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Horizontal equity in health care utilization – evidence from three high-income Asian economies

Jui-fen Rachel Lu	*Chang Gung University, Taiwan*
Gabriel M. Leung	*University of Hong Kong, Hong Kong SAR, China*
Soonman Kwon	*Seoul National University, South Korea*
Keith YK Tin	*University of Hong Kong, Hong Kong SAR, China*
Eddy van Doorslaer	*Erasmus University, Netherlands*
Owen O'Donnell	*University of Macedonia, Greece*

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Correspondence: Dr GM Leung, Department of Community Medicine and School of Public Health, University of Hong Kong, 21 Sassoon Road, Pokfulam, Hong Kong, China. Email: gmleung@hku.hk.

Abstract

Employing consistent methods, we examine the degree to which the principle of "equal treatment for equal need"(ETEN) is maintained in Hong Kong, South Korea and Taiwan.

Deviation in the degree to which health care is distributed according to need is measured by an index of horizontal inequity. This is a measure of income-related inequality in the utilization of health care after standardizing for differences in need. Inequality in utilization is decomposed into four major sources:- i) income; ii) need indicators (self-assessed health status, activity limitation, and age and gender interaction terms); iii) non-need variables (education, work status, private health insurance coverage, employer-provided medical benefits, Medicaid status (low-income medical assistance), geographic region and urban/rural residency; and iv) a residual term. Service types studied include western doctor, licensed traditional medicine practitioner (LTMP), dental and emergency room (ER) visits as well as inpatient admissions.

Violations of the ETEN principle were most frequently observed in Hong Kong (all service types except for ER visits), whereas South Korea appeared to have maintained ETEN across all service types examined. Taiwan showed intermediate results in that the better-off were more likely to use outpatient services (controlling for need), but quantities of western doctor and dental visits were evenly distributed while there was pro-rich bias in the number of LTMP episodes. ER visits and inpatient admissions were either proportional or slightly pro-poor.

Future work should focus on developing, implementing and evaluating policy interventions to reduce the observed unequal distributions in these three economies, in addition to the urgent and rigorous examination of horizontal equity elsewhere in Asia.

Keywords: income-related inequality, income-related inequity, decomposition analysis, health care utilization, Asia

Introduction

One of the main equity concerns in systems with egalitarian goals is to ensure that the horizontal equity standard is met, such that there is "equal treatment for equal need" (ETEN). Consistency of health care delivery systems with this principle has been tested across a number of OECD countries (van Doorslaer et al, 2002; van Doorslaer et al, 2004). There is however little evidence against which to evaluate the equity performance of the health systems of the high-income economies of Asia.

Whereas most OECD countries (with the US a notable exception) have had a long history of developing social protection systems which are rooted in the egalitarian tradition, the three Asian health systems under consideration, Hong Kong, South Korea and Taiwan, have developed over a much more compressed timeframe concomitant with their rapid economic advance. Comparison of the equity performance of these three health systems is interesting given substantial differences between them in the financing and organization of health care. Moreover, the pervasive use of non-western allopathic health care in this region calls for the inclusion of licensed traditional medicine practitioners and other traditional healers in any equity analysis.

Health system characteristics

Hong Kong

Hong Kong is a former British colony repatriated as a special administrative region of the People's Republic of China since 1997. Over 95% of its 6.8 million population is ethnic Chinese, although socio-culturally the city-state is one of the most westernized societies in all of Asia. Historically, its health system has evolved from a tax-funded British National Health Service model. However, it has always maintained a sizeable private sector, in keeping with its otherwise laissez-faire economy. As at fiscal year 2001/2, annual total health expenditure is 5.7% of GDP in this mixed medical economy, where public and private funding sources account for 57% and 43% of total spending respectively. The majority (~95%) of public funding is derived from government general tax revenue with the rest recovered from fees and charges at the point-of-care. About 70% of private health financing is through out-of-pocket household expenditure, with private insurance schemes and employer-provided medical benefits accounting for the remainder. In terms of the delivery of care, 95% of total bed-days in Hong Kong are provided by 44 public hospitals, under the management of the Hospital Authority. There are 12 private hospitals that account for the remaining (5%) market share. Provision of outpatient services is shared between private and public sectors in the ratio of 70:30 respectively. Hong Kong has no functional primary care network to perform gate-keeping from inappropriate escalation of care. About half of all specialists work in the private sector, most of whom combine specialty care with general medical services. All complementary care services including licensed traditional medicine practitioners (ie Chinese medicine) and other traditional or non-allopathic healers are provided in the private sector where out-of-pocket, fee-for-service payment is the predominant mode of financing. Further details of Hong Kong's health system are available elsewhere (Leung et al, 2005).

South Korea

The Republic of Korea (South Korea), a member of the OECD (Organization for Economic Cooperation and Development) since 1996, has a population of 46 million people. Social health insurance was first introduced for industrial workers in large firms in 1977. After incremental extension of population coverage over the years based on insurance societies in firms (for employees) and in geographic regions (for the self-employed), Korea achieved universal coverage in 1989. National health insurance (NHI) experienced a major change when it became a single payer by merging all insurance societies in 2000 (Kwon, 2003a). Insurance contributions (in the form of premiums) are proportional to income and shared equally by the employer and the employee. For the self-employed, government provides partial subsidy, and premium payments of the poor is fully subsidized. NHI offers a comprehensive benefit package including inpatient care, outpatient care and traditional medicine.

Health care delivery in Korea relies heavily on private hospitals where more than 90% (85%) of acute care hospitals (beds) are private. Hospitals have big outpatient care centers, and most office (clinic)-based physicians are board-certified specialists. Since physician clinics and hospitals often overlap in service provisions, there is competition rather than coordination among them. Health care providers in Korea are reimbursed on a fee-for-service basis according to a government-regulated uniform fee schedule (Kwon, 2003b). Health care providers therefore have perverse incentives to rapidly adopt new services and high-technology care when they can avoid the fee standards and instead set market prices for those un-insured (out-of-coverage) services, which eventually contributes to a rather high proportion of household direct payment (35%) in national health expenditure. Traditional medicine providers are trained in formal schools, which have six years of academic curriculum as do schools of (western allopathic) medicine. Traditional medicine is popular in Korea, and acupuncture is covered by NHI while only a limited number of herbal medicines are covered.

Taiwan

Taiwan, an island situated in the western Pacific, with a total land size of the Netherlands, and a population of 22.5 million people, is one of the most densely populated countries in the world. After more than two decades of rapid economic growth, Taiwan has become an advanced economy and its gross national product (GNP) per capita had reached US $13,000 by the late 1990's (Council for Economic Planning and Development, 2004). As at 2003, Taiwan spent 6.3% of GDP on health, averaging US$ 808 per capita annually (Department of Health, 2004). Direct payment by households accounted for roughly 30% of national health expenditure. Taiwan achieved universal coverage in 1995, by implementing a single-payer social insurance program. The National Health Insurance (NHI) program was built upon the integration of three existing social insurance schemes, combined with extended coverage to the originally uninsured accounting for roughly 43% of the population in 1995. NHI offers comprehensive benefit coverage that includes ambulatory care as well as inpatient services. Visits to licensed traditional medicine practitioners (Chinese medicine) and dentists are also covered, but to a limited extent and on a supplementary basis only.

Taiwan has a market-oriented health care delivery system, reflecting its free-enterprise economy (Lu and Hsiao, 2003), as evidenced by the pluralistic

organization of health services. Hospital ownership is mixed - public hospitals account for 35% of all beds (Department of Health, 2004). Sixty-three percent of allopathic physicians are salaried employees of hospitals. The remainder are fee-for-service private practitioners. Chinese medicine practitioners, who are licensed medical professionals, although not all underwent formal structured education, mainly practice in privately-owned clinics. Western medical doctors who practice in private clinics do not have hospital admitting privileges, which is typical of a compartmentalized system. Over the years, hospitals have developed large outpatient departments and affiliated clinics for primary care in order to maintain inpatient volume and compete with private practitioners who operate free-standing clinics (with beds) (Lu, Hsieh, 2003). NHI revenue relies on payroll-based premiums with the government subsidizing the poor, veterans, and farmers.

Table 1 summarizes key economic and health indicators and system characteristics of these three populations.

Methods

We deployed consistent methods (van Doorslaer et al, 2004) to measure and explain horizontal (in)equity in the utilization of health care in Hong Kong, South Korea and Taiwan. Deviation in the degree to which health care is distributed according to need is measured by an index of horizontal inequity (Wagstaff and van Doorslaer, 2000). This is a measure of income-related inequality in the utilization of health care after standardizing for differences in need, as proxied by age, gender and common health indicators. Inequality in utilization is explained through decomposition analysis (Wagstaff et al, 2003). This reveals the contribution of different non-need and other variables to income-related inequality.

Data sources

Table 2 describes three population-based surveys on which the present set of analyses was based. They were mainly selected on the basis of their suitability for this analysis and their cross-comparability. In terms of content, they included a wide range of common, standardized variables including basic socio-demographics, gross monthly income, health status [self-assessed health (5-point Likert); activity limitation (3-point Likert)], education, economic activity status/occupation, insurance or medical benefits coverage, and geographic region (and/or urban/rural indicator) that allowed for the examination of hypotheses relating to inequality in use of health services by income. Different types of health care utilization were measured by self-reported use with varying recall periods as detailed in Table 2. Total volume of use was annualized by *pro rata* scaling to 12 months; whereas probability of use was for the recall period as specified. Only Hong Kong distinguished between general practitioner vs specialist outpatient visits. South Korea did not have information on emergency room services.

Measuring and decomposing inequality in health care utilization

We used a concentration index (C) as the measure of relative income-related inequality in use of health care (Wagstaff et al, 1991). Estimates for C and its robust standard error were obtained by running the following convenient regression (Kakwani, Wagstaff et al, 1997):

$$\frac{2\sigma_R^2}{\overline{y}} y_i = \alpha + \beta R_i + \varepsilon_i \qquad (1)$$

where *y* is health care use, $\overline{y}$ is its mean of y, R_i is the weighted relative fractional rank of the *i*th individual in the income distribution, ($R_i = \frac{1}{N}\sum_{j=1}^{i-1} w_j + \frac{1}{2} w_i$, where w_i is the sampling weight $w_0 = 0$ and *N* is the sample size) and σ_R^2 is the variance of R_i. The ordinary least squares (OLS) estimate of the slope coefficient is the estimate of *C*.

Wagstaff, van Doorslaer et al (2003) show that for any linear model of health care use, it is possible to decompose the contributions to the concentration index in such a way that the sources of income-related inequality can be identified. Consider the following model

$$y_i = \alpha + \beta \ln inc_i + \sum_k \gamma_k x_{ik} + \sum_p \delta_p z_{ip} + \varepsilon_i \qquad (2)$$

where we distinguished between three types of explanatory variables: income (ln*inc*), health need standardizing variables (x_k), i.e. age, sex, self-assessed health and activity limitation, and other non-need variables (z_p) including education, economic activity status/occupation, insurance and/or medical benefits coverage (for Hong Kong and South Korea only), and geographic region (for South Korea and Taiwan only).

The concentration index for health care use can be written as:

$$\hat{C} = \hat{\eta}_\theta \hat{C}_{\ln inc} + \sum_k \hat{\eta}_k \hat{C}_k + \sum_p \hat{\eta}_p \hat{C}_p + G\hat{C}_\varepsilon \qquad (3)$$

where $\hat{C}_{\ln inc}$, $\hat{C}_k$, $\hat{C}_p$ are concentration indices for the respective variables and $\hat{\eta}_k$ is the estimated (partial) demand elasticity of each determinant *k*, defined as: $\hat{\eta}_k = \hat{\gamma}_k \overline{x}_k / \overline{y}$ where $\overline{x}_k$ is the mean of x_k; and analogously for $\hat{\eta}_\theta$ and $\hat{\eta}_p$. The first term in (3) denotes the partial contribution of income inequality, the second the contribution of health need variables, the third the contribution of all other variables and the last term is the generalized concentration index of ε. While this method is based on a linear regression model, van Doorslaer and co-workers (2000) have shown that the measurement of horizontal inequity does not differ substantially between OLS-based and non-linear specifications (for an extension to non-linear estimation that requires use of approximation techniques, see van Doorslaer et al (2004)). While *C* gives a measure of income-related inequality in health care use, it does not yet measure the degree of inequity where need-adjusted inequality has to be accounted for. Thus, by indirect standardization, we computed an index of horizontal inequity (HI) in health care use by subtracting the need-expected inequality (i.e. the second term) from total inequality:

$$HI = \hat{C} - \sum_k \hat{\eta}_k \hat{C}_{xk} \qquad (4)$$

We repeated this sequence of analyses to compute *C* (measuring income-related inequality of unstandardized distribution of actual health care uses) and *HI* (measuring

income-related inequity, by standardizing out need differences) for each of the health care use variables as listed in the last column of Table 2. A positive value of *C* (*HI)* indicates inequality (inequity) favoring the rich (the distribution is pro-rich), that is, the better-off consume more compared to those worse-off; by contrast, a negative value represents inequality (inequity) favoring the poor (the distribution is pro-poor). A zero or non-significant value of *C* (*HI*) means that health care use is distributed equally (equitably) across income groups.

In addition to the total count-based outcome, *y*, we derived a probability-based outcome of ever use, as a proxy measure of access, as opposed to measuring the total quantity of services consumed as per the former outcome.

Dental visits are regressed on age (as a need variable) and sex (as a non-need variable) dummies separately, in addition to income and non-need factors, because the other need variables do not have a priori face validity as explanatory factors.

Results

We first present the results of income-related inequality (*C*) and inequity (*HI*) in probability of any use and total volume of utilization (Table 3 and Figure 1), followed by findings from the decomposition analysis (Tables 4 and 5 and Figure 2).

Income-related inequality and inequity

All three territories report a large number of western doctor visits, averaging 8.8 per person annually (Table 3). There is pro-poor inequality in the probability of visiting a western doctor (negative concentration indices) in South Korea and Taiwan but pro-rich inequality in Hong Kong, which is largely driven by the strongly positive concentration index for general practitioner services albeit somewhat buffered by the pro-poor distribution of the smaller proportion of specialist visits. The distributions of volume of doctor visits display a similar pattern. Controlling for variation in need shifts all distributions of doctor visits (probability and volume) in a pro-rich direction reflecting the positive relationship between income and reported health. The *HI* for doctor visits in Hong Kong are significantly positive, and even larger than the concentration indices, indicating unequal treatment for given need that is to the advantage of the better-off. In South Korea, while the poor are significantly more likely to consult a doctor and do so more often (negative *C*), the hypothesis of equal treatment for equal need cannot be rejected (*HI* not significantly different from zero). In Taiwan, the poor are more likely to consult but this seems to be completely attributable to their greater propensity to illness. For a given level of need, it is the better-off who are more likely to consult, while there are no significant differences in the volume of consultations.

LTMP visits, amounting to about 2 episodes annually for each respondent, are distributed evenly in South Korea, while the probability of use (but not volume) is greater among the better-off in both Taiwan and Hong Kong. Controlling for need again shifts all distributions in a pro-rich direction. For given need, there is no difference in use of LTMP in South Korea, while there is pro-rich bias in Hong Kong and Taiwan.

The average Taiwanese paid 2.5 dental visits per year, compared to 1.14 and 1.12 visits reported for Hong Kong and South Korea respectively. The distributions of dental care display the same general patterns as those for LTMP. Dental services are evenly distributed in South Korea, while there is both inequality and inequity to the advantage of

the better-off in Taiwan (although not for volume of care) and to a much greater extent in Hong Kong. Recall periods for dental care differed substantially in the three surveys (Table 2) which likely led to a higher (ie less under-reporting) observed probability of use for Hong Kong compared to the other two populations with much shorter duration (2 and 4 weeks respectively) of recall.

Hong Kong reported nearly twice as many emergency room visits (0.22 visits) as Taiwan (0.14 visits) (data not available for South Korea). The poor use significantly more emergency care in both territories, the gradient being particularly strong in Hong Kong. Controlling for need removes the pro-poor bias in Taiwan but not Hong Kong. However, the different recall periods (12 months for Taiwan vs 1 month for Hong Kong) is likely responsible for the artifactually large use probability between the two populations.

All three territories show marked pro-poor concentration indices for inpatient care. The pro-poor bias persists after adjusting for income-related differences in need in Taiwan and South Korea but not in Hong Kong, where there is some evidence of inequity to the advantage of the better-off. Although the public sector in Hong Kong is responsible for 95% of total bed-days (as above), it only has 77% market share for ever hospitalization and about 85% for number of admissions (ie public hospitals have a more severe case-mix with longer lengths of stay). Therefore, we suspect the slight need-adjusted pro-rich distributions for probability and total volume of use is a reflection of private sector activity, which is highly socio-economically patterned unlike the two social insurance systems of Taiwan and South Korea.

The index values and associated 95% confidence intervals are presented in Figures 1a through 1e.

Decomposition of inequality

Income-related inequality of utilization is decomposed into contribution of four major sources as per equation (3):- i) income (in logarithm form); ii) need indicators (self-assessed health status, activity limitation, and age and gender interaction terms); iii) non-need variables (education, work status, private health insurance coverage, employer-provided medical benefits, Medicaid status (low-income medical assistance), geographic region and urban/rural residency); and iv) a residual term. As a result of aggregating the contributions of different variables under one of the four broad categories (for simplicity and ease of interpretation), positive and negative contributions may cancel out so that a small overall category total in Figure 2 may mask larger underlying positive and negative contributions (see Table 4). The sum of the bars in figure 2 would be zero if utilization was equal across income, whereas the need bar would be the only one to appear if there was perfect equity. If there are discrepancies between actual and need-expected distributions of use, then other bars appear indicating the direct contribution of income or its effect through common correlates with health care utilization. More detailed disaggregated numerical results are shown in Tables 4 and 5.

Need factors account for most of the pro-poor inequality in western doctor visits in South Korea and Taiwan (Figures 2a and 2b). In the case of South Korea, pro-poor tendencies are further reinforced by non-need factors; those with lower education attainment and Medicaid recipients consume disproportionately more ambulatory care (Table 4). In Taiwan, the direct effect of income is in a pro-rich direction but not sufficiently so to counterbalance the pro-poor inequality created by the distribution of

need. Hong Kong's pro-rich inequality in all western doctor visits can be attributed to a large non-need contribution (mainly consisting of employer-provided medical benefits and private health insurance) as well as the direct effect of income in the case of total volume of use. However, there are contrasting findings for general practitioner (GP) and specialist (SP) care, with non-need factors acting in opposite directions. The employed and those with private insurance or benefits coverage have higher incomes and consume more GP but fewer SP episodes. Another factor driving a pro-poor SP pattern was that less well-off individuals had much greater health care needs.

LTMP decomposition results are qualitatively similar to those for general practitioner visits in Hong Kong. Compared to western doctor visits, income and non-need factors substantially reduce the magnitude of pro-poor inequality in use probability for South Korea and push Taiwan into pro-rich inequality and inequity for both the probability and volume of use. Urban residency is an important contribution to this pro-rich inequality in Taiwan.

The pro-rich distribution of dental visits in Hong Kong and Taiwan is the consequence both of the direct effect of income and its correlation with both non-need factors (eg education, private insurance and medical benefits (Hong Kong) and urban/rural differences (Taiwan)) and dental care.

For emergency room (ER) visits in Hong Kong, need and non-need (number of visits) contributions are negative, resulting in the pronounced pro-poor inequality observed. In the case of Taiwan, the lesser magnitude of pro-poor inequality is mainly driven by health care need, counterbalanced by regional differences in use.

Pro-poor inequality in inpatient admissions in Hong Kong and Taiwan is principally attributable to income differences in need. In South Korea, non-need factors make a stronger relative contribution to the pro-poor inequality. The non-employed, who have lower incomes, are more likely to be admitted and consumed more inpatient episodes.

The contribution of the residuals is large in some cases, especially in South Korea and Hong Kong and particularly for probability of use. This is likely partially explained by the suboptimal performance of the regression models in which the dependent variable takes a very low mean value (and hence the larger residuals for the probability models). Consequently, it can be related to short recall periods.

Discussion

This paper provides the first analysis of income-related inequality and inequity of health care utilization in the adult populations of three high-income East Asian economies, namely Hong Kong, South Korea and Taiwan. While our results confirm the universal observation that the poor have disproportionately greater health care needs, we find much heterogeneity in the distribution of utilization across these three high-income territories. Violations of the ETEN principle are most frequently observed in Hong Kong, where inequity favors the better-off in all service types except for ER visits. By contrast, South Korea appears to have maintained ETEN across all service types examined. The equity performance of the Taiwanese system lies between that of the two others. There is slight pro-rich inequity in the probability of using outpatient services but not in the volume of utilization (except for LTMP). On the other hand, inpatient admissions show slight pro-poor inequity in Taiwan.

In general, the direct effect of income is to shift the distribution of health care in a pro-rich direction. Exceptions are dental care in South Korea, inpatient care in Taiwan and the volume of emergency care in Hong Kong. The direct effect of income is the major pro-poor driver of the number of ER visits in Hong Kong but the effect did not contribute at all to access to ER (see below for explanation). On the other hand, disparities in need are the major source of any pro-poor inequalities that arise in the utilization of health care. The contribution of non-need factors, such as private insurance coverage, regional or urban/rural differences, education attainment and economic activity, to income-related inequality in health care differs across the territories. In Hong Kong, non-need factors are mainly responsible for pro-rich inequity in all services except for emergency care. The concentration of private care coverage via insurance or employer-provided benefits among the best-off 30% of the population is the major driver of the utilization distributions of all service types (except for ER visits which is completely free of charge to all) in a pro-rich direction. In South Korea, non-need factors shift the distribution in a pro-poor direction . For instance, individuals with lower educational attainment or who are unemployed (both variables are highly correlated with income) consume more outpatient and hospital services respectively. Moreover, about half of the Medicaid population (Medicaid type 1) makes no co-payment at the point of service. Anecdotally, inpatient admissions for mostly social reasons are also not uncommon among low-income groups. In Taiwan, non-need factors contribute to pro-rich inequity of LTMP and dental care but to pro-poor inequality of inpatient care. Urban residency, which is closely correlated with income and the distribution of health care resources, imposes a significant pro-rich bias to the utilization distribution for all types of services except for western doctor visits and hospital admissions. The pro-poor tendencies detected for the latter two service categories can be attributed to various deliberate policy interventions (including service-on-wheel in the rural areas and exemption of co-payment for the rural residents) undertaken by NHI to specifically ameliorate the problem of access to care commonly encountered by the rural population. It is important to understand the contribution of such factors since they offer, to varying degrees, some of the most important policy levers through which to operate on horizontal inequity in health care utilization.

Hong Kong's GP vs SP dichotomy deserves a special note. International experience from Europe and elsewhere demonstrate an almost universally consistent pattern that GP care is usually pro-poor whereas the reverse is true for SP services, irrespective of the type of health care or financing system (van Doorslaer et al, 2004). However, the exact opposite finding is observed in Hong Kong. We hypothesize that this surprising finding is a reflection of Hong Kong's uniqueness with respect to organization and funding. While the public sector provides almost free GP care, the absolute level of population coverage is very low, mainly catering to the most medically and socially indigent (with a strong old age bias) and implicitly rationed by exceedingly long waiting queues (on a first-come-first-served basis with no prior appointments allowed) and inconvenient amenities. The vast majority of patients instead seek private care because of very reasonable out-of-pocket charges (US$15-20 per episode inclusive of 3-5 days of medication) accompanied by virtually on-demand logistics. This would expectedly produce a pro-rich bias due to the out-of-pocket payment mechanism. In contrast, a much larger (relative to GP) proportion of SP care is provided in the public sector (with

an efficient appointment system and better amenities but again very low co-pays) serving a significant share of the chronic disease patient population. Both features would result in disproportionate utilization by poorer patients. In fact, a formal benefit-incidence analysis shows that Hong Kong achieves strongly pro-poor distributions of all hospital and non-hospital care and hence of the total public subsidy to health care. Specifically, the poorest (richest) fifth of the population use 37-48% (7.3-10.6%) of hospital and non-hospital services, where the percentage of public subsidy totals 37.3-46.3% (7.9-11.6%) to the poorest (richest) income quintile (O'Donnell et al, 2005). These results are the product of a universally accessible public system, with minimal user charges from which the poor are exempted. The availability of private health care (coupled with rationing by waiting time in public facilities as well as the incentive of choice of and better amenities by private providers) gives the better-off and those covered by private insurance or medical benefits the alternative to opt-out of the public system, ensuring that the subsidy goes disproportionately to the poor (Besley and Coate, 1991). Jointly considering Hong Kong's ER and GP findings, we postulate a "crowd-in" phenomenon by most relatively poor individuals (not the destitute who would be covered under the limited GP public care) who lack appropriate access to GP care and therefore have little effective option but to use the ER as their entry point to the health care system. This is a classic case of substitution of medical services in response to perverse incentives in system organization.

We can also draw important lessons from the two social insurance systems. While Taiwan's and South Korea's programs share many common features, our findings indicate sharp contrasts in horizontal equity for some service types. In Taiwan, the scope of service coverage by national insurance appears to largely determine the distribution of utilization across income groups. For South Korea, the almost universal pro-poor tendencies suggest additional explanatory factors apart from its social insurance financing mode. First, South Korea allows practitioners to extra-bill patients for uncovered services within the same utilization episode. However, Taiwan prohibits providers from rendering both covered and uncovered services in the same visit, i.e., either the providers see the patient as a self-pay patient (hence the patient pays all) or as a NHI insured (who then pays nothing but the standard co-payment). As the well-off are more likely to consume non-NHI covered services, a pro-rich inequity would be observed. More importantly, we did not measure the content, quality or comprehensiveness of a visit (see caveats below) in the present exercise and thus cannot observe the within-episode extra-billing allowed in South Korea where the presumably pro-rich tendencies would have been masked. Second, Taiwan has a more constrained supply of medical practitioners and the distributions of dentists and LTMP in Taiwan are known to cluster highly around urban areas, resulting in a pro-rich contribution to utilization inequity (evidenced by the significance and magnitude of the urban dummy variable). South Korea does not report to have the same degree of geographic mal-distribution of providers. Third, Taiwan's private insurance sector (providing mostly indemnity-based supplementary coverage) has grown considerably over the years, accounting for 9% of total financing sources, compared to only 2% in South Korea. As supplementary coverage is highly correlated with income, this may contribute, in part, to the observed pro-rich inequity.

Another unique set of insights derived from the present findings concerns LTMP episodes. Traditional medicine has always maintained its place in health care in East Asia and indeed is rapidly being adopted in the West as an alternative and

complementary form of medical care. LTM practitioners are formally registered and licensed medical professionals in all three territories. Our results show significantly pro-rich income inequity in Hong Kong and Taiwan, but insignificantly so in South Korea. A probable explanation is the scope of service coverage and the supply/distribution of the LTMP. Although both national insurance schemes in Taiwan and South Korea cover LTMP service, such care is mostly delivered privately and the dispensing fees of herbal remedies (which tend to be the major source of provider profits and a larger absolute amount compared to the consultation fee) fall outside the scope of coverage. The relatively smaller number of LTM practitioners (Taiwan: 0.19 per 1,000 vs South Korea: 0.3), who are aggregated in urban areas in Taiwan, results in greater pro-rich inequity, compared to South Korea. On the other hand, Hong Kong's publicly financed direct service delivery program provides a trivial amount of LTMP services, again leaving most people paying out-of-pocket as in GP care thus resulting in a similarly pro-rich distribution. On decomposition, this pro-rich inequality is mainly explained by private insurance coverage in Hong Kong, education and urban residency in Taiwan and unobserved residuals in South Korea (which should be further disaggregated in the future).

Several potential caveats bear mention. Like the European study from which our work derived, we echo van Doorslaer et al's (2004) emphasis on the inherent methodological limitation of being unable to distinguish between good and poor quality episodes and thus having to default to the assumption that "an episode is an episode". Closely related to this, as the pre-specified level of service coverage (eg, high-technology service items, formularies and alternative medicine) varies across different national insurance or service schemes of the three territories, the content of an episode (as locally defined) may also differ. Similarly, our analyses were predicated on the tenet that all reported utilization were similarly appropriate with respect to particular levels of morbidity across the three territories examined. Third, we acknowledge that the relatively short recall periods in the three surveys for ambulatory episodes likely introduced some under-reporting due to recall errors and non-uniform distribution of utilization episodes throughout the year (eg due to seasonality of illness). Nevertheless, so long as the under-reporting was non-systematically related to income and the other covariates considered in the analysis, this phenomenon should not have affected the validity or veracity of the results. Indeed, there is some preliminary evidence from Hong Kong suggesting that under-reporting was non-systematic by age or sex (Tsui et al, 2005). Fourth, although we extracted a set of common core variables from the three surveys, we cannot guarantee complete comparability due to different questionnaire formats, survey settings, country-specific circumstances and so on. More importantly, the slightly different and limited sets of covariates adopted for the three locations in the decomposition analysis preclude more detailed dissection of issues such as private-public sector interactions and the role of supplemental insurance coverage. Fifth, the measurement of medical need was likely incomplete by using self-assessed health status and activity limitations, which would be particularly problematic in the unlikely scenario where there was differential reporting bias by income groups. However, we have no reason to believe such was the case and other studies based on the same datasets have demonstrated face and content validity of these variables.

In sum, it appears that equals are treated mostly equally in South Korea in terms of health care utilization rates whereas Hong Kong's otherwise highly progressive performance in vertical equity of health care financing (O'Donnell et al, 2005) has not protected it from apparently inequitable treatment among those with equal medical need across income strata. In Taiwan, the scope and content of service coverage as well as geographic distribution of medical professionals seem to be the main drivers of the heterogeneous pro-poor/pro-rich mix of results. Future work should focus on developing, implementing and evaluating policy interventions to reduce the observed unequal distributions in these three economies, in addition to the urgent and rigorous examination of horizontal equity elsewhere in Asia.

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Table 1 Summary of health system characteristics

System characteristics	Hong Kong	South Korea	Taiwan
Economic indicators, 2003			
GDP per capita (PPP adjusted)	22,911	15,916 [a]	12,726
NHE as % of GDP	5.7 [a] (2001/02)	5.9 [a]	6.3
NHE per capita (PPP adjusted)	1,312	931 [a]	808
Health indicators, 2003			
Infant mortality rate	2.3	5.4 [a]	4.9
Life expectancy	M: 78.5; F: 84.3	M: 72.8 [a]; F: 80.01 [a]	M: 73.3; F: 79
Health system			
Year of universal coverage	1964 (universal access to public services)	1989	1995
Scheme/model	Predominantly tax-funded inpatient and privately-funded outpatient care	Social insurance	Social insurance
Ambulatory care	Yes	Yes	Yes
Inpatient services	Yes	Yes	Yes
Financing system			
Financing mix in 2000	Government general revenue: 57.2% Social insurance: not applicable Direct payment: 29.9% Private Insurance: 11.6% Other private sources: 1.3%	Government general revenue: 10.9% Social insurance: 43.5% Direct payment: 37.3% Private insurance: 2.2% Other private sources: 6.1%	Government general revenue: 8.84% Social insurance: 51.78% Direct payment: 30.15% Private insurance: 8.9 Other private sources 0.33%
Social insurance premium contribution rate	Not applicable	3.95%	4.55%
Delivery system, 2003			
Western medicine practitioners per 1,000 pop	1.62	1.66	1.43
Licensed traditional medicine practitioners per 1,000 pop	1.18 (registered or listed Chinese medicine practitioners)	0.3	0.19
Dentists per 1,000 pop	0.25	0.4	0.4
Acute beds per 1,000 pop	4.88	6.65	4.00
Provider ownership	Inpatient: mainly public; Outpatient: mainly private	Dominant private sector	Mixed ownership
Hospital beds (pri: pub)	9:91 (acute beds)	85:15	65:35
Referral system	Yes in public system; No in private system	Yes, limited	No
Payment to providers	Salary for public doctors; mostly FFS for private doctors	FFS	Mainly FFS, global budget

Note: a: 2001

Table 2 Data sources

Location	Survey	Year	Sample size	Inclusion criterion by age (years)	Types of services included (recall period)
Hong Kong	Thematic Household Survey	2002	10015 households / 29561 individuals	14+	• Western doctor visit (1 month) • Emergency room (1 month) • Licensed traditional medicine practitioner visit (1 month) • Dental visits (12 months) • Hospital admissions (12 months)
South Korea	National Health Survey	1998	8823 households / 8823 individuals	20+	• Western doctor visit (2 weeks) • Licensed traditional medicine practitioner visit (2 weeks) • Dental visits (2 weeks) • Hospital admissions (12 months)
Taiwan	National Health Interview Survey	2001	7632 households / 31436 individuals	12+	• Western doctor visit (1 month) • Emergency room (12 months) • Licensed traditional medicine practitioner visit (1 month) • Dental visits (1 month) • Hospital admissions (12 months)

Table 3 Income-related inequality and inequity in annual per capita health care utilization - probability of use and volume of utilization

	Hong Kong						South Korea						Taiwan					
	Prob.	***C***	***HI***	**Total no.**	***C***	***HI***	**Prob.**	***C***	***HI***	**Total no.**	***C***	***HI***	**Prob.**	***C***	***HI***	**Total no.**	***C***	***HI***
Outpatient visits																		
Western doctor	0.18	**0.0185**	**0.0927**	8.27	**0.0241**	**0.1037**	0.16	**-0.0921**	-0.0090	9.76	**-0.0975**	-0.0234	0.35	**-0.0158**	**0.0174**	8.44	**-0.0534**	0.0007
-General practitioner	0.15	**0.0581**	**0.1144**	6.99	**0.0573**	**0.1181**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
-Specialist	0.03	**-0.2013**	-0.0177	1.27	**-0.1580**	0.0243	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
LTM practitioner	0.03	**0.0574**	**0.1195**	2.55	0.0237	**0.1237**	0.02	-0.0178	0.0862	1.38	-0.0321	0.0726	0.07	**0.0522**	**0.0699**	2.02	0.0401	**0.0615**
Dentist	0.31	**0.2612**	**0.2698**	1.14	**0.2266**	**0.2386**	0.02	0.0283	0.0333	1.12	-0.0155	-0.0262	0.10	**0.0597**	**0.0695**	2.53	0.0154	0.0265
Hospital services																		
Emergency room	0.01	**-0.2226**	**-0.1751**	0.22	**-0.2518**	**-0.2013**	NA	NA	NA	NA	NA	NA	0.10	**-0.0351**	0.0046	0.14	**-0.0370**	0.0217
Inpatient admission	0.07	**-0.0502**	**0.0638**	0.14	**-0.0954**	**0.0468**	0.10	**-0.0744**	**-0.0627**	0.07	**-0.0734**	-0.0506	0.07	**-0.1284**	**-0.0510**	0.10	**-0.1470**	**-0.0435**

LTM : Licensed traditional medicine
Prob. :Probability of outpatient visits/inpatient admissions in the previous year
Total no. :Total number of visits/admissions/hospital days per person per year
Statistically significant ($p<0.05$) *C* and *HI* indices are in bold type

Table 4 Contributions to inequality in probability of use by service type

	Western doctor					LTM practitioner			Dentist*			Emergency room		Inpatient admission		
	HK	(GP)	(SP)	SK	TW	HK	SK	TW	HK	SK	TW	HK	TW	HK	SK	TW
C (actual)	0.0185	0.0581	-0.2013	-0.0921	-0.0158	0.0574	-0.0178	0.0522	0.2612	0.0283	0.0597	-0.2225	-0.0351	-0.0502	-0.0743	-0.1284
C (predicted)	-0.0080	0.0442	-0.2335	-0.1120	-0.0157	-0.0011	-0.0603	0.0518	0.1909	-0.0291	0.0611	-0.1210	-0.0350	-0.0909	-0.0533	-0.1274
GC (residual)	0.0265	0.0140	0.0322	0.0200	0.0000	0.0585	0.0425	0.0004	0.0703	0.0573	-0.0015	-0.1014	-0.0002	0.0407	-0.0210	-0.0010
HI	0.0927	0.1144	-0.0177	-0.0090	0.0174	0.1194	0.0862	0.0699	0.2698	0.0333	0.0693	-0.1750	0.0046	0.0638	-0.0627	-0.0510
C contribution of:																
Income																
ln (income)	**0.0000**	**0.0127**	0.0000	0.0000	**0.0201**	0.0000	0.0279	**0.0449**	**0.0522**	-0.0268	**0.0420**	**0.0000**	-0.0072	0.0098	0.0020	-0.0238
Need																
Self-assessed health (Ref=Very good)																
Good	0.0020	0.0016	0.0039	**0.0039**	**0.0025**	-0.0037	0.0055	**0.0032**				0.0007	**0.0027**	0.0017	0.0035	**0.0020**
Fair	**-0.0090**	**-0.0084**	**-0.0125**	**0.0041**	**-0.0107**	**-0.0098**	0.0038	**-0.0148**				-0.0106	**-0.0130**	**-0.0085**	0.0016	**-0.0114**
Bad	**-0.0265**	**-0.0195**	**-0.0708**	**-0.0412**	**-0.0120**	**-0.0328**	**-0.0510**	**-0.0136**				**-0.0461**	**-0.0217**	**-0.0413**	**-0.0216**	**-0.0294**
Activity limitations (Ref=None at all)																
A little	**-0.0106**	**-0.0090**	**-0.0248**	-0.0151	-0.0006	-0.0095	0.1023	-0.0018				-0.0215	**-0.0046**	**-0.0173**	0.0302	**-0.0084**
A lot	**-0.0062**	**-0.0035**	**-0.0177**	0.0053	0.0002	-0.0063	-0.1247	**-0.0012**				-0.0039	**-0.0025**	**-0.0174**	**-0.0668**	**-0.0074**
Age-sex dummies (Ref=16-34 male/16-34)*																
35-44 male/35-44*	**0.0029**	0.0023	**0.0084**	**0.0054**	**0.0014**	0.0040	0.0030	**0.0023**	**0.0077**	-0.0038	**-0.0016**	-0.0099	0.0010	-0.0015	0.0031	**0.0021**
45-64 male/45-64*	**-0.0008**	-0.0004	**-0.0033**	**-0.0165**	**0.0005**	**-0.0021**	**-0.0165**	0.0003	**-0.0050**	-0.0076	0.0004	0.0020	-0.0001	**-0.0014**	-0.0023	**0.0009**
65-74 male/65-74*	**-0.0069**	**-0.0051**	**-0.0190**	**-0.0205**	**-0.0050**	-0.0039	**-0.0241**	-0.0006	**-0.0082**	-0.0050	**-0.0082**	**0.0176**	-0.0004	**-0.0073**	0.0022	**-0.0095**
75+ male/75+*	**-0.0075**	**-0.0052**	**-0.0180**	**-0.0044**	**-0.0033**	0.0026	-0.0101	0.0013	**-0.0031**	**0.0113**	-0.0002	0.0127	-0.0012	**-0.0159**	**0.0056**	**-0.0088**
16-34 female	**0.0047**	**0.0053**	0.0026	**0.0044**	**0.0014**	**0.0064**	0.0055	**0.0045**				-0.0040	**0.0016**	**0.0058**	**0.0054**	-0.0013
35-44 female	**0.0029**	**0.0028**	**0.0042**	**-0.0038**	**0.0007**	**0.0122**	-0.0008	**0.0021**				-0.0002	-0.0006	0.0016	**-0.0026**	-0.0003
45-64 female	**-0.0032**	**-0.0029**	**-0.0056**	**-0.0105**	**0.0010**	**-0.0085**	-0.0020	**0.0014**				-0.0006	**-0.0004**	-0.0004	-0.0038	0.0003
65-74 female	**-0.0079**	**-0.0068**	**-0.0179**	**-0.0032**	**-0.0065**	**-0.0084**	0.0034	-0.0014				0.0107	-0.0016	-0.0023	0.0014	**-0.0044**
75+ female	**-0.0081**	**-0.0075**	**-0.0131**	**0.0090**	**-0.0028**	-0.0022	0.0017	0.0007				0.0058	0.0011	**-0.0098**	**0.0323**	**-0.0019**
Non-need																
Education (Ref=Graduate)																
Undergraduate/College	-0.0070	-0.0059	-0.0200	**0.0168**	-0.0049	-0.0052	-0.0044	-0.0077	-0.0022	**0.0688**	-0.0036	-0.0244	0.0113	-0.0028	-0.0307	0.0159
High school	-0.0076	-0.0060	-0.0193	0.0053	-0.0012	-0.0131	-0.0041	-0.0014	**-0.0158**	**0.0218**	-0.0021	-0.0189	0.0023	0.0004	-0.0043	0.0032
Middle school	**0.0085**	0.0081	0.0126	**-0.0045**	0.0025	0.0122	0.0032	0.0057	**0.0227**	**-0.0181**	0.0064	0.0020	-0.0018	-0.0038	0.0059	-0.0072
Elementary/No schooling	0.0178	0.0160	0.0413	**-0.0305**	**0.0089**	0.0410	0.0057	**0.0241**	**0.0803**	**-0.0644**	**0.0230**	0.0012	-0.0126	0.0007	0.0205	**-0.0307**
Economic activity (Ref=Employed)																
Inactive	0.0033	**0.0130**	**-0.0549**	-0.0038	**-0.0006**	0.0031	0.0052	0.0001	-0.0021	0.0058	**-0.0007**	-0.0073	-0.0002	**-0.0259**	**-0.0337**	-0.0001
Housework	0.0028	**0.0037**	-0.0046	-0.0008	**-0.0010**	0.0049	0.0002	0.0002	0.0009	**0.0080**	0.0005	**0.0198**	0.0000	-0.0048	-0.0019	-0.0018
Medical benefit/insurance coverage (Ref=Nil)																
Employer-provided benefit	**0.0341**	**0.0413**	-0.0015			-0.0143			**0.0431**			-0.0342		**0.0224**		
Privately purchased insurance	**0.0143**	**0.0175**	-0.0035			**0.0323**			**0.0210**			-0.0117		**0.0271**		

Social insurance	**0.0089**		**0.0137**			-0.0056			**0.0103**	
Medicaid	**-0.0195**		-0.0019			-0.0109			-0.0082	
Region (Ref=Region 1/Rural)										
Region 2		0.0028		0.0063			0.0071	**-0.0215**		**-0.0147**
Region 3		0.0002		0.0007			0.0004	**-0.0048**		-0.0001
Region 4		-0.0005		**-0.0048**			**-0.0025**	**0.0059**		0.0018
Region 5		-0.0018		**-0.0094**			**-0.0083**	**0.0154**		**0.0094**
Region 6		**-0.0041**		-0.0028			-0.0008	**0.0126**		0.0053
Urban	-0.0008	**-0.0029**	-0.0018	**0.0134**		-0.0025	**0.0097**	**0.0056**	-0.0014	**-0.0072**
*Male**					**-0.0007**	-0.0002	**-0.0002**			

HK=Hong Kong; SK=South Korea; TW=Taiwan; ref=reference

* Dental visits are regressed on age (as a need variable) and sex (as a non-need variable) dummies separately, in addition to income and non-need factors, because the other need variables do not have a priori face validity as explanatory factors.

Statistically significant ($p<0.05$) *C* and *HI* indices are in bold type

Table 5 Contributions to inequality in total number of visits by service type

	Western doctor					LTM practitioner			Dentist			Emergency room		Inpatient admission		
	HK	(GP)	(SP)	SK	TW	HK	SK	TW	HK	SK	TW	HK	TW	HK	SK	TW
C (actual)	0.0241	0.0573	-0.1580	-0.0975	-0.0534	0.0237	-0.0321	0.0401	0.2266	-0.0155	0.0154	-0.2518	-0.0370	-0.0954	-0.0734	-0.1470
C (predicted)	0.0091	0.0447	-0.1860	-0.1338	-0.0535	0.0011	-0.1191	0.0401	0.1679	-0.0298	0.0164	-0.2915	-0.0368	-0.1361	-0.0545	-0.1453
GC (residual)	0.0149	0.0125	0.0280	0.0364	0.0001	0.0226	0.0870	0.0000	0.0587	0.0143	-0.0009	0.0397	-0.0002	0.0407	-0.0190	-0.0017
HI	0.1037	0.1181	0.0243	-0.0234	0.0007	0.1237	0.0725	0.0615	0.2386	-0.0261	0.0263	-0.2013	0.0217	0.0468	-0.0506	-0.0436
C contribution of:																
Income																
ln (income)	**0.0262**	**0.0221**	**0.0488**	-0.0028	0.0077	0.0287	0.0017	0.0331	**0.0590**	-0.0435	-0.0008	**-0.1547**	0.0095	0.0064	0.0109	-0.0107
Need																
Self-assessed health (Ref=Very good)																
Good	0.0024	0.0027	0.0007	0.0041	**0.0026**	0.0022	-0.0004	**0.0035**				-0.0015	**0.0025**	0.0017	0.0042	**0.0021**
Fair	**-0.0102**	**-0.0103**	**-0.0101**	**0.0037**	**-0.0132**	**-0.0147**	0.0001	**-0.0149**				-0.0074	**-0.0138**	**-0.0081**	0.0018	**-0.0098**
Bad	**-0.0401**	**-0.0318**	**-0.0859**	**-0.0471**	**-0.0237**	**-0.0559**	**-0.0412**	**-0.0143**				**-0.0517**	**-0.0294**	**-0.0595**	**-0.0247**	**-0.0440**
Activity limitations (Ref=None at all)		-														
A little	**-0.0115**	**-0.0087**	**-0.0266**	-0.0174	**-0.0023**	-0.0107	0.2220	**-0.0034**				-0.0280	**-0.0080**	**-0.0200**	0.0247	**-0.0086**
A lot	**-0.0063**	0.0037	**-0.0203**	-0.0107	-0.0005	-0.0168	-0.2659	**-0.0024**				-0.0076	**-0.0032**	**-0.0262**	**-0.0740**	**-0.0101**
Age-sex dummies (Ref=16-34 male/16-34)*																
35-44 male/35-44*	**0.0041**	**0.0030**	**0.0096**	0.0038	0.0008	0.0115	0.0018	**0.0029**	**0.0047**	**-0.0193**	-0.0011	-0.0103	**0.0022**	-0.0013	0.0025	**0.0025**
45-64 male/45-64*	**-0.0014**	**-0.0009**	**-0.0040**	**-0.0074**	**0.0005**	-0.0018	-0.0116	0.0003	**-0.0054**	0.0036	0.0007	0.0025	-0.0002	**-0.0017**	-0.0012	**0.0009**
65-74 male/65-74*	**-0.0064**	**-0.0053**	**-0.0125**	**-0.0123**	**-0.0072**	-0.0068	-0.0099	-0.0024	**-0.0085**	0.0117	**-0.0100**	**0.0196**	**-0.0034**	-0.0084	0.0036	**-0.0136**
75+ male/75+*	**-0.0044**	-0.0036	-0.0089	0.0002	**-0.0027**	0.0041	-0.0114	0.0018	-0.0030	**0.0146**	-0.0005	**0.0169**	-0.0022	**-0.0161**	**0.0077**	**-0.0103**
16-34 female	**0.0065**	**0.0071**	0.0032	**0.0060**	**0.0012**	0.0038	0.0106	**0.0052**				-0.0021	0.0010	0.0033	**0.0052**	-0.0015
35-44 female	**0.0042**	**0.0042**	**0.0044**	-0.0015	**0.0006**	**0.0086**	-0.0016	**0.0028**				0.0009	-0.0006	0.0007	**-0.0027**	0.0001
45-64 female	**-0.0039**	**-0.0036**	**-0.0051**	-0.0047	**0.0010**	**-0.0084**	-0.0010	**0.0017**				0.0011	-0.0003	0.0001	-0.0033	0.0002
65-74 female	**-0.0062**	**-0.0049**	**-0.0137**	0.0004	**-0.0082**	**-0.0144**	0.0068	-0.0038				0.0135	**-0.0043**	0.0002	0.0026	**-0.0080**
75+ female	**-0.0064**	**-0.0052**	-0.0133	**0.0088**	**-0.0031**	-0.0008	-0.0030	0.0017				0.0036	0.0009	-0.0069	**0.0307**	**-0.0034**
Non-need																
Education (Ref=Graduate)																
Undergraduate/College	-0.0105	-0.0086	-0.0209	0.0065	-0.0033	0.0012	-0.0241	0.0068	0.0040	**0.0573**	0.0034	-0.0245	0.0086	-0.0021	-0.0675	0.0186
High school	-0.0104	-0.0077	-0.0257	0.0044	0.0001	-0.0039	-0.0146	0.0007	-0.0083	**0.0235**	0.0003	-0.0168	0.0021	-0.0022	-0.0185	0.0043
Middle school	**0.0096**	0.0085	0.0152	-0.0035	0.0015	0.0118	0.0118	-0.0030	**0.0174**	**-0.0158**	0.0031	0.0003	-0.0024	-0.0014	0.0138	-0.0064
Elementary/No schooling	0.0205	0.0138	0.0568	**-0.0455**	0.0038	0.0386	-0.0006	0.0081	**0.0666**	-0.0418	0.0085	0.0008	-0.0103	0.0047	0.0669	-0.0304
Economic activity (Ref=Employed)																
Inactive	0.0008	**0.0128**	**-0.0654**	-0.0096	-0.0002	0.0201	-0.0092	-0.0002	**-0.0117**	0.0125	-0.0005	-0.0134	0.0001	**-0.0355**	**-0.0357**	-0.0002
Housework	0.0019	0.0030	-0.0037	0.0000	-0.0012	0.0026	-0.0041	0.0011	-0.0026	0.0074	0.0000	0.0139	0.0006	-0.0037	-0.0018	-0.0028
Medical benefit/insurance coverage (Ref=Nil)																
Employer-provided benefit	**0.0315**	**0.0396**	-0.0126			**-0.0340**			**0.0341**			**-0.0374**		**0.0160**		
Privately purchased insurance	**0.0192**	**0.0220**	0.0038			**0.0359**			**0.0220**			-0.0092		**0.0239**		
Social insurance				**0.0115**			**0.0147**			-0.0123					**0.0106**	
Medicaid				**-0.0227**			0.0055			-0.0200					-0.0076	

Region (Ref=Region 1/Rural)									
Region 2		0.0070		0.0161		0.0047	**-0.0231**		**-0.0224**
Region 3		0.0022		0.0005		0.0002	-0.0035		-0.0014
Region 4		**-0.0019**		**-0.0049**		-0.0026	**0.0066**		0.0031
Region 5		-0.0036		-0.0091		**-0.0097**	**0.0187**		0.0096
Region 6		**-0.0093**		-0.0065		0.0005	**0.0163**		0.0098
Urban	0.0019	-0.0022	0.0044	**0.0187**	-0.0060	**0.0203**	-0.0013	-0.0026	**-0.0129**
*Male**					**-0.0007**	-0.0018	**-0.0002**		

HK=Hong Kong; SK=South Korea; TW=Taiwan; ref=reference

* Dental visits are regressed on age (as a need variable) and sex (as a non-need variable) dummies separately, in addition to income and non-need factors, because the other need variables do not have a priori face validity as explanatory factors.

Statistically significant ($p<0.05$) *C* and *HI* indices are in bold type

Figure 1a. Inequality indices for probability and total number of western doctor visits (with 95% confidence intervals)

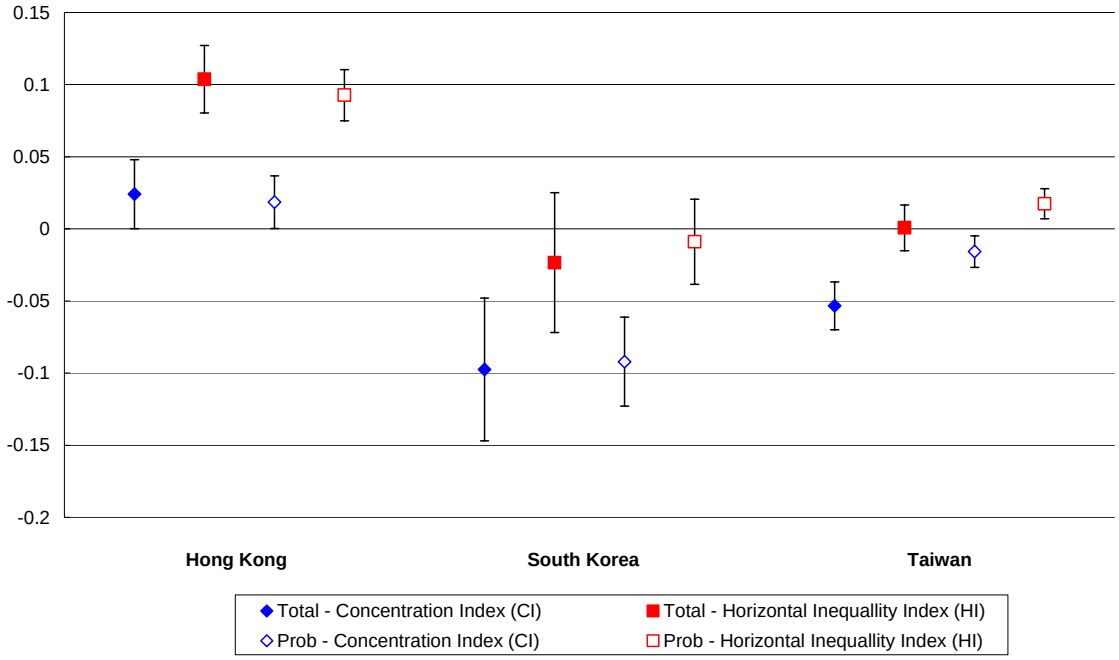

Figure 1b. Inequality indices for probability and total number of licensed traditional medicine practitioner visits (with 95% confidence intervals)

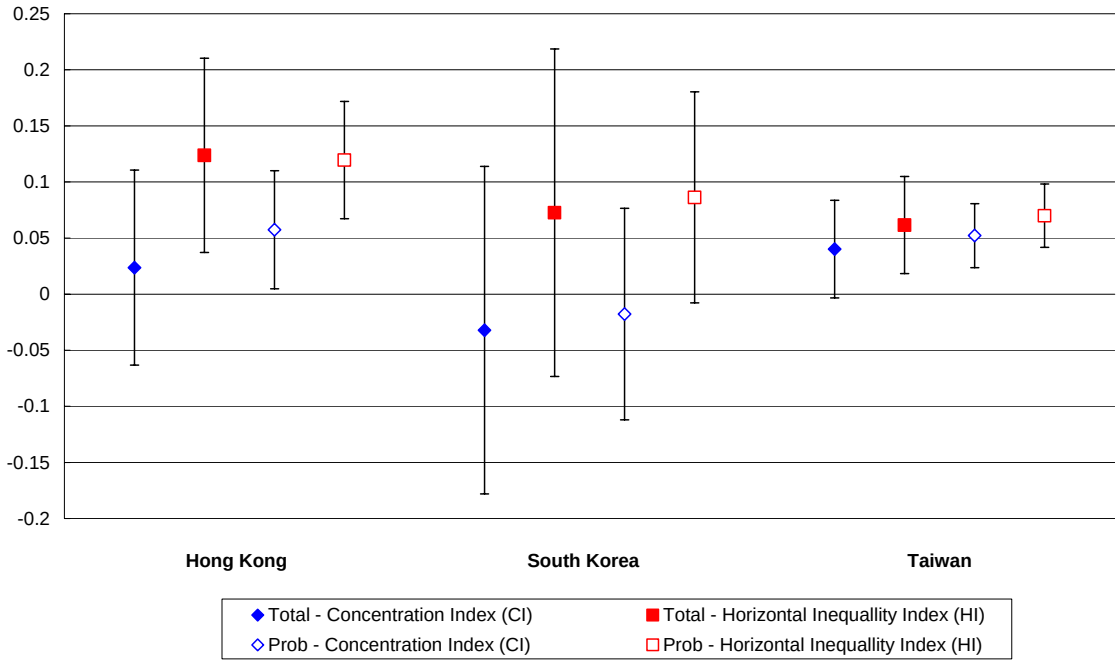

Figure 1c. Inequality indices for probability and total number of dental visits (with 95% confidence intervals)

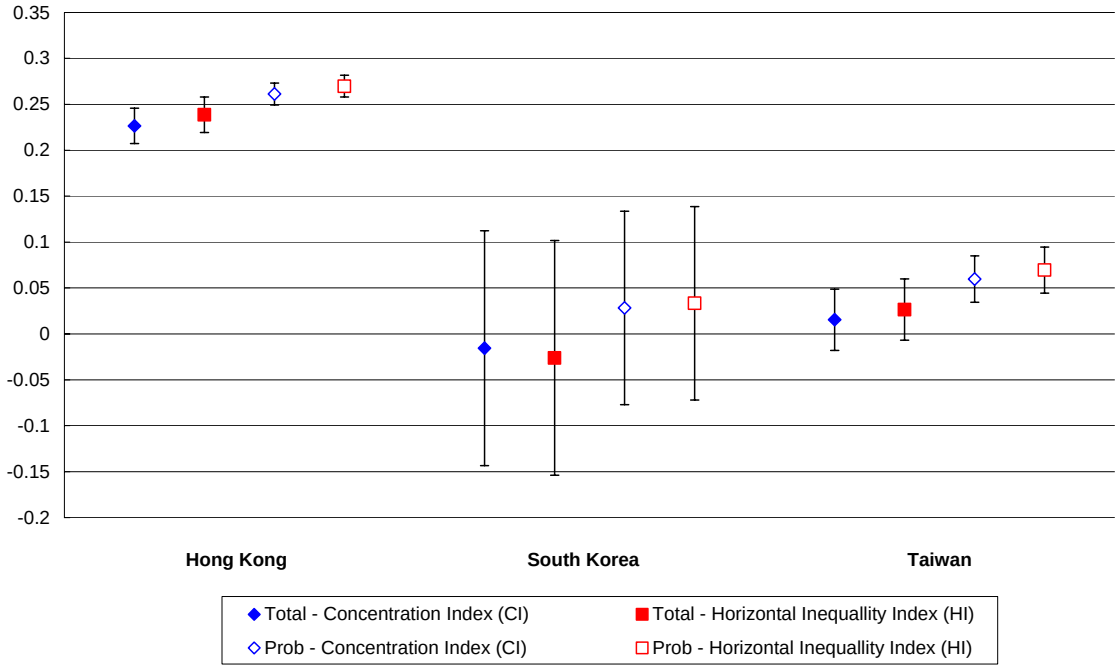

Figure 1d. Inequality indices for probability and total number of emergency room visits (with 95% confidence intervals)

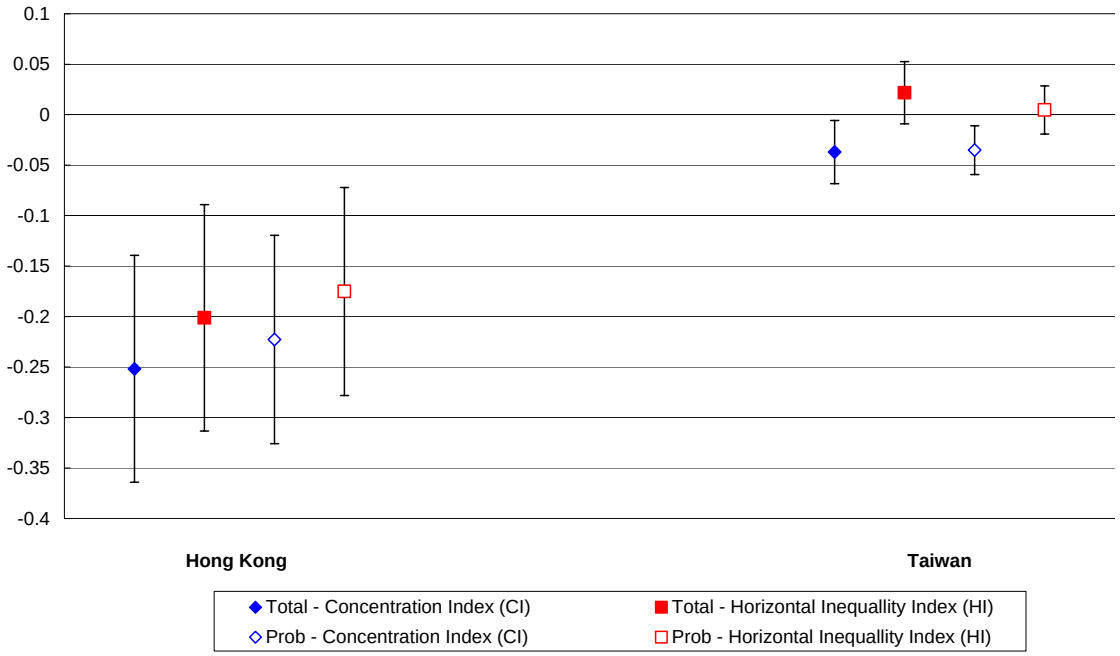

Figure 1e. Inequality indices for probability and total number of hospital admissions (with 95% confidence intervals)

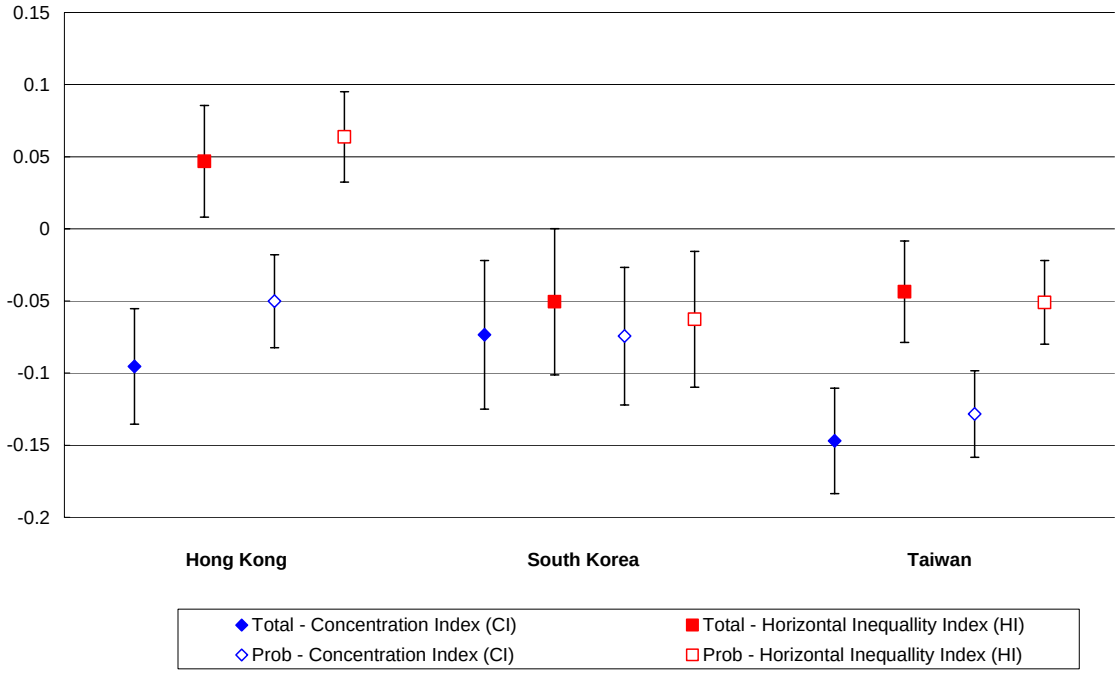

Figure 2a Decomposition of inequality for probability of utilization

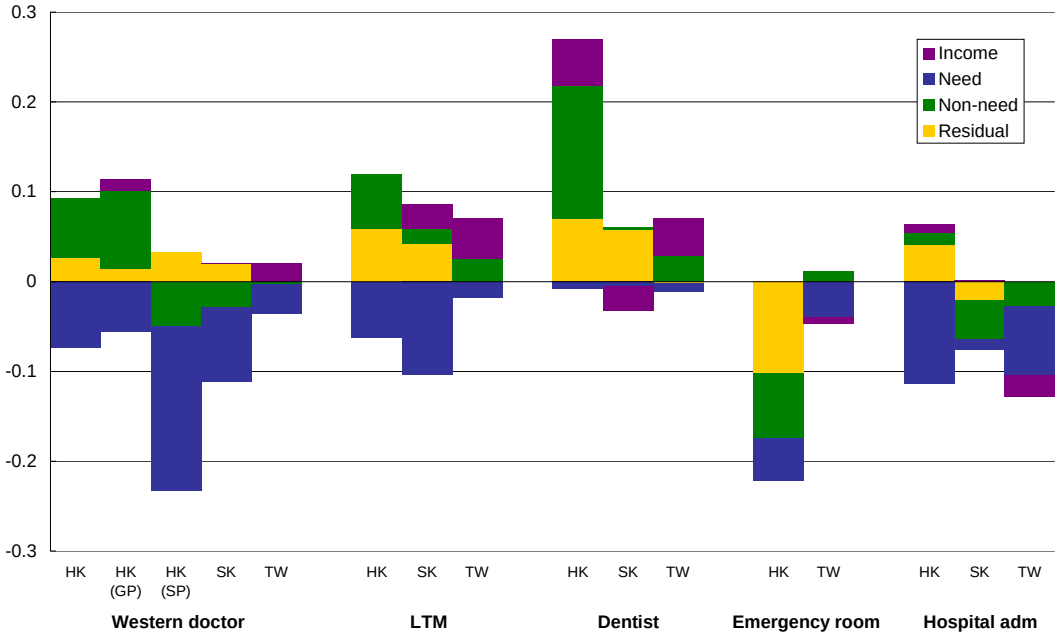

Figure 2b Decomposition of inequality for total number of episodes