

The distribution of net benefits under the National Health Insurance programme in Taiwan

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The redistributive effects of a social insurance programme are determined by how the programme is paid for—who pays and how much do they pay?—and how the benefits are distributed. As a result, the redistributive effects of a social health insurance programme should be evaluated on the basis of its net benefit—the difference between benefits and payment. Among the rich body of empirical analysis on equity in health care financing, however, most studies have relied on partial analysis, assessing equity by source of financing while ignoring the benefit side, or looking at equity in benefits but ignoring the funding side. Either approach risks misleading findings. In this study, therefore, the primary objective was to assess the distribution of net benefits across income groups under Taiwan's National Health Insurance (NHI) programme.

This study observed a nationally representative sample of 74 012 NHI enrollees from 1996 to 2000. The unique NHI databases in Taiwan provide comprehensive enrolment and utilization information, and allowed linkage to each enrollee's income tax files. In addition to crude estimates, two-part models and ordinary least-square models were used to adjust inpatient and outpatient benefits for health care needs (age, sex, major disease status and physical disability).

After adjusting for health care needs, the distribution of net benefits showed an apparent pro-poor pattern, with the lowest income group receiving the highest net benefits (NT\$3353) and the top income group receiving the lowest net benefits (–NT\$3072) in 1996. Although a clear pro-poor pattern was observed among those enrollees who paid wage-based premiums, this vertically equitable pattern was less evident among the enrollees who paid fixed premiums. Overall, a trend of increasing net benefits was observed in all income groups between 1996 and 2000, and all the NHI enrollees can be considered better off over time.

In addition to contributing to the limited literature on equity in net benefits, the study provides an important policy reference to developing countries with large underground economies and relatively small populations of regular wage-earners as it indicates that using fixed premiums as a major financing scheme may pose a serious equity concern and policy challenge.

Keywords Taiwan, national health insurance, net benefits

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KEY MESSAGES

- The redistributive effects of a social insurance programme are determined by how the programme is paid for—who pays and how much they pay—and how the benefits are distributed.
- Assessing equity by source of social insurance financing while ignoring the benefit side, or looking at equity in benefits but ignoring the funding side, risks misleading findings.
- In developing countries with large underground economies and relatively small populations of regular wage-earners, using fixed premiums for financing health care may pose a serious equity concern and policy challenge.

Introduction

In addition to providing financial risk protection, social health insurance is often promoted for equity reasons. The redistributive effects of a social insurance programme are determined by how the programme is paid for—who pays and how much do they pay?—and how the benefits are distributed. As a result, the redistributive effects of a social health insurance programme should be evaluated on the basis of its net benefit—the difference between benefits and payment (Zschock 1989; Culyer and Wagstaff 1993). Among the rich body of empirical analysis on equity in health care financing, however, most studies have relied on partial analysis, assessing equity by source of financing while ignoring the benefit side, or looking at equity in benefits but ignoring the funding side (Culyer *et al.* 1992; Wagstaff *et al.* 1992; van Doorslaer *et al.* 1999; Wagstaff *et al.* 1999; van Doorslaer *et al.* 2000). Either approach risks misleading findings.

Limited research exists on the distribution of the net benefits of social health insurance programmes. Conducting such studies faces three major challenges: (1) the lack of complete information on sources of both funding and benefits at the household/individual level; (2) the difficulty in linking insurance-related information to income-tax data along with information on household structure; (3) the complexity involved in constructing appropriate algorithms for allocating benefits and payments. A study that tried to overcome these obstacles and estimate the redistributive consequences of public health care programmes in the province of Manitoba, Canada (Mustard *et al.* 1998) showed a progressive redistributive effect at the household level in the distribution of non-cash health care benefits financed purely by taxation sources. While the results provide a lesson for developed countries where their health insurance programmes are financed through general taxation, they may not be generalizable to systems not financed entirely by general tax revenue, such as a social health insurance system.

The primary objective of this study was to assess the distribution of net benefits across income groups under Taiwan's National Health Insurance (NHI) programme. Taiwan established its NHI in 1995 with the objective of providing equal access to health care for all. It is financed by a combination of premium and tax revenue through government subsidies. As a single insurer, the NHI has also maintained detailed individual-level data on enrolment, health care utilization, and income, which allows us to analyze the distribution of net benefits. In addition to filling

a knowledge gap in the redistributive effects of social health insurance, our results will also provide valuable lessons for economies that have a relatively large non-wage sector which renders wage-based premium financing infeasible.

Health care financing in Taiwan

The NHI is a social insurance system financed by premiums and taxes. In 2000, premiums from the insured and employers constituted 72% of NHI revenues, and the remaining 28% was subsidized by the government through taxes. Enrolment is mainly through employment, and enrollees are classified into one of the subcategories of six main insurance categories, according to their occupation (Table 1). Premium contributions are collected in two ways: (1) waged-based premiums paid by regular wage earners, and (2) fixed premiums (varied according to job category) paid by those without a well-defined monthly wage. For those individuals in category I, such as the employees of public or private enterprises, and employers, whose monthly wage information can be easily obtained, premiums are based on wages. In 2000, there were eight wage brackets with a cap of NT\$87 600 (2000 annual average: 1 US\$ = NT\$31.225). The contribution

Table 1 Percentage contribution of the NHI premium by insurance category and financing source

Category	Sub-category	Government %	Employer %	Employee %
1st	Private-sector employees	10	60	30
	Government employees		70	30
	Self-employed/employers			100
2nd	Union workers	40		60
3rd	Farmers/fishermen	70		30
4th	Military servicemen	100		
5th	Low-income households	100		
6th ^a	Veterans	100		
	Community groups	40		60

^aVeterans and community groups both fall into the 6th insurance category but the financing of the premium differs.

rate was 4.25% for all wage brackets. Thus, premiums are higher for those in higher wage brackets. Those in categories II-VI, including seasonal or temporary workers without a fixed employer, farmers and fishermen, whose monthly wages are not well defined and are more difficult to assess, are enrolled in NHI through various workers' associations or the local government. They pay fixed premiums, pre-determined by the Bureau of National Health Insurance (BNHI) according to occupation.

The wage-based premium is shared by an individual, his or her employer and the government. The premium contribution of each source varies by insurance category. For example, in private enterprises, employees pay 30%, the employer pays 60% and government pays the remaining 10%. Employers and the self-employed pay 100% of their premiums. The government subsidizes 100% of the premiums for low-income individuals, veterans and aborigines. Premiums for dependants are levied on a per capita basis; an individual pays for a maximum of three dependants. See Table 1 for a more detailed description of the insurance categories and shares of premium contribution by category.

Although Taiwan's NHI was designed to be pro-poor, the dual financing schemes may not necessarily lead to pro-poor redistribution. The fixed premium and the cap set at NT\$87 600 for wage-based premiums may limit the system's redistributive function.

Benefits coverage

The NHI programme offers comprehensive and equal benefit coverage to all its enrollees. The benefits package includes outpatient services in clinics and hospitals, inpatient hospital services, dental services, Chinese medicine services, diagnostic tests and examinations, prescription drugs and certain over-the-counter drugs, preventive services, day care for the mentally ill and home care. Cosmetic surgeries, long-term care, dentures, hearing aids and prosthetics are not covered.

In order to minimize the moral hazard inherent in a comprehensive universal health insurance programme, NHI beneficiaries bear some cost-sharing obligations. For outpatient care, from 1996 to 2000, beneficiaries paid co-payments of NT\$50 for clinic visits or outpatient visits to district hospitals, NT\$100 for an outpatient visit to regional hospitals and NT\$150 for an outpatient visit to academic medical centres. For inpatient services, beneficiaries are required to pay co-insurance for medical services as well as for the cost of beds and meals. The payment varies with the length of stay: 10% for the first 30 days, 20% for days 30 through to 60, and 30% for 61 days and beyond (Bureau of National Health Insurance [Taiwan] 2005). On average, the co-payment rate is relatively lower in Taiwan than in other countries.

Although the NHI benefit coverage was designed to be comprehensive and equal for all enrollees, due to differences in disease patterns and health care utilization, the distribution of benefits to rich and poor may not necessarily be equal. Hence, it is important to examine whether NHI's equal and comprehensive package has achieved equity in meeting health needs.

Methods

Study design and sample

The NHI sample files, constructed and managed by the National Health Research Institute (NHRI), consist of comprehensive utilization and enrolment information for a nationally representative sample of 100 000 NHI beneficiaries out of a population of 21 400 826 enrollees throughout Taiwan in 2000. A random sampling design was used by the NHRI to select a representative sample (National Health Research Institute [Taiwan] 2005a, b). After excluding those individuals whose files lacked complete information, household registration record or NHI enrolment record, or who died during the study period, the final sample contained 74 012 individuals. This study followed the study sample for the fiscal years 1996, 1998 and 2000 to estimate the net benefits of the NHI programme by income quintiles.

Data

Seven electronic databases were linked to construct a database for the study. The NHI enrolment files provide information on enrolment status, premiums paid and physical disability status. The NHI ambulatory care claims files contain records of the use of outpatient services at the individual level, and the NHI inpatient files contain records of each admission case. Records include information such as gender, date of birth, date of service and reimbursements of all insured physician services, procedures, laboratory tests, diagnostic imaging and prescription drugs for each outpatient care visit or hospital admission. The NHI major-disease file identifies individuals in the sample with serious diseases such as cancer and major mental illnesses. In addition, the household registry was used to provide information on the aboriginal status and residential location of each individual in the sample. Death certificates were used to track those who died during the study period from 1996 to 2000.

The income tax files covering the years 1998–2000, managed by the Ministry of Finance, were also linked to provide gross income information on average individual and household incomes over the 3-year period, number of household members within the economic family unit, number of household members aged 70 or over, and number of household members aged 20 or under. Unfortunately, the Ministry of Finance did not provide information on actual tax paid by individuals or households. Of the sample subjects, about 19% did not file a tax return for all 3 years. The majority of these individuals were exempt from income tax mainly because their annual incomes were below the level at which tax returns are required. Hence, these 19% of 74 012 individuals were included in the lowest income quintile (Q0). The distribution of income tax data in our sample is similar to that in the general population. Unique, anonymous individual identification numbers and dates of birth were used to link all seven datasets.

Variables

Average per capita household income

A measure of total household income was derived from the income tax files. Each individual's household income was defined as total household gross income and calculated by

summing the gross incomes from the income tax returns of all members of the same economic household unit. Household income was then adjusted for household structure (number of individuals aged 70 or above and number of individuals aged 20 or under) according to the equivalence scale proposed by Aronson *et al.* (1994) and Buhmann *et al.* (1988):

$$e_h = (A_h + \Phi K_h)^\theta$$

Where e_h is the equivalence factor for household h , A_h is the number of adults in household h and K_h is the sum of number of children aged 20 or under, and number of individuals aged 70 or above. Since no empirical study is available in Taiwan to determine the two parameters, Φ and θ , we followed Wagstaff *et al.* (1999) to set the two parameters at a value of 0.5. Then we divided the household-structure-adjusted household income by the number of household members to get a per capita household income. We then constructed the average per capita household income by averaging the per capita household incomes over the years 1998–2000. Individuals were grouped into quintiles of approximately 15 000 individuals each according to average per capita household income. The lowest quintile group (Q0) contained the poorest individuals including those who did not file any income tax return.

Premium

A measure of premiums was derived from the enrolment file. Premiums are collected from three sources: individual contribution, employer contribution and government subsidy. Share of premium contribution by the insured, employer and government for each insurance category is specified in Table 1. The formulae used by the Bureau of National Health Insurance to calculate individual, employer and government contribution of premium were as follows:

Total employer contribution for a household = insurable wage \times premium rate (4.25%) \times employer's share of premium \times (1 + national average number of dependents per insurance household)

Total employer contribution for a household = insurable wage \times premium rate (4.25%) \times government's share of premium \times (1 + national average number of dependents per insurance household)

Premium per subject = premium \div actual household size

In order to relieve possible overwhelming financial pressure on large families, the government set the maximum number of payable dependants at three. Furthermore, in order to prevent employers from discriminating against employees of larger families, instead of being based on number of payable dependants, the calculation of employer contribution is based on a national average number of dependants per household. The national average numbers of dependants per household were 1.10, 0.95 and 0.88 in 1996, 1998 and 2000, respectively (Bureau of National Health Insurance [Taiwan] 2001).

On the other hand, due to data unavailability, the number of payable dependants and actual household size of each subject in our study sample were not available. So a national average number of payable dependants and a national average household size under each insurance category were used as proxies, respectively.

Net payment

Net payment at the individual level includes individual premium contribution, employer premium contribution and co-payments for using the NHI health services. Government subsidies to premium contribution from general taxation were not included in the calculation of net payment because we were unable to precisely allocate the tax burdens to each individual due to the lack of data on actual taxes paid by each individual. This limitation will be discussed in more detail below. The data on co-payments comes from the NHI claims files. However, claims files do not record direct out-of-pocket payments for uninsured services, registration fees, fees for meal and room upgrades, or payments for special nursing-aid services in hospital. In this study, the distributive effects of the three sources of net payment were investigated separately.

Total health care benefit

In this study, total health care benefit is defined as the consumption of insured health care services, as measured in NT-dollars. Detailed financial information regarding provider payments can be found in the computerized NHI medical services claims files. Total health care benefits included consumption of all services offered in ambulatory care visits and hospital admissions. The distributive effects of ambulatory care, hospital care and total benefits were analysed separately.

Net benefits

Net benefits were calculated by subtracting net payments (individual contribution, employer contribution and co-payments) from the total health care benefit.

Statistical analyses

The unit of observation of this study was each individual in the sample. Both benefits and payment measures were adjusted for the Consumer Price Index and defined in real terms. As health care needs are a likely confounder, all benefits measures were adjusted for this factor. In this study, a set of four variables (age, sex, major disease status and physical disability) was used to adjust for differences in health care needs across each income quintile. The distribution of each variable across income quintile is presented in Table 2. Inpatient expenditure was modelled using the two-part models (Duan *et al.* 1983; Cretin *et al.* 1990; Jones 2000). In the first part, the probability of hospitalization was estimated using logistic regression. The inpatient expenditure, conditional on a positive inpatient use, was then estimated using ordinary least square (OLS) linear regression. Since the distribution of medial expenditure was highly skewed, the natural logarithm of inpatient expenditure was used in the models. Predicted log medical expenditures were re-transformed to a raw scale in order to calculate the predicted total medical expenditure using the smearing technique (Duan 1983). Outpatient expenditure was modelled using OLS linear regression since over 80% of individuals incurred outpatient expenses. SAS and STATA were the statistical packages used. The data linkage process was conducted within the Bureau of National Health Insurance and followed the government's confidentiality regulations during the linkage and analysis processes.

Table 2 Descriptive statistics of demographic characteristics, physical disability, major diseases, and utilization of outpatient and inpatient services across income quintiles in 2000

	Income quintile				
	Q0	Q1	Q2	Q3	Q4
Gender					
Male	7181 (51.2)	7380 (49.2)	7168 (47.8)	7337 (48.9)	7438 (49.6)
Female	6850 (48.8)	7615 (50.8)	7828 (52.2)	7658 (51.1)	7557 (50.4)
Age: mean (sd)	38 (19.8)	35 (18.0)	36 (18.8)	38 (19.7)	39 (20.2)
Physical disability					
None	13 325 (95.0)	14 357 (95.8)	14 473 (96.5)	14 490 (96.6)	14 503 (96.7)
Mild	225 (1.6)	198 (1.3)	191 (1.3)	169 (1.1)	165 (1.1)
Moderate	227 (1.6)	229 (1.5)	178 (1.2)	173 (1.2)	175 (1.2)
Severe	254 (1.8)	211 (1.4)	154 (1.0)	163 (1.1)	152 (1.0)
Major disease status					
None	13 638 (97.2)	14 707 (98.1)	14 734 (98.3)	14 721 (98.2)	14 663 (97.8)
Other major disease	139 (1.0)	110 (0.7)	116 (0.8)	117 (0.8)	102 (0.7)
Cancer	162 (1.2)	88 (0.6)	83 (0.6)	112 (0.8)	173 (1.2)
Mental disease	92 (0.7)	90 (0.6)	63 (0.4)	45 (0.3)	57 (0.4)
Probability of use of any outpatient services (sd)	0.871 (0.336)	0.900 (0.301)	0.933 (0.249)	0.939 (0.239)	0.952 (0.214)
Outpatient expenses of users (s.e)	12 308 (35 932)	10 418 (29 391)	10 412 (27 871)	11 527 (31 497)	12 037 (27 864)
Mean outpatient expenses (s.e)	10 715 (33 780)	9 371 (28 051)	9 719 (27 052)	10 828 (30 651)	11 456 (27 306)
Probability of use of any inpatient services (sd)	0.093 (0.290)	0.083 (0.276)	0.074 (0.262)	0.073 (0.260)	0.072 (0.258)
Inpatient expenses of users (s.e)	69 099 (140 274)	44 300 (77 881)	42 921 (80 910)	41 530 (71 008)	48 433 (74,159)
Mean inpatient expenses (s.e)	6 412 (47 187)	3 666 (25 507)	3 171 (24 685)	3 016 (21 955)	3 485 (23 496)
Total	17 127 (63 607)	13 038 (40 268)	12 891 (42 266)	13 844 (40 368)	14 942 (39 598)

Results

Table 2 presents some descriptive statistics, demographic characteristics, physical disability, major diseases, and utilization of outpatient and inpatient services across income quintiles. The results indicate that some differences were observed in the distribution of these variables across each quintile. The lowest income quintile (Q0) had slightly more males than females, more individuals with physical disability and major diseases. In terms of health care utilization, those individuals of the Q0 group had a lower probability of using any outpatient services, but higher probability of any inpatient service use than those in other income quintiles. Both their outpatient and inpatient expenses were higher than those of people in higher income quintiles.

Table 3 shows the distribution of the study sample by insurance category in 1996, 1998 and 2000, and the distribution of the full NHI population by insurance category in 2000. The sample distribution was similar to the full NHI population distribution by insurance category. The three largest insurance groups were private-enterprise employees, workers enrolled through worker's associations, and farmers and fishermen. These three groups comprised almost 80% of the NHI enrollee population.

Table 4 presents the distribution of the sample population by premium types and income. Those who pay fixed premiums dominated the bottom two income groups (78.2% in Q0 and

66.4% in Q1) in 1996 but were less dominant in higher income groups. Wage-based enrollees dominated the top two income groups (66.4% in Q3 and 80.1% in Q4). Although the proportion of those in the wage-based group increased from 51.3% in 1996 to 52.6% in 2000 while the proportion of those in the fixed-premium group decreased from 48.7% in 1996 to 47.4% in 2000, the income distributions of these two groups stayed the same.

Tables 5a–c report the distributions of crude measures of total benefits, net payments and net benefits by income quintiles in 1996, 1998 and 2000. While in 1996, no substantial difference in total benefits was observed among income quintiles, we can note a clear progressive pattern for inpatient care and an evident regressive pattern for outpatient services. The lowest quintile group incurred higher inpatient expenditures than the higher income quintiles, but had lower outpatient expenditures than the top three quintiles.

In 1996, a clear progressive distribution of net payments was observed among income quintiles, with the lowest quintile (Q0) paying the lowest amount (NT\$6952) while the top quintile (Q4) contributed the highest amount (NT\$13 973). More specifically, the most sizable differences in premium contributions across income quintiles were observed for employer contributions, ranging from NT\$1528 in the lowest quintile to NT\$8195 for the top quintile (Q4). Employer contribution for the top income quintile was almost five times that of the lowest quintile group. Overall, employer contribution

Table 3 The distributions of the study sample and the full NHI population by insurance category in 1996, 1998 and 2000

Category	Sub-category	Sample						Population	
		1996		1998		2000		2000	
		No.	%	No.	%	No.	%	No.	%
1st	Private-sector employees	31 852	43.04	32 215	43.53	32 715	44.20	9 781 995	45.71
	Government employees	4597	6.21	4600	6.22	4632	6.26	1 257 699	5.88
	Self-employed/employers	1554	2.10	1589	2.15	1557	2.10	425 827	1.99
2nd	Union workers	14 688	19.85	13 940	18.83	13 320	18.00	3 750 883	17.53
3rd	Farmers/fishermen	11 187	15.12	11 301	15.27	11 247	15.20	3 304 109	15.44
4th	Military servicemen	200	0.27	203	0.27	190	0.26	68 579	0.32
5th	Low-income households	344	0.46	416	0.56	525	0.71	146 335	0.68
6th	Veterans	2068	2.79	2102	2.84	2134	2.88	645 595	3.02
	Community groups	7522	10.16	7646	10.33	7692	10.39	2 019 804	9.44
Total		74 012	100.00	74 012	100.00	74 012	100.00	21 400 826	100.00

Table 4 Distribution of the study sample by income level and types of financing schemes in 1996, 1998 and 2000

Income	1996		1998		2000	
	Wage-based premium No. (%)	Fixed premium No. (%)	Wage-based premium No. (%)	Fixed premium No. (%)	Wage-based premium No. (%)	Fixed premium No. (%)
Q0	3062 (21.8)	10 969 (78.2)	2812 (20.0)	11 219 (80.0)	3039 (21.7)	10 992 (78.3)
Q1	5033 (33.6)	9962 (66.4)	4891 (32.6)	10 104 (67.4)	5264 (35.1)	9731 (64.9)
Q2	7951 (53.0)	7045 (47.0)	8324 (55.5)	6672 (44.5)	8444 (56.3)	6552 (43.7)
Q3	9953 (66.4)	5042 (33.6)	10 251 (68.4)	4744 (31.6)	10 207 (68.1)	4788 (31.9)
Q4	12 004 (80.1)	2991 (20.0)	12 126 (80.9)	2869 (19.1)	11 950 (79.7)	3045 (20.3)
Total	38 003 (51.3)	36 009 (48.7)	38 404 (51.9)	35 608 (48.1)	38 904 (52.6)	35 108 (47.4)

Table 5a Distribution of crude measures of total benefits, net payment and net benefits by income level in 1996

	Total benefits			Net payment			Copayment	sum	Net benefits ^b
				Premium					
	Inpatient	Outpatient	sum	Government subsidy	Individual contribution	Employer contribution			
Q0 ^a	3169	7391	10 560	4721	4607	1528	817	6952	3608
Q1	2879	6740	9619	4278	4255	2355	813	7422	2197
Q2	2740	7428	10 168	3462	4038	4008	859	8905	1263
Q3	2739	8029	10 769	2992	4183	5654	896	10 734	35
Q4	2464	8614	11 079	2587	4843	8195	934	13 973	-2895
Mean	2793	7644	10 437	3594	4382	4385	864	9632	806

Note: All figures in NT\$ (1 US\$ = NT\$31.225).

^aQ0: Individuals without income tax.

^bNet benefits = Total benefits - Net payment = Total benefits - (Individual contribution + Employer contribution + Copayment).

seems to show the strongest income redistributive effects. Further, we note that the co-payment rate was low relative to the size of benefits received, and the distribution of co-payments was slightly progressive, which may be the result of greater outpatient use at academic medical centres (which require higher co-payment) among higher income groups.

Most importantly, our results show that net benefits decreased as income increased. The distribution of net benefits was pro-poor, from NT\$3608 for the lowest income quintile

to -NT\$2895 for the top income quintile. The relationship between net benefits and income became stronger over time; larger net benefit differentials across the income groups were observed in 1998 and 2000. Overall, the patterns reported in 1998 and 2000 were similar to those observed in 1996.

Tables 6a-c report the distribution of total benefits, net payments and net benefits in 1996, 1998 and 2000, adjusting for health care needs (age, sex, major disease status and physical disability). The patterns were similar to the crude measures and the distribution of adjusted net

Table 5b Distribution of crude measures of total benefits, net payment and net benefits by income level in 1998

	Total benefits			Net payment					Net benefits ^b
				Premium			Copayment	sum	
	Inpatient	Outpatient	sum	Government subsidy	Individual contribution	Employer contribution			
Q0 ^a	3634	8874	12 508	4742	4969	1353	907	7230	5278
Q1	2840	8335	11 175	4294	4561	2216	878	7654	3521
Q2	2436	8740	11 177	3369	4307	4181	929	9418	1759
Q3	2784	9656	12 440	2910	4549	5952	1019	11 519	920
Q4	2615	10 385	13 000	2571	5367	8505	1066	14 938	-1938
Mean	2852	9202	12 054	3562	4748	4481	961	10 190	1864

Note: All figures in NT\$ (1 US\$ = NT\$31.225).

^aQ0: Individuals without income tax.

^bNet benefits = Total benefits - Net payment = Total benefits - (Individual contribution + Employer contribution + Copayment).

Table 5c Distribution of crude measures of total benefits, net payment and net benefits by income level in 2000

	Total benefits			Net payment					Net benefits ^b
				Premium			Copayment	sum	
	Inpatient	Outpatient	sum	Government subsidy	Individual contribution	Employer contribution			
Q0 ^a	6412	10 715	17 127	4638	4758	1373	1246	7377	9749
Q1	3666	9371	13 038	4187	4302	2306	1142	7749	5288
Q2	3171	9719	12 891	3293	4146	4374	1237	9757	3134
Q3	3016	10 828	13 844	2940	4534	6316	1301	12 151	1693
Q4	3485	11 456	14 942	2660	5415	8966	1426	15 807	-866
Mean	3918	10 414	14 332	3529	4629	4710	1271	10 610	3722

Note: All figures in NT\$ (1 US\$ = NT\$31.225).

^aQ0: Individuals without income tax.

^bNet benefits = Total benefits - Net payment = Total benefits - (Individual contribution + Employer contribution + Copayment).

Table 6a Distribution of adjusted total benefits, net payment and adjusted net benefits by income level in 1996

	Total benefits			Net payment					Net benefits ^b
				Premium			Copayment	sum	
	Inpatient	Outpatient	sum	Government subsidy	Individual contribution	Employer contribution			
Q0 ^a	3221	7084	10 305	4721	4607	1528	817	6952	3353
Q1	2787	7169	9956	4278	4255	2355	813	7422	2534
Q2	2564	7716	10 280	3462	4038	4008	859	8905	1375
Q3	2592	7936	10 528	2992	4183	5654	896	10 734	-206
Q4	2624	8277	10 901	2587	4843	8195	934	13 973	-3072

Note: For inpatient services, the likelihood ratio for the first logistic part was 0.034; the adjusted R² for the second linear part was 0.150. For outpatient services, the adjusted R² was 0.198.

All figures in NT\$ (1 US\$ = NT\$31.225).

^aQ0: Individuals without income tax.

^bNet benefits = Total benefits - Net payment = Total benefits - (Individual contribution + Employer contribution + Copayment).

benefits remained pro-poor; as income increased, net benefits decreased. In 1996, the lowest quintile received the highest net benefits (NT\$3353) while the top income group received the lowest net benefits (-NT\$3072) after adjusting for health care needs. Similar findings were reported for 1998 and 2000.

Figures 1a-c show the trends of adjusted total benefits, net payments and net benefits from 1996 to 2000. The pattern in Figure 1a indicates that after adjustment, an increasing trend

in total benefits was observed for all income groups. The magnitude of increase was particularly large for the lowest income quintile (Q0). On the other hand, a much flatter increasing trend was observed for net payment among all income quintiles (Figure 1b). As the increases in adjusted total benefits over time were greater than increases in net payments in all income groups, an increasing trend in net benefits was observed for all income groups (Figure 1c). More specifically, the lowest income quintile had the largest increase in net

Table 6b Distribution of adjusted total benefits, net payment and adjusted net benefits by income level in 1998

	Total benefits			Net payment					Net benefits ^b
				Premium			Copayment	sum	
	Inpatient	Outpatient	sum	Government subsidy	Individual contribution	Employer contribution			
Q0 ^a	3282	8479	11 761	4742	4969	1353	907	7230	4531
Q1	2844	8809	11 653	4294	4561	2216	878	7654	3999
Q2	2312	9210	11 522	3369	4307	4181	929	9418	2104
Q3	2690	9538	12 228	2910	4549	5952	1019	11 519	709
Q4	2748	9929	12 677	2571	5367	8505	1066	14 938	-2261

Note: For inpatient services, the likelihood ratio for the first logistic part was 0.046; the adjusted R² for the second linear part was 0.159. For outpatient services, the adjusted R² was 0.219.

All figures in NT\$ (1 US\$ = NT\$31.225).

^aQ0: Individuals without income tax.

^bNet benefits = Total benefits - Net payment = Total benefits - (Individual contribution + Employer contribution + Copayment).

Table 6c Distribution of adjusted total benefits, net payment and adjusted net benefits by income level in 2000

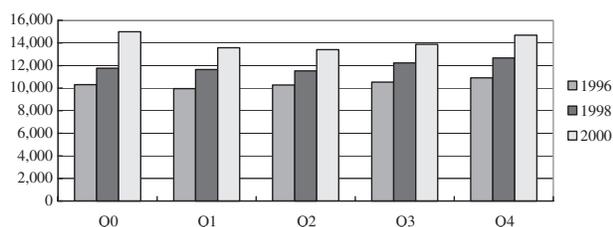
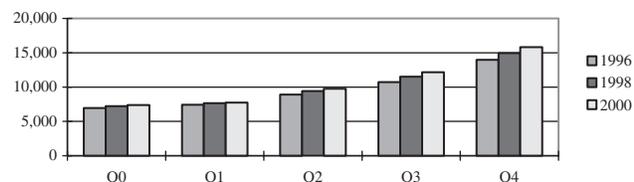
	Total benefits			Net payment					Net benefits ^b
				Premium			Copayment	sum	
	Inpatient	Outpatient	sum	Government subsidy	Individual contribution	Employer contribution			
Q0 ^a	4948	10 044	14 992	4638	4758	1373	1246	7377	7615
Q1	3587	9993	13 580	4187	4302	2306	1142	7749	5831
Q2	3166	10 247	13 413	3293	4146	4374	1237	9757	3656
Q3	3134	10 738	13 872	2940	4534	6316	1301	12 151	1721
Q4	3658	11 025	14 683	2660	5415	8966	1426	15 807	-1124

Note: For inpatient services, the likelihood ratio for the first logistic part was 0.069; the adjusted R² for the second linear part was 0.192. For outpatient services, the adjusted R² was 0.288.

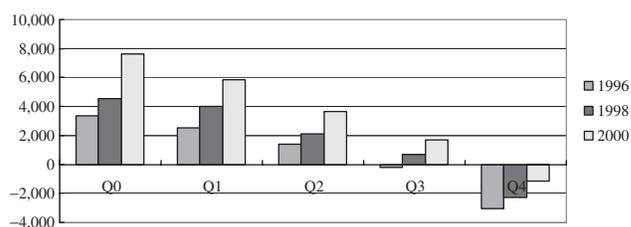
All figures in NT\$ (1 US\$ = NT\$31.225).

^aQ0: Individuals without income tax.

^bNet benefits = Total benefits - Net payment = Total benefits - (Individual contribution + Employer contribution + Copayment).

**Figure 1a** Changes in the distribution of adjusted total benefits by income level from 1996 to 2000**Figure 1b** Changes in the distribution of net payments by income level from 1996 to 2000

benefit over time. In addition, although the top income group had negative net benefits for all 3 years, the negative value decreased over time, along with the trend of increasing net benefits observed in all other groups. Thus every group fared better at the end of the period than at the beginning.

**Figure 1c** Changes in the distribution of adjusted net benefits by income level from 1996 to 2000 Note: Benefits and payments in NT\$ (1 US\$ = NT\$31.225).

Since the NHI has two different methods of calculating contributions, wage-based and fixed-premium, it is useful to conduct separate net-benefit analyses for the wage-based and fixed-premium enrollees. After adjusting for health care needs, Tables 7a and 7b present the distributions of total benefits, net payments and net benefits for those who pay wage-based premiums and those who pay fixed premiums, respectively.

Individual contribution and employer contribution were two major sources of net payments for those who pay wage-based premiums, and strong progressive patterns were observed in these two categories. Therefore, the distribution of net payments shows a strong progressive relationship with income. On the other hand, for those paying fixed premiums, none of

Table 7a Distribution of adjusted total benefits, net payments, and adjusted net benefits among the NHI enrollees who pay wage-based premiums by income level in 2000

	Total benefits			Net payment					Net benefits ^b
				Premium			Copayment	sum	
	Inpatient	Outpatient	sum	Government subsidy	Individual contribution	Employer contribution			
Q0 ^a	4175	10 024	14 199	1373	3563	5994	1308	10 865	3334
Q1	2411	8427	10 838	1435	3460	6168	1064	10 692	146
Q2	2473	8955	11 428	1425	3741	7495	1096	12 332	-904
Q3	2239	8901	11 140	1557	4496	9103	1150	14 748	-3608
Q4	2821	9371	12 192	1831	5598	11 115	1340	18 053	-5861

Note: For inpatient services, the likelihood ratio for the first logistic part was 0.047; the adjusted R² for the second linear part was 0.208. For outpatient services, the adjusted R² was 0.253.

All figures in NT\$ (1 US\$ = NT\$31.225).

^aQ0: Individuals without income tax.

^bNet benefits = Total benefits - Net payment = Total benefits - (Individual contribution + Employer contribution + Copayment).

Table 7b Distribution of adjusted total benefits, net payments, and adjusted net benefits among the NHI enrollees who pay fixed premiums by income level in 2000

	Total benefits			Net payment					Net benefits ^b
				Premium			Copayment	sum	
	Inpatient	Outpatient	sum	Government subsidy	Individual contribution	Employer contribution			
Q0 ^a	5384	11 393	16 777	5540	5089	96	1228	6413	10 364
Q1	4365	11 752	16 117	5676	4757	216	1184	6157	9960
Q2	4044	11 624	15 668	5702	4667	352	1419	6438	9230
Q3	4930	12 972	17 902	5888	4616	374	1624	6614	11 288
Q4	6317	13 018	19 335	5912	4700	533	1764	6996	12 339

Note: For inpatient services, the likelihood ratio for the first logistic part was 0.084; the adjusted R² for the second linear part was 0.178. For outpatient services, the adjusted R² was 0.309.

All figures in NT\$ (1 US\$ = NT\$31.225).

^aQ0: Individuals without income tax.

^bNet benefits = Total benefits - Net payment = Total benefits - (Individual contribution + Employer contribution + Copayment).

the three net payments sources (individual contribution, employer contribution and co-payments) had a strong progressive pattern. Hence, the distribution of net payments in the fixed-premium group showed a much weaker income-redistribution effect than that in the wage-based group. Furthermore, net payments for wage-based individuals were substantially higher than for those paying fixed premiums at every income level.

A clear pro-rich pattern was observed in total benefits for both the wage-based and fixed-premium groups at all income levels except the lowest quintile. Among the wage-based individuals, the lowest quintile received the highest total benefits. Although the lowest quintile of the fixed-premium population (NT\$16 777) did not receive the highest total benefits, its benefits were still higher than those of quintiles Q1 and Q2. Furthermore, those paying fixed premiums tended to receive substantially higher benefits than those paying wage-based premiums at every income level except for the lowest quintile. One plausible explanation is that the fixed-premium group had a higher proportion of the elderly than did the wage-based premium group.

A strong pro-poor effect was observed in net benefits among the wage-based population, whereas a clear pro-rich effect was

observed in net benefits among the fixed-premium population. Furthermore, while individuals paying fixed premiums received large positive net benefits at every income level, only the lowest two quintiles of the wage-based population received positive net benefits, with the remaining income groups receiving negative net benefits. Wage-based enrollees received much lower net benefits than fixed-premium enrollees at all income levels. Wage-based enrollees were subsidizing fixed-premium enrollees.

Discussion

We can identify at least four significant findings. First, the results suggest that determining the equity of the NHI programme based on either health care utilization or financial burdens only may be misleading. When both factors are taken into consideration, the distribution of net benefits of the NHI programme is clearly pro-poor and indicates that the NHI has successfully served its social mission by providing sound coverage to the poor.

Secondly, the substantially larger differences observed in net payments made by the rich and the poor are likely to be

the major contributing factor to the pro-poor distribution of net benefits. Of all three net payment sources, employer contribution was most progressive and contributed significantly to the equity of the NHI financing schemes. This may be attributable to the strong redistributive function of employer contribution and the concentration of fixed-premium enrollees in lower income quintiles. When contemplating financing the NHI through income tax or general taxation, policy-makers should not overlook the strong income-redistribution effects of the existing wage-based premium system.

Thirdly, given the low co-payment levels in Taiwan, total health care utilization by rich and poor is similar. That no discernible difference can be found across income quintiles may suggest that everyone's health care needs have been satisfied under the National Health Insurance with its low cost-sharing obligation. However, the rich and the poor have different utilization patterns. The rich tend to use more outpatient care while the poor tend to use more inpatient care. The distribution of inpatient care is more regressive than that of outpatient care, and the results remain robust after adjusting for individual medical needs. To avoid unfairly impacting the poor, these differential usage patterns should be kept in mind when designing schemes to streamline health care utilization.

Fourthly, and most important, the separate analyses for wage-based and fixed-premium populations indicate that the NHI programme has very poor horizontal equity due to the substantial net benefit differences observed between wage-based and fixed-premium individuals at the same income level. Moreover, the strong regressive distribution of net benefits observed among the wage-based population, and the apparent progressive distribution of net benefits observed among the fixed-premium population, suggest that wage-based premium schemes can lead to much better vertical equity than fixed-premium schemes. Since many developing countries are characterized by a sizable underground economy and a relatively small regular wage-earner population, a wage-based premium scheme may not be feasible. On the other hand, relying heavily on fixed-premium schemes for financing may pose serious concerns regarding equity. The trade-off between feasibility and equity becomes a policy dilemma for developing countries in devising financing schemes for social health insurance.

An additional encouraging observation regarding the NHI programme is that it maintains a satisfaction rate of almost 80%. However, its financial sustainability is questionable. This study offers a plausible explanation of the relationship between a high satisfaction rate and vulnerable financial sustainability. All income groups, except for the top quintile, enjoyed positive net benefits between 1996 and 2000. Moreover, everyone, even those in the top income group, is experiencing increasing net benefits. Since everyone benefits more over time under the NHI programme, it is not surprising that it has a high satisfaction rate. However, the weakening financial sustainability of the NHI programme may be the hidden cost of this high satisfaction rate. The long-term failure to raise premiums in line with actuarial cycles and estimates and the rise in health care expenditures have resulted in the increasing trend of net benefits across all groups. This may be the root of the

current financial crisis of the NHI. In addition, although government subsidies provide positive net benefits to the majority of the population, the insured tend to forget that these subsidies come from their own pockets. In the face of financial crisis, premiums must be raised or other financing schemes (income tax or general taxation) employed in order to keep the NHI financially sound. Without a rise in premiums, it is doubtful whether the net benefits can remain positive and continue to increase.

In interpreting our results the following qualifications should be kept in mind. The distribution of net benefits in favour of the poor may be underestimated for the following reasons. First, since the income tax information provided by the Ministry of Finance does not include data on actual tax payments and we do not have an appropriate allocation algorithm, we are not able to allocate individual tax contribution to government subsidies. Hence, we did not include government subsidies as a part of net payments or in the analyses of net benefits. Since the rich tend to carry a larger tax burden than the poor, the distribution of net benefits in favour of the poor was probably underestimated in this study. Secondly, although risk reduction is the main goal of social health insurance, this study does not measure the benefits from risk protection, benefits that tend to be larger for the poor than the rich. Due to lack of information on out-of-pocket payments other than co-payments, the interpretation of the results is limited to the net benefits of the NHI programme. The results are not sufficient to describe the equity of total health care expenditure in Taiwan. Thirdly, since we only used four observable variables (age, sex, major disease status and physical disability) to adjust for health care need, there may be other unobservable health statuses. If these unobservable variables are correlated with income, the coefficient estimates for income can be biased upwards if lower income is correlated with poorer health. Fourthly, excluding individuals with incomplete data in our analyses may be a source of bias. If poor people are more likely to have incomplete data, the pro-poor pattern of net benefit of the NHI programme could be stronger than we observed. If incomplete data occurs at random, then the omission of incomplete data is not a problem. Finally, several data limitations should be noted: (1) the household economic unit for tax purposes is not necessarily the same as the co-resident household unit; (2) individuals belonging to the lowest quintile may still have income, even though they do not file an income tax return; (3) our estimate of medical needs using age, sex, major disease status and physical disability may not adequately reflect individual medical needs.

Conclusion

This study is a first step towards evaluating the equity of the NHI programme by taking both health care benefits and payments into consideration. Taking these two factors into account, the distribution of net NHI benefits is pro-poor. Future research evaluating the equity of a health care system should take into account benefits as well as payments. Focusing on only one of these factors may produce

misleading results. We also found that using two different financing schemes leads to an inequitable distribution of net benefits between the wage-based and fixed-premium enrollees at the same income level, and the distribution of benefits in the fixed-premium scheme shows worse vertical equity than in the wage-based premium scheme. The study provides an important policy reference to developing countries with large underground economies and relatively small populations of regular wage-earners as it indicates that using fixed premiums for financing health care may pose a serious equity concern and policy challenge.

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