993, persons with GEI are almost four times (OR = 3.99, $p < .01$) and those with NGI are more than two times (OR = 2.19, $p < .05$) more likely than uninsured individuals to visit a physician. In 1999 (four years after the introduction of NHI), the difference between respondents with government insurance in 1993 and those who were uninsured was reduced and only marginally significant (OR = 2.29, $p < .10$), but the difference between respondents with non-government insurance and the uninsured was similar and still significant (OR = 2.68 $p < .05$).

Health insurance coverage in 1993 remains a significant predictor of physician visits in the adjusted models. Indeed, the effect of non-government insurance is more pronounced in both waves than in the unadjusted models. In 1993, controlling for other enabling, predisposing and need factors, respondents with either government or non-government insurance were about four times more likely than those with no insurance to visit a physician in connection with their high blood pressure. In 1999, similar to unadjusted results, the effect of non-government insurance remained strong (OR=3.75, $p < .01$) in the adjusted model, whereas the effect of government insurance was reduced by half and no longer significant (OR=2.02, $p > .10$).

Contrary to our hypothesis that the importance of enabling factors would lessen after NHI, income had a modest effect on physician visits in 1999, but no effect in 1993. In 1999, those in the second and third tertile of the income distribution were more likely than those in the lowest tertile to see a physician for their high blood pressure, though these differentials were only marginally significant (OR=2.56, $p < .10$ for the 2nd tertile; OR=3.37, $p < .10$ for the 3rd tertile).

Several other factors also emerged as important predictors. Among the predisposing characteristics, gender, marital status, and education show significant relationships with physician visits. In 1993, the likelihood of seeing a physician for the treatment of hypertension is much higher for females than for males (OR = 3.24, $p < .01$). In accordance with our expectations, married respondents are less likely to visit a physician (OR = 0.47, $p < .05$). In 1999 (after NHI), there are no differences between men and women, but married persons continue to be less likely than unmarried persons to see a physician for their hypertension. As hypothesized, higher education is associated with higher probability of seeing a physician. Our results support this association in both pre and post NHI periods, though the effect is most pronounced for the high education group in 1993 (OR = 4.15, $p < .10$), whereas in 1999 it is

most pronounced for the group with low or moderate education (OR = 2.72, $p < .05$). With regard to the need characteristics, while neither measure was significant in 1993, the presence of diseases is significant in the post-NHI wave. In 1999, respondents with three or more comorbid diseases are more likely to visit a physician compared to the respondents who do not have any other diseases (OR = 5.27, $p < .05$).

Use of medication for high blood pressure

Results of the unadjusted models for medication use show that, in 1993, respondents with government insurance are more likely to use medication to treat their high blood pressure compared to uninsured respondents (OR = 2.46, $p < .01$). In 1999, there is no statistically significant difference between the insured and the uninsured respondents.

Adjusting for predisposing, other enabling, and need factors, health insurance remains a strong predictor of medication use in 1993. Respondents who had government or non-government insurance were more likely than those who were uninsured to use medication to treat their high blood pressure (OR = 2.38, $p < .01$ for GEI; OR = 1.55, $p < .10$ for NGI). As in the unadjusted model, there were no differences in medication use in 1999 by health insurance status in 1993. These findings are consistent with our hypothesis that differentials by health insurance status in the pre-NHI period will be reduced or eliminated post-NHI.

There were few significant effects for the other factors we examined. In 1993, the likelihood of using medication is significantly higher among respondents with seven years or higher education compared to the respondents with no education (OR = 2.37, $p < .05$). As with physician visits, household income is related to medication use in 1999, but not in 1993. Respondents in the second tertile of the income distribution are more likely (OR = 2.12, $p < .01$), and respondents with missing income are less likely (OR = 0.26, $p < .01$) to use medication to treat high blood pressure compared to respondents in the first tertile. The use of medication is significantly related with respondents' self-rated health. Respondents who report better health are less likely to use medication for high blood pressure both before (OR = 0.47, $p < .01$) and after (OR = 0.61, $p < .01$) NHI.

DISCUSSION

In this study, we examine the short-term effect of Taiwan's universal health care program (NHI) on the utilization of physicians' visits and medications for the treatment of high blood pressure among older adults. We utilized the Andersen behavioral model of health care utilization and examined the effects of a range of enabling, predisposing and need factors. Our primary hypotheses were that, prior to the introduction of NHI, utilization of health care would be higher among individuals who had health insurance compared to those who were uninsured, and that utilization would converge for the previously insured and uninsured groups after NHI was implemented. Our results lend partial support to both of these hypotheses.

Utilization is higher among older adults who were insured compared to those who were uninsured before NHI, and there is some convergence in utilization rates between previously uninsured and insured groups after NHI. However, the convergence is much more pronounced for medication use than physician visits. For physician visits, we observe a convergence in utilization for those who were previously covered by government insurance compared to the uninsured. However, individuals who were previously insured under NGI are still significantly more likely to visit physicians in the post-NHI period than those who were previously uninsured. Our best conjecture to explain the continued higher physician utilization among the NGI beneficiaries in the post-NHI period is based on changes in out-of-pocket costs and accessibility of medical facilities. Before NHI, an insured beneficiary was required to pay a small registration fee to visit a physician, but after NHI, beneficiaries have to pay both a copayment and a registration fee. The cost of both copayment and registration fee varies with the type of medical facility and the physician. Individuals with very low income, with specific disabilities, or who live in aboriginal, are exempt from paying these fees. Due to financial and non-financial vulnerabilities of the NGI group (farmers represent a majority of this group in our sample) (Cheng & Chiang, 1998; Cheng, 2003; Liu & Chen, 2002), this group may be exempt from any out-of-pocket expenses and therefore would have less of a financial barrier to visit a physician. In addition to the out-of-pocket costs, expansion of medical care facilities in rural areas in the post-NHI period could also increase the accessibility of physicians for the NGI group.

We also examined the role of income as an enabling factor. While income is not a significant predictor in the pre-NHI wave, it shows a marginally significant association in the post-NHI wave. In 1999, respondents with higher incomes are more likely to visit a physician and use medication compared to the respondents in the lowest income group. We speculate that the cost structure of medical care after NHI and the role of private health insurance in Taiwan might explain this relationship. As mentioned above and also noted by Cheng & Chiang (1997), Lu & Hsiao (2003), and Wen and colleagues (2008), NHI increased the out-of-pocket costs for the previously insured (except for those with very low income or others who are exempt from the fees, as described above). In addition, Liu & Chen (2002) found that individuals with higher income and education are more likely to have additional private health insurance. Either one or both of these factors suggest that individuals with higher income are more able to afford health care.

Among the predisposing factors, gender, marital status, and education show a significant association with physician visits. The effects of education and marital status are as expected and remain significant in both the pre and post NHI periods. The effect of gender is significant in the pre-NHI period only. Overall, the higher utilization among women could be attributed to their higher life expectancy and higher comorbidities. For medication use, the advantage of higher education is consistent in 1993 only. Individuals with higher education may have a better understanding of the importance of treating high blood pressure and of its adverse long-term effects, and therefore be more likely to seek treatment. It is unclear why the effect of education

on medication use is diminished in 1999. As noted above, however, income emerged as an important predictor of medication use in 1999 and since income and education are correlated, this may be part of the explanation.

As indicators of need, we focused on self-rated health and comorbid diseases. In the Taiwanese elderly population, Chi & Hsin (1999) reported that both subjective (self-rated health) and objective (physician diagnosed diseases) health have strong relationships with general medical care utilization. Individuals with better self-rated health and fewer diseases are less likely to utilize medical care than those who report poorer health and who have more diseases. In the US elderly population, Hurd & McGarry (1997) also found that individuals with better self-rated health are less likely to visit a doctor. Our results show some consistency with these findings. We find a strong and consistent association between self-rated health and medication use for high blood pressure, but only a weak association between health (specifically comorbidity) and physician visits.

Some caution is warranted in interpreting the results of our study due to the small sample size and lack of information on a few variables of interest. Because we focused on the impact of universal health care on the treatment of a specific chronic disease (high blood pressure), our sample size was fairly restricted. In addition, as the literature suggests, utilization of medical care may also be influenced by private health insurance, personal initiative and health beliefs, or the direct or indirect impact of other public policies, such as those relating to alcohol and tobacco use, nutrition, physical activity, helmet and seat-belt use, and the like. Unfortunately, our study data do not provide information on these variables to disentangle their effect. Nevertheless, we feel that this initial effort of focusing on chronic disease management provides valuable insights and a promising area for future studies. As the universal health care system in Taiwan matures, future studies with richer data can provide better understanding on specific chronic diseases.

Our understanding of the effect of universal health care will remain partial without including the effect of other social policies, as health is a combined measure of well-being, not just treating the diseases. Further studies are needed to determine the role of universal access to health care and its components, such as the structure of copayments and availability of health care providers in promoting the equity for health care utilization. Longitudinal data covering a longer period of time and a broader age group could help in elucidating the effect of universal access and its effect in preventing, delaying, and managing chronic diseases.

In summary, the results of our study suggest that the introduction of NHI may have been instrumental in reducing the disparity in utilization between previously insured and uninsured hypertensive older adults in Taiwan. Effective management of HBP or any chronic disease cannot be achieved by medical care only, however. Studies of a multidisciplinary nature that consider the effect of other social policies, psychological aspects of motivating behaviors in seeking or not seeking care, and programs to educate and motivate people to adopt healthy life styles would be beneficial in the formulation of policies and programs for effective management

of chronic disease. Universal health care access may not be a panacea for population health, but at least it is one step towards the foundation of social equity.

Table 1. Socio-demographic and health characteristics for the total age 70+ sample in 1993 and for the two analysis samples

Characteristics	1993		1999
	70 years or older	70 years or older with HBP	70 years or older with HBP
Predisposing characteristics			
Age			
70-74	51.1	51.4	45.3
75+	48.9	48.6	54.7
Gender			
Male	52.9	45.1	50.1
Female	47.1	54.9	49.9
Marital status			
Married	52.3	48.0	45.6
Unmarried	47.7	52.0	54.4
Ethnicity			
Taiwanese	82.1	76.8	73.4
Mainlanders	17.9	23.2	26.6
Education			
No education	49.4	51.0	37.9
Less than 7 yrs	36.4	33.9	40.0
7 yrs or higher	14.2	15.0	22.1
Occupation			
Never worked	23.9	24.8	25.3
Government or Non family	37.4	38.8	43.8
Family	38.8	36.4	30.9
Enabling characteristics			
Health insurance			
Uninsured	29.0	27.2	22.8
Government Insurance	25.3	29.9	33.5
Non-Government	45.7	42.9	43.7
Monthly Income tertiles			
First	30.5	28.5	32.5
Second	36.6	37.0	33.8
Third	31.1	32.5	29.9
Missing	1.8	2.0	3.8
Type of locality			
Rural	36.2	36.0	36.0
Urban	36.8	35.2	36.3
Large city	27.0	28.9	27.7
Need characteristics			
Self-rated health			
Fair/Poor	31.4	40.0	48.7
Excellent, Very Good, Good	68.6	60.0	51.3
Presence of other diseases			
None	24.9	16.7	21.5
One	28.4	26.2	28.1
Two	22.5	24.2	23.3
Three or more	24.2	32.9	27.2
N	1,668	492	755

Table 2. Distribution of health insurance coverage in 1993 by socio-demographic and health characteristics, among persons age 70+ with high blood pressure, Taiwan 1993

Characteristics	Health Insurance Coverage (%)			Total (n=492)	Pearson Chi-square (p-value)
	Uninsured	Government Insurance (GEI)	Non- Government Insurance (NGI)		
Age in years					
70 -74	26.9	32.8	40.3	100.0	2.32 (0.31)
75+	27.6	26.8	45.6	100.0	
Gender					
Male	15.8	44.6	39.6	100.0	49.86 (0.00)
Female	36.7	17.8	45.6	100.0	
Marital status					
Married	17.4	25.4	38.3	100.0	22.44 (0.00)
Unmarried	36.3	34.7	47.9	100.0	
Ethnicity					
Taiwanese	29.9	15.9	54.2	100.0	160.30 (0.00)
Mainlanders	18.4	76.3	5.3	100.0	
Education					
No education	35.9	13.9	50.2	100.0	120.40 (0.00)
Less than 7 yrs	23.4	31.7	44.9	100.0	
7 yrs or higher	6.8	79.7	13.5	100.0	
Occupation					
Never worked	36.9	25.4	37.7	100.0	90.09 (0.00)
Govt or Non family	27.7	48.7	23.6	100.0	
Family	20.1	12.8	67.0	100.0	
Monthly Income tertiles					
First	30.0	15.7	54.3	100.0	68.80 (0.00)
Second	34.6	19.2	46.2	100.0	
Third	16.9	52.5	30.6	100.0	
Missing	20.0	60.0	20.0	100.0	
Type of locality					
Rural	18.1	16.4	65.5	100.0	97.38 (0.00)
Urban	27.2	27.2	45.7	100.0	
Large city	38.7	50.0	11.3	100.0	
Self-rated health					
Fair/Poor					4.51 (0.11)
Excellent, Very Good, Good	32.0	25.9	42.1	100.0	
	24.1	32.5	43.4	100.0	
Presence of other diseases					
None	23.2	35.4	41.5	100.0	9.35 (0.16)
One	26.4	29.5	44.2	100.0	
Two	24.4	23.5	52.1	100.0	
Three or more	32.1	32.1	35.8	100.0	

Table 3. Association between health insurance coverage in 1993 and physician visits and medication use for the treatment of high blood pressure in 1993 and 1999, among persons age 70+ with high blood pressure

Health insurance status (1993)	Physicians' visits (%)		Medication use (%)	
	1993	1999	1993	1999
Uninsured	81.3	93.0	57.5	77.3
Government Insurance	94.6	96.8	76.9	81.4
Non-Government Insurance	90.5	97.3	64.9	78.8
Total	89.2	96.2	66.5	79.3
Chi-square (p-value)	13.38 (0.00)	6.00 (0.05)	12.24 (0.00)	1.16 (0.56)

Table 4. Odds ratios (OR) and 95% confidence interval (CI) for the effect of 1993 health insurance status on physician visits and medication use for the treatment of high blood pressure, among respondents age 70+ with high blood pressure, Taiwan 1993 and 1999

Variable	Physicians' visits		Medication use	
	1993 (n = 492)	1999 (n = 755)	1993 (n = 492)	1999 (n = 755)
Unadjusted models: OR (CI)				
Health insurance (Uninsured)				
Government	3.99**	2.29+	2.46**	1.29
Non-government	2.19*	2.68*	1.37	1.09
Model statistics				
-2 Log likelihood	323.38	240.64	615.18	768.10
Chi-Square	0.0	0.0	0.0	0.0
df	1.0	1.0	1.0	1.0
Adjusted models: OR (CI)				
Enabling characteristics				
Health insurance (Uninsured)				
Government	4.16**	2.02	2.38**	1.04
Non-government	4.00**	3.75**	1.55+	1.09
Monthly Income tertiles (First)				
Second	1.18	2.56+	1.13	2.12**
Third	1.16	3.37+	1.19	1.39
Missing	1.23	0.24	0.91	0.26**
Type of locality (Rural)				
Urban	0.72	1.03	1.22	1.28
Large city	1.29	1.32	1.11	1.49
Predisposing characteristics				
Age (70-74)				
75+	0.97	0.90	0.88	0.75
Gender (Male)				
Female	3.24**	1.33	1.07	1.00
Marital status (Unmarried)				
Married	0.47*	0.47+	1.02	1.19
Ethnicity (Taiwanese)				
Mainlanders	1.85	0.73	0.77	1.03
Education (No education)				
Less than 7 yrs	1.32	2.72*	1.17	0.91
7 yrs or higher	4.15+	1.61	2.37*	1.53
Occupation (Never worked)				
Government or Non family	0.89	2.00	0.76	0.76
Family	0.92	1.77	0.72	1.02
Need characteristics				
Self-rated health (Fair/Poor)				
Excellent, Very Good, Good	0.57	0.91	0.47**	0.61**
Other diseases (None)				
One	1.09	1.43	1.29	0.99
Two	1.82	1.62	1.54	0.95
Three or more	1.29	5.27*	1.52	1.23
Model statistics				
-2 Log likelihood	294.84	219.96	590.63	738.40
Chi-Square	6.96	6.94	10.02	4.62
df	8	8	8	8
**P <= 0.01; * p<= 0.05; +p<=0.10				

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Comparative Study of the Elderly in Asia

This series of research reports deals with the status of the elderly in several Asian countries. The series was initiated in 1989 under a broad project sponsored by the U.S. National Institute on Aging (Grant No. AG07637) and directed by Albert I. Hermalin. This particular report presents research that was conducted under a parallel ROI grant from the National Institute on Aging, A Comparative Study of Aging and Health in Asia (AG20063-01 and AG20072-01). This is a multi-country collaborative study whose overall goal is to describe and analyze health transitions and health care utilization patterns in four Asian countries undergoing rapid population aging and social and economic change.

The project uses existing longitudinal survey data from five Asian settings: Taiwan, the Philippines, Singapore, Indonesia, and China. Organizations collaborating in this research include the Population Council, New York; the Population Institute, University of the Philippines; the Department of Sociology, National University of Singapore; the Bureau of Health Promotion, Department of Health, Taichung, Taiwan; the Beijing Geriatric Clinical and Research Center, Beijing, China; and the Nihon University Population Research Institute, Tokyo, Japan.

For additional information on this research project, please visit the project website: <http://aha.psc.isr.umich.edu> or contact the Principal Investigator: Mary Beth Ofstedal, Population Studies Center, University of Michigan, PO Box 1248, Ann Arbor, MI 48106-1248, USA.

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