

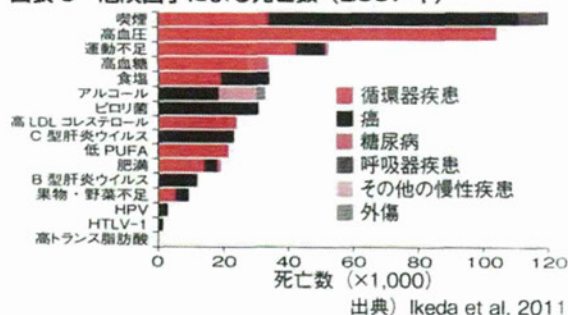
も我が国のイメージ向上が可能である。こうした方策は、現在のグローバルヘルスの潮流でもある。すなわち、資金やプロジェクトの供与のみではなく、バリュー感のある戦略とビジネスモデルの開発が重要となっている。資金は後からついてくるのである。

考えてみると、後藤新平が台湾で行ったことはまさに、日本型の医療、教育や農業のパッケージ輸出による地域おこし、国づくりであった。この日本型モデルに着目したのが、MDGsの土台を築いた著名なマクロ経済学者であるジェフリー・サックスである。彼は、アフリカの最貧地域がMDGsを達成するために、ミレニアム・ビレッジ・プロジェクト（MVP）を2006年に立ち上げ、保健医療、教育、農業、テクノロジーとイノベーション、水とエネルギー、ジェンダーと公平性、環境、ビジネスと起業家精神という8つのセクターごとに戦略を設定し、これに基づく施策をコミュニティ主導の包括的アプローチを用いて極度の貧困となる要因を削減しようとした。また、MVPは学界やビジネス、市民社会、政府の全員参加型アプローチを用いている。MVPは、日本政府やドイツ財団の支援を受け、大きな成果を上げた¹⁰⁾。

我が国の保健医療分野における過去50年間の最大の成果は、国民間での公平性を高めながら低コストで良好な健康アウトカムを実現したことである。健康アウトカムに関しては、日本は、食事等のおかげで虚血性心疾患および一部のがんの危険因子が元々低かったことから多大な恩恵を受けてきており、1950年代にはすでに他の先進国に比べて生活習慣病による死亡率は一般に低かった。ただし、脳卒中死亡率はきわめて高く、平均寿命の急激な伸びの一つの理由は、主に公衆衛生対策および血圧などの主要危険因子のプライマリ・ケアにおける管理によるものであり、やはり保健医療制度のインパクトは大きい¹¹⁾。また、我々の分析では、少なくとも同じニーズをもつ人が同等の医療を受けられるか、医療費は公平に負担されているかという点、そして、家計の壊滅的な負担の予防の割合に関しては他国と比較しても比較的良好であり、現行の皆保険制度下での保健制度パフォーマンスは世界的にもこれまでは満足できるものであった¹²⁾。

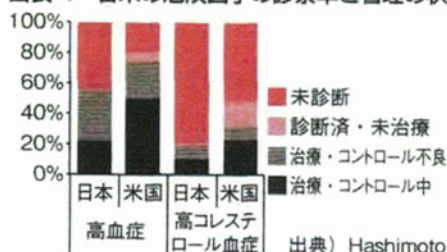
しかし、良好な健康アウトカムにも陰りが見え始めている。1990年代中頃以降は、他国に比べ成人男性死亡率の低下率が鈍化しており、成人女性も成人男性ほどではないが鈍化している。日本の男性の死亡率はスウェーデン、イタリア、オーストラリアの、また女性の死亡率

図表3 危険因子による死亡数(2007年)



出典) Ikeda et al. 2011

図表4 日米の危険因子の診察率と管理の状況



出典) Hashimoto et al. 2011

はスウェーデンの後塵を拝している。近年の傾向が続けば、他の国の成人死亡率が日本を下回る可能性がある¹³⁾。

ランセット日本特集号で池田らは、他の先進国に比べて喫煙や高血圧がまだ多いこと(図表3)、肥満が少しずつ上昇していること、自殺率が高くまた上昇していることなど、実績悪化の原因を数多く提示している¹⁴⁾。さらに、日本には国民皆保険制度がありアクセスはよいが、提供されている医療の質が低い可能性も指摘されている。例えば、我が国では高血圧や高コレステロール血症の患者が実際に治療される割合は他の先進国に比べてはるかに低い¹²⁾。図表4に示すように、高血圧症および高コレステロール血症を抑える薬剤を現在処方されている患者のうち、目標数値を達成したのは半数にすぎなかった。さらに、未診察・未治療患者の割合は、アメリカの推計数よりも多かった。医療の質が不十分なことを考慮すれば、日本の健康アウトカムをさらに改善させるには保健医療制度を刷新する必要がある。

これまでの途上国型モデルは国外の医療展開にはきわめて有用であるが、国内ではそれでは対応できない。日本は基本政策として、診療報酬点数表により支払条件を供給側で厳格に管理する一方、サービスの提供方法については自由放任主義的アプローチを取ってきたために、深刻な受給ミスマッチが生じている¹²⁾。

ワシントン大学のマレーは、経済停滞、政治の混乱、高齢化、十分ではないタバコ対策という状況のなかで、

日本は保健医療の新たな課題に効果的に対応しておらず、これらの課題に取り組むには、安価で多くの患者を診る、従来どおりのアクセスを全国民に保証する制度だけでは不十分であると指摘している。我が国は一致協力して取り組まなければ、アメリカと同様、世界での平均寿命ランキングが下がっていく可能性がある¹³⁾。しかし、少子高齢化の進む今もなお、高度経済成長時代の制度が惰性的に継続されているのが現状である。また、橋本らの試算では、無保険者もすでに百万人以上おり、皆保険は実質破綻している¹²⁾と考える。

また、医療費を賄うために税を投入しているが、社会保険のリスクシェアリングという原則、あるいは税の応能負担による所得再分配機能という二つの目的がきわめて曖昧にされながら、多くの保険制度改革議論は財源論に終始している。財源論はもちろん重要である。さらに、給付抑制、無駄なサービスのカットや成果に基づく支払い、混合診療、医療の規制緩和などは、やるかやらないかではなく、いつどのようにやるかというイシューであろう。だが、それらは必ずしも今後の医療の価値やあり方の本質ではない。我が国の医療のあり方を論ずることなく、既存制度の財源をとりあえず確保し、延命するという現在の医療行政の継続はきわめて困難な時期にきている。

7) 国民皆保険制度が抱える今後の課題は世界から注目されている

日本は、少子高齢化の進展、経済的不確実性の増大、そしてグローバル化という今日の文脈のもとで、「健康」の意味を考え直す必要に直面している。特に、国民が健康に対して抱えている価値観に寄りそって、国内外ともに整合性のある健康ビジョンを策定する必要がある⁴⁾。これが、ランセット日本特集号の最大のメッセージである。

日本は、伝統的な国家安全保障に加えて「人間の安全保障」、つまり、すべての人々を脅威から守り、生存・暮らし・尊厳のための糧を与えることを外交政策の礎にした。緒方貞子氏とアマルティア・セン教授を委員長として国連に「人間の安全保障委員会」を作り、その意義を広めた。それは日本が政治・経済・社会の発展の相互依存性を理解していたからであるといえよう。これまで機能してきた我が国の保健医療制度は破綻し始めており、最近の震災でも明らかのように、現在では国内の人間の安全保障をも脅かし始めている。人間の安全保障がこれまでに重要であり、このコンセプトをもっと積極的

に国内政策に应用することが必要であると筆者は考える。アマルティア・センの弟子である経済学者アナンドは、人間の安全保障のコンセプトの主要な課題の一つは人々の健康を守ることであり、そのために包括的な国民皆保険制度は必須である、と述べている¹⁴⁾。

国民皆保険制度が達成した成果は大きい。しかし、過去の成功が現状に合わなくなっているのも事実である。国民皆保険制度は目的ではなく、あくまでも保健医療の目標を達成するための一つの手段である。日本の国民皆保険制度が抱えている課題の一つは、財源もそうだが、保健医療のあり方やそれに対する人々の価値観が変わってきていることをまず認識すべきことである。今までのように、安くて皆が同じような医療を受けられればそれでよいという時代ではなく、個人のニーズ、価値観を重視した高付加価値の保健医療へと質的に転換しなければならぬ。そして、困っている人々には手厚い保護を行う。その際に核となる考えが「人間の安全保障」であり、それを達成する際に必要となる発想が「保健医療は投資」であるということである。

実状に合わせて我が国の保健医療制度をよりよいものにするには、官僚や学者、政治家任せにするのではなく、国民が自分たちの切実な問題として考え、従来の保健セクターを越えて連携し、行動しなくては行けない。外交安全保障と同様に、保健医療は存在するのが当たり前ではなく、自分たちで守らなくては行けない。日本のような急速に高齢化が進む国はほとんどなく、日本がこうした問題をどのように解決していくかは、今後のモデルとして世界中が注目している。

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Horizontal inequity in healthcare access under the universal coverage in Japan; 1986–2007

Ryo Watanabe, Hideki Hashimoto*

Department of Health Economics and Epidemiology Research, The University of Tokyo School of Public Health, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan

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ABSTRACT

Universal coverage of healthcare aims at securing access to appropriate healthcare for all at an affordable cost. Since 1961, Japan's national health insurance has provided an equal package of benefits including outpatient, inpatient, dental, and pharmaceutical services. Reduced copayment and other welfare programs are available to the elderly. However, social health insurance may not be a panacea to achieve healthcare for all, especially when facing household impoverishment due to economic stagnation. Using time-series cross-sectional data of a nationally representative survey of Japan, we assessed the degree of inequity in healthcare access in terms of the "equal treatment for equal needs" concept, to identify the impact of changing economic conditions on people's healthcare access. Concentration indices of actual healthcare use (C_M) and standardized health status as a marker of healthcare needs (C_N) were obtained. We decomposed C_M to identify factors contributing to inequalities in healthcare use. Results showed that horizontal inequities in healthcare access in favor of the rich gradually increased over the period with a widening health gap among the poor. The inequality in favor of the rich was specifically observed among people aged 20–64 years, whereas high horizontal equity was achieved among those aged >65 years. Decomposition of C_M also demonstrated that income and health status were major contributors to widening inequality, which implies that changes in household economic conditions and copayment policy during the study period were responsible for the diminished horizontal equity. Our results suggest that the achievement of horizontal equity through universal coverage should be regarded as an ongoing project that requires continuous redesign of contribution and benefit in the nation's healthcare system.

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Introduction

Universal coverage of healthcare has become a global policy agenda, aiming to secure access to appropriate healthcare for all at an affordable cost (Carrin, Mathauer, Xu, & Evans, 2008). To achieve this egalitarian goal many countries including Japan have adopted social health insurance systems. Japan introduced social health insurance for factory workers in 1922, and gradually expanded the coverage until it achieved mandatory and universal coverage in 1961. Since then, Japanese health insurance has provided an equal package of benefits for all, including outpatient, inpatient, dental, and pharmaceutical services. Relatively generous coverage resulted in a rapid increase of medical care utilization, which at least partially contributed to the decrease in stroke and the consequent world's longest life expectancy of Japanese adults (Ikeda, Saito, Kondo, et al., 2011).

However, social health insurance may not be a panacea to achieve healthcare for all at an affordable cost. Previous studies across European and East-Asian countries revealed that the horizontal inequity (HI) in healthcare access over household economic conditions, or the degree of "equal access for equal needs" (Le Grand, 1978; Wagstaff, Paci, & van Doorslaer, 1991) varied across countries even with social insurance systems under universal coverage schemes (van Doorslaer, Koolman, & Puffer, 2002; Lu et al., 2007). In Japan, Ohkusa and Honda (2003) were the first to estimate the degree of HI using nationwide micro data from 1992, 1995 and 1998 (Ohkusa & Honda, 2003). They found that access was slightly unequal in favor of the poor in Japan. However, their analysis failed to incorporate the existing policy of reduced copayment for those aged ≥ 70 years, and was thus likely to overestimate the pro-poor nature of the system because the elderly tend to consume a large portion of medical expense and their income is limited after retirement (Ministry of Health, Labour and Welfare, 2009a).

With the prolonged recession after the "bubble" economy implosion in 1991, the premium collection for Japanese public

* Corresponding author. Tel.: +81 3 5841 1887; fax: +81 3 5841 1888.

E-mail addresses: hidehashimoto-circ@umin.ac.jp, hashimoto_hideki@hotmail.com (H. Hashimoto).

health insurance has decreased because of decreased wages, while the demand for healthcare has been increasing with population aging (Ikegami & Campbell, 1999). The Japanese government responded to the situation by gradually raising copayment rates for the elderly and the employed since the late 1990s as shown in Table 1. Economic recession also led to increasing income disparity and relative poverty, which could result in a widening gap in access to necessary healthcare across income groups (Organization for Economic Cooperation and Development, 2006; Tachibanaki & Urakawa, 2008). Indeed, Babazono, Kuwabara, Hagihara, Yamamoto, and Hillman (2005) reported a significant reduction in outpatient care utilization among diabetic patients who were covered by health insurance for the employed after a copayment amendment in 2003. However, until now, there has been no nationwide assessment of the impact of economic recession and policy change on the HI in healthcare access in Japan. With emerging global interest in constructing universal coverage schemes (World Health Organization, 2010), Japan's experience provides an important lesson on how HI in access to effective healthcare would be threatened in the face of economic difficulties and population aging. This paper aimed to fill the gap in the evidence discussed above by analyzing nationwide data throughout the 1980s and 2000s, when Japan struggled through demographic and economic challenges.

Methods

For our purpose, we basically followed previous studies (van Doorslaer et al., 1997; van Doorslaer et al., 2002; Lu et al., 2007; Ohkusa & Honda, 2003) to assess income-related HI by calculating concentration indices (CIs) of healthcare utilization using time-series cross-sectional data of nationally representative samples, the details of which are below.

Data sources: comprehensive survey of living conditions (CSLCP)

We followed Ohkusa and Honda (2003) and used CSLCP micro data. A large-scale CSLCP was conducted every 3 years, in which all households and their members living in sample unit areas, which were cluster-sampled from 47 prefectures nationwide in Japan, were invited to participate. The survey comprised self-administered questionnaires on household and members' health statuses, and an interview questionnaire on household income. The income survey was conducted in a subsample of household and health surveys. Household and health questionnaires were administered in June of each survey year, and the interview survey on income status was conducted in July of the same year.

Table 1
Transition of copayment rate in Japan.

Type of insurance	Year							
	1983	1997	2001	2002	2003	2006	2008	
Health services for elderly	IP: 300 yen/day OP: 400 yen/day	IP: 1000 yen/day OP: 500 yen/day + medication sharing	10%	10% (20%)		10% (30%)	Age 75 and over Age 70–74	10% (30%) 20% (30%)
National health insurance ^a		30%		IP: 30% OP: 30% + medication sharing		30%	Under 70	30%
Employee's health insurance	Beneficiary	Fixed payment (-1984) 10% (1984-)		IP: 20% OP: 20%; medication sharing		30%		
	Beneficiary's dependent family	IP: 30% (-1981) IP: 20% (1981-) OP: 30%		IP: 20% OP: 30%; medication sharing		30%		

IP: inpatient, OP: outpatient.

Source: Ministry of Health, Labour and Welfare. Annual Health, Labour and Welfare Report: 2007 (in Japanese).

^a Self-employed, retired, and their family.

In the 2007 survey, the household and health questionnaires were distributed to a total of 287,807 households located in 5440 unit areas that were selected by stratified random sampling from areas of the Population Census conducted in 2005. A total of 230,596 households completed the questionnaires (response rate, 80.1%). The income survey, on the other hand, was conducted in 36,285 households in 2000 sample unit areas; 24,578 households responded (response rate, 67.7%). We merged a dataset for these three questionnaires by unique IDs for households and individuals, which included data from 45,586 individuals (M/F, 21,656/23,930) in 16,177 households. Using similar procedures we obtained 7 databases for the years 1986, 1989, 1992, 1995, 1998, 2001, and 2004.

Household income

The survey assessed annual pretax income including labor income, asset income, pension, and other social security transfers. Following a previous study (Shibuya, Hashimoto, & Yano, 2002), we obtained equivalent pre-tax income by dividing total household pre-tax income by the square root of the number of family members.

Healthcare utilization

To measure healthcare utilization we used self-reported "physician visits in the previous 1 month" in the questionnaires. Physician visits included outpatient and inpatient services provided by western medicine physicians as well as traditional care such as acupuncture for musculoskeletal conditions covered by public health insurance.

Estimation of healthcare needs

Healthcare needs are often operationalized as expected likelihood (e.g. probability or amount) of healthcare use (van Doorslaer et al., 1997). More concretely, actual healthcare use was regressed on the "needs" and "non-needs" factors of individuals, and a predicted value using the actual values of the "needs" variables was obtained as the estimate of "healthcare needs" solely attributable to the individual's needs status. "Needs" variables often include the individual's demographic and health conditions, while "non-needs" variables are composed of household income, regional availability of services, and other socio-economic conditions that may affect access to healthcare. However, in this study, we chose not to use this method because we believe that predicted health utilization would underestimate healthcare needs, especially among the poor. Linearly predicted healthcare utilization should reflect healthcare need if the threshold of health conditions that leads to care utilization is independent of income status and year.

We doubt that the assumption may not hold because worsening economic conditions and increasing burden of out-of-pocket payment over time could selectively deter healthcare utilization among the poor until they get sicker. Thus, instead of predicted healthcare use, we used predicted health status to more directly reflect one's healthcare needs.

For this purpose, we started from self-reported health (SRH) status measured in 5 response levels, which is commonly employed as an indicator of individual health status and is known to significantly predict mortality and utilization of healthcare (DeSalvo, Fan, McDonell, & Fihn, 2005). However, some researchers have criticized the measure as being susceptible to reporting bias, and its comparability across populations is questionable (Lindeboom & van Doorslaer, 2004). A possible solution for this is to construct a single measure of health status by regressing SRH on several conditions that are objectively measured or subjectively reported with less susceptibility to response bias such as sex, age, diagnosed chronic conditions and functional limitations (Jürges, 2005). More specifically, we constructed an ordered probit model with SRH as the target outcome regressed on the above factors. Based on the estimated response we calculated the estimated risk of reporting less than "fair" health, standardized for the needs conditions of the individuals.

Estimation of horizontal inequity

To evaluate HI we used two methods of estimating CI as a relative measurement of income-related inequality in healthcare utilization and healthcare need, following previous studies (van Doorslaer et al., 1997).

CI corresponds to twice the area between the concentration curve and the 45° line, and runs from -1 (over-diagonal, implying pro-poor) to $+1$ (under-diagonal, implying pro-rich). The basic idea is that we could measure the degree of HI as the difference between the CI of healthcare use (C_M) and that of healthcare need (C_N).

C_M was therefore calculated by the following formula:

$$C_M = \frac{2}{N\bar{y}} \sum_{i=1}^N (y_i - \bar{y}) \left(R_i - \frac{1}{2} \right) \quad (1.1)$$

$$= \frac{2}{\bar{y}} \text{cov}(y_i, R_i) \quad (1.2)$$

Where y_i is the measure of healthcare utilization of i th individual, N the sample size, and \bar{y} mean healthcare use. R_i is relative fractional rank in income of the i th individual. If we replace y_i with estimated health status as healthcare need, we can calculate C_N . Subtracting C_N from C_M provides HI. A positive HI value indicates a distribution of healthcare access for health conditions in favor of the rich, and vice versa.

Another method used to obtain HI is via a decomposition of C_M (van Doorslaer et al., 2002; Wagstaff, van Doorslaer, & Watanabe, 2003). Suppose healthcare utilization (y) is predicted in a linear additive regression model such as:

$$y = \alpha + \sum_k \beta_k x_k + \varepsilon \quad (1.3)$$

Where x_k is the k th factor of the vector including the source of inequality such as demographics, income, and access to other healthcare resources. Then, C_M can be decomposed into the sum of CIs for each factor weighted by its elasticity as follows:

$$C_M = \sum_k \left(\frac{\beta_k \bar{x}_k}{\bar{y}} \right) C_k + \frac{GC_\varepsilon}{\bar{y}} \quad (1.4)$$

Where C_k is CI for x_k and GC_ε is the generalized CI for the error term.

Although healthcare utilization was expressed in binary term, we relied on linear decomposition rather than nonlinear decomposition for analytic simplicity, following previous studies that reported that the difference between linear and nonlinear estimators was only moderate (van Doorslaer, Koolman, & Jones, 2004; Lu et al., 2007).

As explanatory factors of the linear model, previous studies have included health needs measured by sex, age, and subjective health status and non-need factors such as equivalized household income, education, labor force participation, marital status, and residential region (van Doorslaer et al., 2004; Lu et al., 2007). In our study, we did not include sex or age because we have already controlled for them in the estimation of the health status indicator. We did not include education or labor force participation because of data limitation; however, their effects should be reflected in the CI for the error term in our case. We additionally included in the model the number of physicians per 1000 population at 47 prefectural levels to reflect regional accessibility to healthcare resources.

HI was calculated for each year for all people aged ≥ 20 years because copayment of child care was subsidized by municipal authorities in Japan, although the conditions of and eligibility for subsidies varied across municipalities. We also carried out subgroup analyses stratified by age with 65 years as the cutoff point because the copayment rate was potentially deducted for those aged ≥ 65 years with means tests in some municipalities. People aged ≥ 75 were unconditionally and universally eligible for reduced copayments at a rate of 10–20% according to their income levels. Finally, households that did not pay income tax were regarded as those under livelihood assistance by the welfare program and were excluded from analyses because they were exempt from copayments and premium payments, which would have affected their healthcare utilization behavior.

Results

Descriptive statistics

Descriptive statistics for each year are shown in Table 2. The sample size gradually decreased because of a decreasing response rate over time. The sex ratio was almost stable, and a gradual elevation of mean age was observed reflecting population aging. The average equivalent income was the highest in 1998 (4.2 million Japanese yen; approximately US\$35,000 in exchange rate of 1998). The rate of healthcare utilization gradually increased from 25.1% in 1986 to 42.0% in 2007, again reflecting the increased proportion of elderly in the sample who tended to have larger demand for healthcare.

Horizontal inequity measured as the gap between healthcare utilization and health status

Fig. 1a shows CI and HI indices for all age categories >20 years. CIs for healthcare use (C_M) were negative throughout the study period, indicating the poor used relatively more healthcare services. Overall, the C_M values were almost constant across years (between -0.032 and -0.052). The CIs for healthcare needs (C_N) were also negative throughout the period, indicating larger healthcare needs in households with lower versus higher income. C_N decreased from -0.058 in 1986 to -0.108 in 2007. Therefore, the HI indices for healthcare access gradually increased from 0.026 to 0.072 over the period, indicating a widening gap in healthcare utilization for healthcare needs in favor of the rich.

Fig. 1b presents CI and HI indices limited to people aged 20–64 years. C_M turned positive, suggesting more utilization by the rich. C_N was constantly negative in this group across years. Subsequently,

Table 2
Descriptive statistics of waves of the comprehensive survey of people's living conditions; 1986–2007.

		Year							
		1986	1989	1992	1995	1998	2001	2004	2007
Sample sizes		85,243	87,484	81,378	73,821	66,444	63,711	50,875	45,586
Sex (female)	%	52.8%	52.6%	52.8%	52.6%	52.5%	52.9%	52.7%	52.5%
Age	Mean	46.5	47.2	47.8	48.1	49.1	50.9	52.2	53.0
	SD	16.0	16.3	16.6	16.9	17.3	17.6	17.7	17.9
Equivalent income (thousand yen)	Mean	2,850.6	3,189.3	3,801.4	4,117.1	4,190.9	3,870.1	3,682.1	3,644.3
	SD	2,269.7	2,585.3	3,067.3	3,359.0	3,340.2	3,241.6	2,506.9	2,684.8
	Median	2,437.2	2,683.3	3,228.9	3,488.3	3,544.9	3,264.7	3,203.2	3,095.0
Physician visit in previous month	%	25.1%	27.4%	28.3%	30.2%	34.1%	38.4%	40.9%	42.0%
Estimated health status less than "fair"	%	18.3%	17.8%	15.1%	10.0%	12.9%	15.2%	17.6%	21.9%

HIs were positive, and the indices increased over time from 0.027 to 0.074, again suggesting a widening gap in favor of the rich.

Fig. 1c presented the results limited to people aged ≥ 65 years. Compared with the younger layer, both C_M and C_N were consistently closer to 0, and the HIs were positive, yet to a smaller degree, ranging between 0.014 and 0.028.

Decomposition of CIs for healthcare utilization

Fig. 2 presents the contributions of estimated health status, equivalent household income, and regional physician density to the CI of healthcare utilization for each year. Income and estimated health status were major contributors to inequality in healthcare utilization each year. Estimated health status was consistently negative throughout the study period (between -0.004 and -0.017). The contribution of equivalent household income was consistently positive (between 0.010 and 0.026), and became larger after 2001. The contribution of regional physician density was almost null.

Discussion

This paper provides cross-sectional time-series data of income-related inequality in healthcare utilization in Japan. In the whole population aged ≥ 20 years the distribution of healthcare utilization was consistently weighted towards the poor, as shown by the negative C_M values. However, when the population was divided at age 65 years the values became positive, suggesting a distribution of utilization in favor of the rich. This finding may be attributable to the observation that elderly households tended to have lower income, and had more frequent use of medical services because of their higher demand for medical care and lower copayment rate for the elderly in the Japanese health insurance system (Ministry of Health, Labour and Welfare, 2008). However, after stratifying the population by age, the distribution in each age category was revealed as unequal in favor of the rich.

The distribution of healthcare needs, depicted as an individual's estimated likelihood to have poor health status, was consistently weighted towards the poor; suggesting that those with lower household income tended to have poor health. The degree of distribution inequality was more manifest in the later part of the study period. As a result, we found that income-related inequity in healthcare access for healthcare needs increased slightly over time mainly because of increasing inequality in health status.

When we focused on people aged ≥ 65 years, the magnitude of HI was small, and consistent over time, while the increasing gap between healthcare utilization and health needs was more apparent among the younger population. The decomposition analyses of this younger layer further confirmed that equivalent household income consistently exhibited the largest contribution to the unequal distribution of healthcare utilization in favor of the

rich, and the contribution became larger after 2001, when economic deterioration and the subsequent income gap became societal problems in Japan (Tachibanaki & Urakawa, 2008).

Using a decomposition analysis Lu et al. (2007) showed that the HI index of western physician visits was 0.0209 in Taiwan, -0.0090 in Korea, and 0.0927 in Hong Kong as of 2004. In our decomposition analysis, our estimation in the same year would be C_M (0.016) minus the contribution of estimated health status (-0.009) = 0.025, which seems comparable with Taiwan. Thus, in the comparative sense Japan still achieved a high degree of horizontal equity in healthcare utilization across household income status. However, when we observed the trend over time, our analysis strongly indicated an early sign of deterioration in this achievement since 2001.

Several studies based on community surveys have revealed that a non-ignorable portion of the population do not seek medical care in spite of felt needs; the major reasons were the time cost to make a visit and the out-of-pocket copayment at visit (Abe, 2010; Murata et al., 2010). Employees' Health Insurance, which mainly covers younger workers, covers 60% of the total population, and the copayment rate for beneficiaries in this plan was revised from 20% to 30% in 2003. In addition, the income gap among the younger population has widened since the 2000s (Tachibanaki & Urakawa, 2008). These conditions may be behind the widening HI in healthcare access among young people. Although some studies showed that the price elasticity of demand for medical care is small (Yashiro, Suzuki, & Suzuki, 2006), Babazono et al. (2008) reported a reduction in healthcare use in lower-income groups after the increase of the copayment rate using aggregated data of Employees' Health Insurance. Ikegami et al. (2011) also attributed the decrease in outpatient service use since the 1990s among those with Employee's Health Insurance to the increased copayment rate. According to the RAND Health Insurance Experiment, higher co-insurance rates significantly reduced access to healthcare and negatively affected health among the vulnerable population with lower income (Gruber, 2006).

In addition to the economic barrier of the increased copayment rate, a widening gap in health literacy across socio-economic groups may also affect access to healthcare. According to the Patients' Behavior Survey Report in 2008, only 15% of outpatients could actually access necessary information when they chose outpatient clinics and had to make a decision for treatment (Ministry of Health, Labour and Welfare, 2009b). Almost half of them depended on physician's referral, and only about 4% used the Internet and other independent sources that became newly available since the late 1990s and were likely to contain detailed information. This information divide might have worsened the unequal utilization of healthcare services (Ishikawa & Yano, 2008).

Our results contradict previous findings by Ohkusa and Honda (2003) who reported that both healthcare utilization and needs were in favor of the poor in 1992, 1995, and 1998. They attributed to

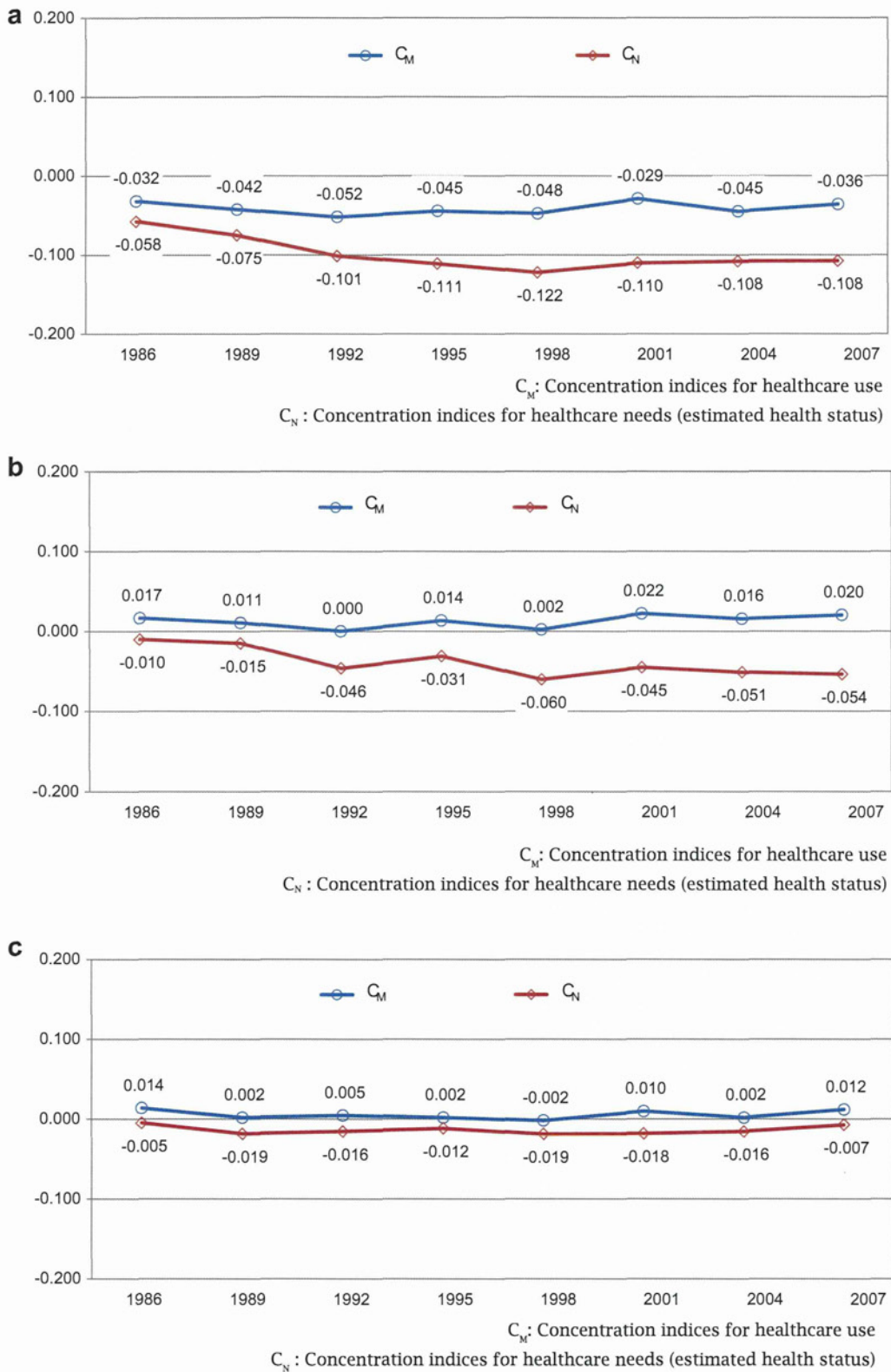


Fig. 1. Estimation of concentration indices and horizontal inequity indices of healthcare access; 1986–2007. a) age 20 and over, b) age from 20 to 64, c) age 65 and over.

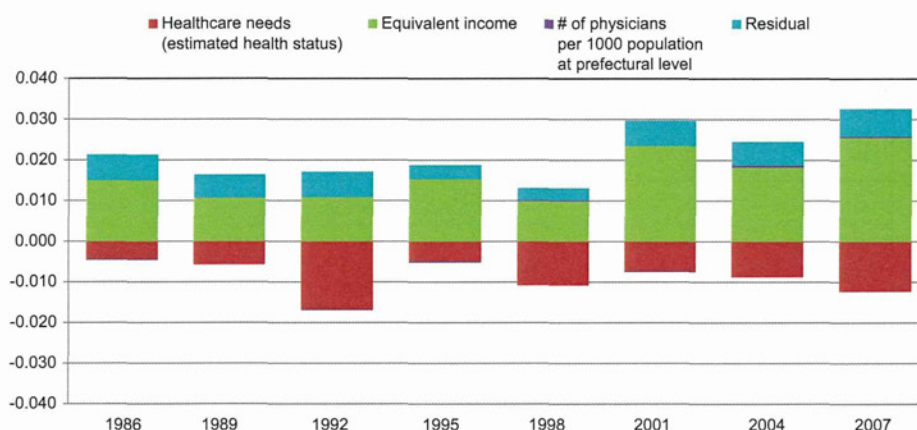


Fig. 2. Results of decomposition analysis of horizontal inequality on healthcare access; 1986–2007, age 20–64.

the improvement of horizontal equity the amendment of the copayment rate for beneficiaries in Employees' Insurance Plans in 1997 from 10% to 20%, which closed the gap between the other plans that bore a 30% copayment. We confirmed that the degree of disparity in healthcare use among people aged 20–64 years was slightly improved from 0.014 in 1995 to 0.002 in 1998, but the improvement was short-lived. Because a similar change was also observed among those aged ≥ 65 years we do not believe that the argument of Ohkusa and Honda (2003) is valid, since the elderly were mainly covered by the National Health Insurance and Elderly Insurance Plans, whose copayment rates remained the same at the time. Instead, our study revealed a growing gap in health status and the contribution of household income to healthcare utilization since the late 1990s and 2000s, suggesting that horizontal equity of healthcare access is deteriorating over time due to the widening income gap and rising out-of-pocket contributions.

Political implications

The copayment rate for people aged < 70 was unified to 30% after healthcare reforms in 2003. This reform achieved equity in the contribution through out-of-pocket payment regardless of income levels, because before the reform, lower copayment rate was applied to those with Employees' Health Insurance who tended to have higher income compared with other public plans. However, even among those with Employee's Health Insurance there was a wide gap in financial status; members with lower income were already burdened with a higher premium rate and out-of-pocket payment (Ikegami et al., 2011). Because of this regressive nature of the current social health insurance scheme, universally raising the copayment rate regardless of income levels would rather aggravate HI in healthcare access. Instead, horizontal equity will be facilitated by introducing a system of fair contribution proportional to ability to pay.

One possible solution could be the introduction of tax-based financing, although its political feasibility seems quite low in Japan because of the conflict of interests among public insurers. Another promising solution might be to standardize the premium contribution rules across plans. Currently, monthly premium contribution under Employees' Health Insurance is calculated by multiplying each worker's monthly wage by a premium rate determined by each insurer, whereas premiums of the National Health Insurance are charged by a varied mix of per capita basis and per household. As the All-Japan Federation of National Health Insurance Organizations argued, making the premium collection proportional to income and

expanding prepayment contribution rather than copayment would ease the financial burden of out-of-pocket medical expenditure among households with low-to-middle income, and may lead to improvements in horizontal equity in access (All-Japan Federation of National Health Insurance Organization, n.d.).

Limitations

This study revealed early signs of deterioration in horizontal equity in healthcare utilization even under the universal coverage of healthcare in Japan. However, there are several weaknesses and limitations of our results that require careful consideration.

First, the data source of this study was a cross-sectional survey; healthcare utilization was assessed in a period previous to the survey (e.g. in a previous month or year), whereas health status was assessed at the time of survey. Thus there was time inconsistency between the actual utilization and estimated healthcare needs. We share this limitation with previous studies that rely on cross sectional surveys (Lu et al., 2007; Ohkusa & Honda, 2003). Thus the results presented in this paper need confirmation using panel datasets in future.

Second, again due to data limitation, we could not consider the types and quality of healthcare utilization. The available data did not discriminate outpatient and inpatient services or general and specialized care. Furthermore, CSLCP does not assess the number of visits. Previous studies conducted with more detailed data in the European Household Panel Survey identified that many European countries have more pro-rich inequalities in the probability of specialist visits whereas most countries showed pro-poor inequalities in the probability and conditional number of GP visits (van Doorslaer et al., 2004). Whether the degree of HI differs across the types and quality of care is also worthy of further investigation because Japanese people currently enjoy frequent visits to physician services under unrestricted approval to access to any type of care (Organization for Economic Cooperation and Development, 2006). Detailed data on the type of healthcare consumption are required to conquer this limitation.

Our data did not allow us to evaluate Japan's refund system against catastrophic copayment, which was introduced in 1973. This system refunds to patients an allowance for the amount exceeding the liable payment according to a means test, which may contribute to the relatively high achievement in horizontal equity compared with other OECD and Asian countries. Ikegami et al. (2011) showed that the Kakwani index of out-of-pocket payment, or the inequity index of payment burden across household ability to

pay, was smaller in Japan compared with other OECD countries, which also supported the notion that the impact of catastrophic copayment was rather limited in Japan. Despite this system, our results showed unequal utilization in favor of the rich. Catastrophic copayment would be more likely to happen in inpatient service use, although our data did not discriminate outpatient and inpatient services. Because the rate of inpatient service use was far smaller than that of outpatient service use, what this study found is mainly applicable to the latter. Further investigation, specifically of the horizontal inequity in inpatient service use is required in future.

Finally, we relied on household income to obtain relative ranks of household ability to pay, although income may not be a good indicator especially among retired individuals (Allin, Masseria, & Mossialos, 2009). Household expenditure for non-food consumption is recommended as the best indicator of household ability to pay, although reliable data are currently not available in Japanese surveys of household and health status. Again, it is imperative to collect nationwide survey data on household consumption and detailed information on healthcare utilization so as to precisely assess the performance of the healthcare system in Japan.

Conclusion

Despite the above limitations, our results strongly suggest the existence of widening inequality in access to healthcare in favor of the rich in Japan since the 2000s. This was mainly caused by declining health status among poor people aged 20–64 years, and increasing attribution of household income to the propensity for healthcare utilization. Although the Japanese health insurance system has achieved a relatively high degree of horizontal equity by global standards, our results provide the lesson that universal coverage of healthcare does not necessarily guarantee access equity, and changing economic and demographic conditions affect the degree of equity. To achieve horizontal equity in healthcare access, universal insurance, although important, is yet only one element; achievement of horizontal equity through universal coverage is not a goal but an ongoing project that requires continuous redesign of contribution and benefit in Japan's health-care system.

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Health benefits of reduced patient cost sharing in Japan

Akihiro Nishi,^a J Michael McWilliams,^b Haruko Noguchi,^c Hideki Hashimoto,^d Nanako Tamiya^e & Ichiro Kawachi^a

Objective To assess the effect on out-of-pocket medical spending and physical and mental health of Japan's reduction in health-care cost sharing from 30% to 10% when people turn 70 years of age.

Methods Study data came from a 2007 nationally-representative cross-sectional survey of 10 293 adults aged 64 to 75 years. Physical health was assessed using a 16-point scale based on self-reported data on general health, mobility, self-care, activities of daily living and pain. Mental health was assessed using a 24-point scale based on the Kessler-6 instrument for nonspecific psychological distress. The effect of reduced cost sharing was estimated using a regression discontinuity design.

Findings For adults aged 70 to 75 years whose income made them ineligible for reduced cost sharing, neither out-of-pocket spending nor health outcomes differed from the values expected on the basis of the trend observed in 64- to 69-year-olds. However, for eligible adults aged 70 to 75 years, out-of-pocket spending was significantly lower ($P < 0.001$) and mental health was significantly better ($P < 0.001$) than expected. These differences emerged abruptly at the age of 70 years. Moreover, the mental health benefits were similar in individuals who were and were not using health-care services ($P = 0.502$ for interaction). The improvement in physical health after the age of 70 years in adults eligible for reduced cost-sharing tended to be greater than in non-eligible adults ($P = 0.084$).

Conclusion Reduced cost sharing was associated with lower out-of-pocket medical spending and improved mental health in older Japanese adults.

Abstracts in **عربي**, **中文**, **Français**, **Русский** and **Español** at the end of each article.

Introduction

Asking patients to share the cost of health care is a measure frequently used to reduce demand and control the health-care budget.^{1–5} Moreover, patient cost sharing can also help finance universal health-care systems by raising additional revenue.⁶ However, there is still some debate about the level of cost sharing that is best able to control costs while ensuring access to health care, preventing impoverishment from out-of-pocket spending and avoiding adverse health effects.^{7,8} Several studies have quantified the effects of health insurance coverage and cost sharing on the use of important health services, but few have investigated their influence on health outcomes.^{9–14} Most studies were conducted in the United States of America, where universal insurance coverage has not been achieved.^{9,11,12,15–20} The extent to which health outcomes are influenced by cost sharing under national health insurance programmes in other countries is unclear. In this study, we assessed how health outcomes in elderly adults were affected by a change in cost sharing under the universal national health insurance programme in Japan.

Japanese national health insurance provides universal coverage for inpatient, outpatient, dental and pharmaceutical services. There is a fixed cost-sharing rate that varies with age and a general upper limit on monthly out-of-pocket spending for all age groups.²¹ In 2007, the proportion of Japan's total national health expenditure that was publicly financed through a tax transfer and social health insurance programme was 81.9%, which ranks among the highest rates for countries in the Organisation for Economic Co-operation and Development's Asia-Pacific region.^{22,23} The remainder

is private spending by households, which comprises out-of-pocket medical spending for services that may or may not be covered (e.g. non-prescribed over-the-counter medications) by the universal programme.²²

Although the exact proportion of patient cost sharing under the public insurance scheme is fixed across services, the level varies by age and income. In particular, in 2001 the Japanese government introduced a system of two different cost-sharing rates: 30% for adults aged less than 70 years and 10% for those aged 70 years or older who had a relatively low income. The rate remained 30% for older individuals with a sufficiently high income.²⁴ We took advantage of this natural experiment to investigate the effect of the change in patient cost sharing at the age of 70 years on physical and mental health.

Methods

Study population

We obtained data from the 2007 Comprehensive Survey of People's Living Conditions – a nationally-representative, cross-sectional survey administered by the Japanese Ministry of Health, Labour and Welfare.²⁵ In total, 2000 sampling units were randomly selected from all 47 prefectures in Japan. All individuals and households in each unit were asked to complete a self-administered questionnaire in July 2007. We restricted our study population to 10 906 individuals aged between 64 and 75 years (i.e. 70 ± 6 years). We excluded individuals who were hospitalized or institutionalized ($n = 408$) and those who were eligible for free health care ($n = 205$). For the remaining 10 293, we performed multiple imputation to address potential bias

^a Department of Society, Human Development and Health, Harvard School of Public Health, 677 Huntington Avenue, Boston, Massachusetts, MA 02115, United States of America (USA).

^b Department of Health Care Policy, Harvard Medical School, Boston, USA.

^c National Institute of Population and Social Security Research, Tokyo, Japan.

^d Department of Health Economics and Epidemiology Research, University of Tokyo, Tokyo, Japan.

^e Department of Health Services Research, University of Tsukuba, Ibaraki, Japan.

Correspondence to Akihiro Nishi (e-mail: anishi@hsph.harvard.edu).

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due to missing data (e.g. data on general health status were missing for 13.3%).

Since 2001, the cost-sharing rate is normally reduced from 30% to 10% in the first month after people turn 70 years of age, provided their annual taxable income is below 12 000 United States dollars (US\$), which was equivalent to 1.45 million Japanese yen in July 2007.²⁴ Overall, 83.3% of the study population was eligible for the reduction in 2007.

Study variables

We analysed three dependent variables: out-of-pocket medical spending, physical health and mental health. Out-of-pocket spending included all expenditure on medical services in the month preceding the survey. We used a 16-point summary physical health measure developed for the Comprehensive Survey of People's Living Conditions.^{26,27} A summary physical health score was derived for each individual from answers to questions on general health status, mobility, self-care and activities of daily living, and pain, as described in a footnote to Table 1. Mental health status was assessed using a Japanese version of the Kessler-6 24-point scale, which has been validated as a strong predictor of mental disorders, excluding substance use disorder, that can be identified using the Structured Clinical Interview of the *Diagnostic and statistical manual of mental disorders, fourth edition* and that have a Global Assessment of Functioning score less than 60.^{28–31} We reversed the original Kessler-6 scale such that 24 was the best score and 0, the worst.

For modelling purposes, we created a dichotomous indicator, designated *age ≥ 70dummy*: the indicator equalled 1 if the participant was 70 years of age or older and 0 otherwise. A second dichotomous indicator, designated *income eligibility*, equalled 1 if the participant was eligible for the lower cost-sharing rate because of his or her taxable income, and 0 otherwise.

To adjust for potential confounders, we considered the following covariates in the regression models: gender, marital status, household size, occupational status, house ownership and the size of the settlement where the individual lived. In addition, we carried out separate analyses for participants who did and those who did not report health-care use under the public insurance programme at the time of the survey for at least one chronic illness that had been diagnosed at a clinic or hospital.

Statistical analysis

The effect of the reduction in the cost-sharing rate at the age of 70 years on out-of-pocket medical spending, physical health and mental health was quantified by estimating the discontinuity in the age trend of these outcomes using a regression discontinuity design.^{17,32} We assumed that out-of-pocket spending and physical and mental health scores would vary smoothly with age in the absence of the rate reduction and attributed any abrupt deviation in the age trend at the age of 70 years to that reduction. Deviations were quantified, first, by estimating the difference between the value of a variable for individuals aged 69 years and 11 months and the value for those in the first month of their 70th year and, second, by determining how much of that difference could not be explained by the trend observed from the age range of 64 to 69 years to the age range of 70 to 74 years.

We fitted the following unadjusted linear model for the three study outcomes:

$$E(Y) = \beta_0 + \beta_1(\text{age}) + \beta_2(\text{age})^2 + \beta_3(\text{age} \geq 70\text{dummy}) \quad (1)$$

where $E(Y)$ is the expected value of the dependent variable, *age* is given in years and *age ≥ 70dummy* is as described above. Thus, β_3 provides a measure of the discontinuity in $E(Y)$ around the age of 70 years and can be interpreted as the effect of the cost-sharing rate reduction. To determine whether the effect observed varied by eligibility for the rate reduction, we fitted separate models for non-eligible and eligible adults.

In secondary analyses, we fitted joint models with interaction terms that compared discontinuities between non-eligible and eligible adults and derived differential discontinuities for eligible adults. These differential discontinuities provided more robust estimates of the effects of cost sharing by controlling for changes in the health of non-eligible adults between the ages of 69 and 70 years. However, our study sample had limited statistical power for estimating these differential effects. In addition, to determine how health-care needs affected outcomes in eligible adults, we fitted separate and joint models for eligible adults who were or were

not receiving health care at the time of the survey.

To check a key assumption of the regression discontinuity design, we confirmed that important characteristics of the study participants did not change around the age of 70 years.^{17,32} Specifically, we used the models described above to look for age discontinuities in sociodemographic factors among eligible adults, such as gender, marital status, household size, occupational status, house ownership, taxable income and the size of the settlement where the individual lived. All *P*-values for these factors were found to be greater than 0.25, which confirms that the characteristics did not abruptly change at the age of 70 years.

Furthermore, we adjusted the above models for these sociodemographic characteristics and used multiple imputation to address bias that could have been introduced by missing data on outcome variables and covariates, as explained in a footnote to Table 2.³³ Therefore, our main results were adjusted for sociodemographic characteristics and multiple imputation.

To understand the clinical significance of the average change in mental health status associated with reduced cost sharing, we used logistic regression to estimate the associated change in the prevalence of mild mental illness. We used a validated threshold for the diagnosis of mental illness (i.e. any mood or anxiety disorder in the *Diagnostic and statistical manual of mental disorders, fourth edition*) in Japan: a score of 19 or less on our reversed Kessler-6 scale.³⁰

We carried out several sensitivity analyses. First, we progressively narrowed the age cohort to individuals aged between 67 and 72 years and then to those between 69 and 70 years. Second, we estimated discontinuities across 11 different dichotomous indicators for age thresholds ranging from 65 to 75 years. We used generalized estimating equations to account for correlated observations within households when estimating standard errors and conducting two-sided tests.^{34,35} Analyses were performed using Stata version 12.0 (StataCorp. LP, College Station, USA) and R version 2.13.0 (R Foundation for Statistical Computing, Vienna, Austria).

Results

Significant differences in sociodemographic characteristics and health-care

Table 1. Demographic characteristics, medical spending and health status of older adults, 2007 Comprehensive Survey of People's Living Conditions, Japan

Characteristic	Eligible ^a for reduced cost sharing at 70 years of age			Not eligible ^a for reduced cost sharing at 70 years of age		
	Aged 64–69 n = 3 837 ^c	Aged 70–75 n = 3 769 ^c	P ^b	Aged 64–69 n = 966 ^c	Aged 70–75 n = 554 ^c	P ^b
Gender			0.147			0.349
Male, %	40.9	42.6		85.5	83.6	
Female, %	59.1	57.4		14.5	16.4	
Marital status			<0.001			0.005
Married, %	80.7	74.9		89.1	85.0	
Unmarried, %	2.9	2.2		1.9	3.1	
Widowed, %	11.9	19.3		6.0	10.1	
Divorced, %	4.4	3.6		3.0	1.8	
Household size			0.608			0.055
Mean, no. of persons	2.72	2.73		2.72	2.59	
Standard error, no. of persons	0.023	0.026		0.042	0.059	
Occupational status			<0.001			<0.001
Not working, %	12.9	74.5		35.6	59.0	
Working, %	86.3	25.5		64.4	41.0	
House ownership			0.039			0.379
No, %	13.7	12.1		5.9	4.7	
Yes, %	86.3	87.9		94.1	95.3	
Settlement size^d			0.004			0.919
Metropolitan area, %	15.9	14.1		19.6	21.1	
Large city (population: > 150 000), %	26.8	25.6		30.4	31.2	
Medium city (population: 50 000–150 000), %	27.9	28.3		27.2	26.4	
Small city (population: < 50 000), %	14.7	14.4		10.2	9.6	
Town or village, %	14.6	17.5		12.5	11.7	
Reported health-care use^e			<0.001			<0.001
No, %	39.2	28.6		39.1	27.8	
Yes, %	60.8	71.4		60.9	72.2	
Out-of-pocket medical spending^f			<0.001			0.259
Mean, US\$	47.6	35.7		49.7	44.8	
Standard error, US\$	1.41	1.15		2.66	3.48	
Physical health^g			<0.001			<0.001
Mean score	13.4	13.0		13.8	13.3	
Standard error	0.044	0.053		0.063	0.106	
Mental health^h			0.397			0.300
Mean score	20.9	21.0		21.6	21.8	
Standard error	0.077	0.083		0.117	0.147	

^a The cost-sharing rate decreased from 30% to 10% at the age of 70 years for individuals who had an annual taxable income under 12 000 United States dollars (US\$).

^b χ^2 tests were used to compare distributions of categorical variables and *t* tests were used for continuous variables.

^c Because values were missing for some variables, the sample sizes for each two-by-two table were smaller than these numbers. Moreover, the total number of individuals was 9126, which is smaller than the number of the study participants (*n* = 10 293) because data on income eligibility were missing.

^d The size of the settlement where the individual lived at the time of the Comprehensive Survey of People's Living Conditions.

^e Health-care use reported at the time of the Comprehensive Survey of People's Living Conditions.

^f Spending in Japanese yen was converted into US\$ using the rate that applied in July 2007 of approximately 120 Japanese yen per US\$.

^g Physical health status was evaluated on a scale of 0 to 16 points and was calculated from the sum of four questionnaire health measures: (i) general health status was assessed by asking, "How is your current health status?" (4 if excellent, 3 if very good, 2 if good, 1 if fair and 0 if poor); (ii) mobility was assessed by asking, "How many days have you been in bed (i.e. bed-ridden) because of health-related problems in the previous one month?" (4 if never, 3 if 1 to 3 days, 2 if 4 to 6 days, 1 if 7 to 14 days and 0 if 15 days or more); (iii) self-care and activities of daily living were assessed by asking, "Do you have difficulty with any of the following four areas in your daily life due to your physical health?: daily movements (e.g. getting up, wearing clothes, eating and bathing); staying outdoors; work, housework or studying; and, exercise or sport" (4 if no difficulties, 3 if difficulty in one area, 2 if difficulty in two areas, 1 if difficulty in three areas and 0 if difficulty in all four areas); (iv) pain was assessed by asking, "Do you have pain in the head, stomach, back or extremities?" (4 if no pain, 3 if pain in one location, 2 if pain in two locations, 1 if pain in three locations and 0 if pain in all four locations).

^h Mental health status was evaluated on a scale of 0 to 24 points using a reversed version of Japanese Kessler-6 scale, such that 24 was best.

Table 2. Effect of reduced cost sharing at age 70 years^a on out-of-pocket medical spending and physical and mental health,^b Japan, 2007

Characteristic	n ^c	Unadjusted model ^d			Adjusted model ^e			Multiple imputation model ^f			Joint model with interaction after imputation ^g		
		β_3	SE	P	β_3	SE	P	β_3	SE	P	δ_6	SE	P
Out-of-pocket medical spending	n	US\$ per month^h	US\$ per month^h		US\$ per month^h	US\$ per month^h		US\$ per month^h	US\$ per month^h		US\$ per month^h	US\$ per month^h	
Non-eligible ^a adults	1790	-3.54	8.48	0.676	-4.10	8.69	0.637	-3.16	8.08	0.696			
Eligible adults ^a	8503	-24.93	3.61	<0.001	-24.92	3.94	<0.001	-25.25	3.59	<0.001	-21.79	8.79	0.014
Eligible adults ^a with no reported health-care use ⁱ	2968	-3.40	4.19	0.417	-3.73	4.27	0.382	-4.19	4.58	0.361		6.43	
Eligible adults ^a with reported health-care use ⁱ	5535	-32.72	5.29	<0.001	-32.76	5.37	<0.001	-32.44	4.61	<0.001	-27.68		<0.001
Physical health^j	n	Score	Score		Score	Score		Score	Score		Score	Score	
Non-eligible ^a adults	1790	-0.31	0.24	0.202	-0.24	0.24	0.326	-0.17	0.15	0.247			
Eligible adults ^a	8503	0.12	0.13	0.381	0.08	0.13	0.106	0.10	0.07	0.143	0.27	0.16	0.084
Eligible adults ^a with no reported health-care use ⁱ	2968	0.19	0.14	0.173	0.19	0.15	0.202	0.14	0.09	0.115			
Eligible adults ^a with reported health-care use ⁱ	5535	-0.02	0.17	0.892	-0.04	0.18	0.799	0.02	0.09	0.857	-0.11	0.13	0.419
Mental health^k	n	Score	Score		Score	Score		Score	Score		Score	Score	
Non-eligible ^a adults	1790	-0.05	0.39	0.888	0.06	0.39	0.873	0.03	0.38	0.932			
Eligible adults ^a	8503	0.58	0.20	0.004	0.56	0.20	0.007	0.66	0.18	<0.001	0.70	0.41	0.086
Eligible adults ^a with no reported health-care use ⁱ	2968	0.63	0.32	0.048	0.64	0.32	0.045	0.79	0.32	0.017			
Eligible adults ^a with reported health-care use ⁱ	5535	0.43	0.27	0.111	0.39	0.28	0.156	0.50	0.23	0.032	-0.29	0.42	0.502

SE, standard error; US\$, United States dollars.

^a The cost-sharing rate decreased from 30% to 10% at the age of 70 years for individuals who had an annual taxable income under 12 000 United States dollars (US\$).

^b The effect of reduced cost sharing was evaluated using a regression discontinuity design and a generalized estimating equation method.

^c The sample sizes include individuals with missing values, all of whom were included in the imputation model.

^d We calculated β coefficients for the model: $E(Y) = \beta_0 + \beta_1(\text{age}) + \beta_2(\text{age})^2 + \beta_3(\text{age} \geq 70 \text{ dummy})$, where $E(Y)$ is the expected value of the dependent variable, namely out-of-pocket medical spending, physical health or mental health, age is given in years and $\text{age} \geq 70 \text{ dummy}$ is a dichotomous indicator that equalled 1 if the participant was 70 years or older and 0 otherwise. No other control variables were used in the unadjusted model.

^e The adjusted model included the control variables: gender, marital status, household size, occupational status, house ownership and the size of the settlement where the individual lived at the time of the Comprehensive Survey of People's Living Conditions. Income was not included as it was used to determine whether an individual was eligible for reduced cost sharing. However, including income in the models did not substantially change the results.

^f For multiple imputation, we used all the variables described in the methods section and an importance-resampling expectation-maximization algorithm with the assumption that values were missing at random. Five data sets generated from the multiple imputation were mobilized and pooled for point estimation. The same control variables included in the adjusted model were used in the multiple imputation and subsequent regression analyses. Since missing values were estimated and filled in, the standard errors in the imputation model should be smaller than those in unadjusted or adjusted model.

^g We calculated δ coefficients for the model: $E(Y) = \delta_1(\text{age}) + \delta_2(\text{age})^2 + \delta_3(\text{age} \geq 70 \text{ dummy}) + \delta_4(\text{age}) \times (\text{income eligibility or reported health-care use}) + \delta_5(\text{age})^2 \times (\text{income eligibility or reported health-care use}) + \delta_6(\text{age} \geq 70 \text{ dummy}) \times (\text{income eligibility or reported health-care use}) + \sum \delta(\text{control variables})$, where $E(Y)$ is the expected value of the dependent variable, namely out-of-pocket medical spending, physical health or mental health, age is given in years and $\text{age} \geq 70 \text{ dummy}$ is a dichotomous indicator that equalled 1 if the participant was 70 years or older and 0 otherwise. Coefficients were calculated between adults who were or were not eligible for reduced cost sharing and between eligible adults who did or did not report health-care use at the time of the survey. The main effect was measured by δ_6 .

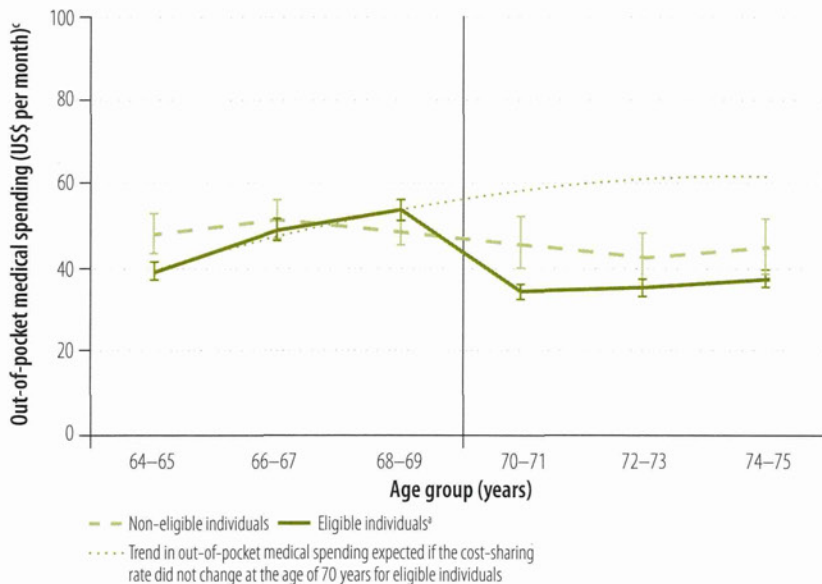
^h Spending in Japanese yen was converted into US\$ using the rate that applied in July 2007 of approximately 120 Japanese yen per US\$.

ⁱ Health-care use reported at the time of the Comprehensive Survey of People's Living Conditions.

^j Physical health status was evaluated on a scale of 0 to 16 points and was calculated as described in a footnote to Table 1.

^k Mental health status was evaluated on a scale of 0 to 24 points using a reversed version of Japanese Kessler-6 scale, such that 24 was best.

Fig. 1. Effect of reduced cost sharing at age 70 years^a on out-of-pocket medical spending,^b Japan, 2007



US\$, United States dollars.

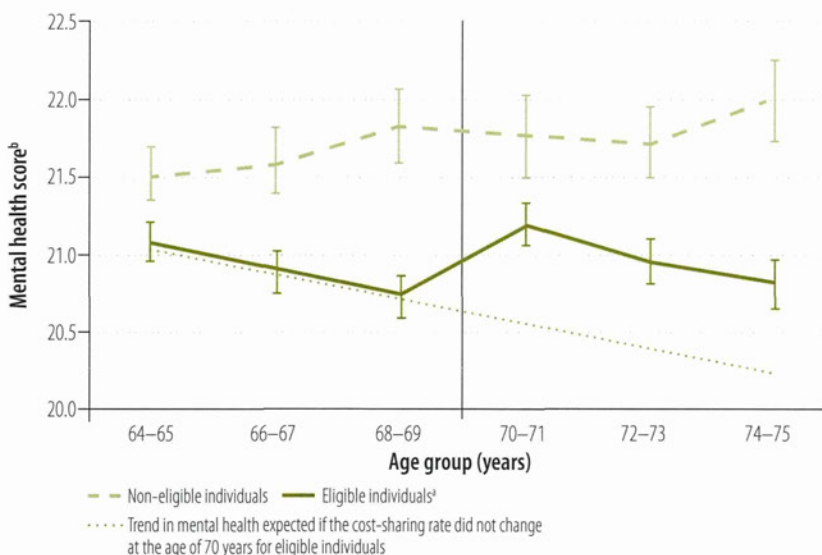
The vertical bars represent standard errors.

^a The cost-sharing rate decreased from 30% to 10% at the age of 70 years for eligible individuals, who had an annual taxable income under 12 000 United States dollars (US\$).

^b Out-of-pocket medical spending includes expenditure both on items covered by public health-care insurance and items that are not covered, such as over-the-counter medicines.

^c Spending in Japanese yen was converted into US\$ using the rate that applied in July 2007 of approximately 120 Japanese yen per US\$.

Fig. 3. Effect of reduced cost sharing at age 70 years^a on mental health,^b Japan, 2007



The vertical bars represent standard errors.

^a The cost-sharing rate decreased from 30% to 10% at the age of 70 years for eligible individuals, who had an annual taxable income under 12 000 United States dollars (US\$).

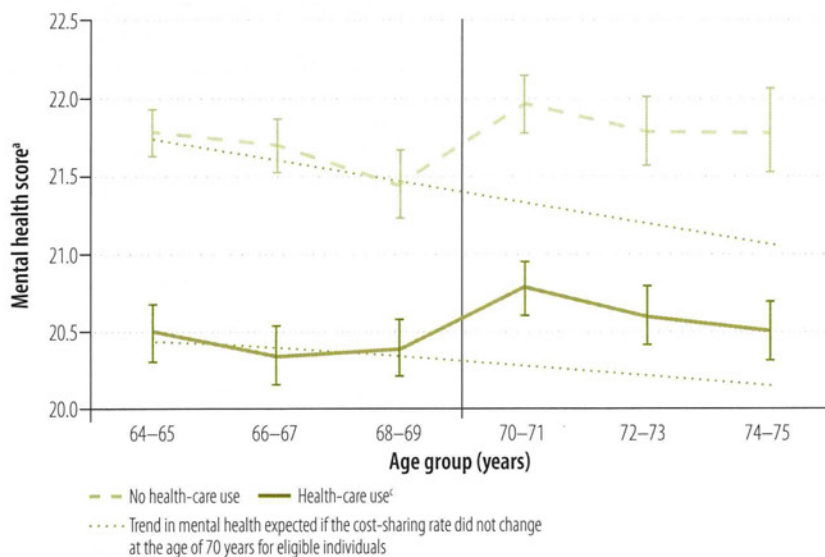
^b Mental health was evaluated on a scale of 0 to 24 points using a reversed version of Japanese Kessler-6 scale, such that 24 was best.

needs were found between participants aged from 64 to 69 years and those aged from 70 to 75 years (Table 1). Table 2 shows that adjustment for sociodemographic covariates and multiple imputation to address bias due to missing data did not substantially alter the results of the analysis. Although out-of-pocket medical spending by adults who were not eligible for lower cost sharing did not change significantly at the age of 70 years ($\beta_3 = -3.16$ US\$/month; $P = 0.696$; Table 2, multiple imputation model), spending by eligible adults decreased significantly and abruptly ($\beta_3 = -25.25$ US\$/month; $P < 0.001$), as shown in Fig. 1. There was no significant discontinuity in physical health score at the age of 70 years in either group (Fig. 2, available at: <http://www.who.int/bulletin/volumes/90/6/11-095380>, and Table 2). However, the differential discontinuity in physical health score for eligible adults ($\delta_6 = +0.27$; $P = 0.084$, joint model with interaction after imputation) showed a relative improvement that approached statistical significance (Table 2). On the other hand, there was a significant improvement in mental health status in the eligible group at the age of 70 years ($\beta_3 = 0.66$; $P < 0.001$; Table 2, multiple imputation model) but not in the non-eligible group ($\beta_3 = 0.03$; $P = 0.932$), as shown in Fig. 3. This improvement was significant even among participants who reported no health-care use at the time of the survey ($\beta_3 = 0.79$; $P = 0.017$), as shown in Fig. 4.

When eligible participants were divided into two subgroups with different health-care needs, the decrease in out-of-pocket spending at the age of 70 years was found to be greater among adults who reported health-care use at the time of the survey than in those who did not ($P < 0.001$ for interaction, Table 2), as shown in Fig. 5. In contrast, the effect of reduced cost sharing on mental health status was similar in the two subgroups ($P = 0.502$ for interaction), as was the effect on physical health status ($P = 0.419$ for interaction), as shown in Fig. 6 (available at: <http://www.who.int/bulletin/volumes/90/6/11-095380>).

Logistic regression analysis showed that the prevalence of mild mental illness decreased significantly at the age of 70 years among eligible participants (odds ratio, OR: 0.718; $P = 0.009$), but

Fig. 4. Effect of reduced cost sharing at age 70 years on the mental health^a of eligible individuals^b using and not using health-care,^c Japan, 2007



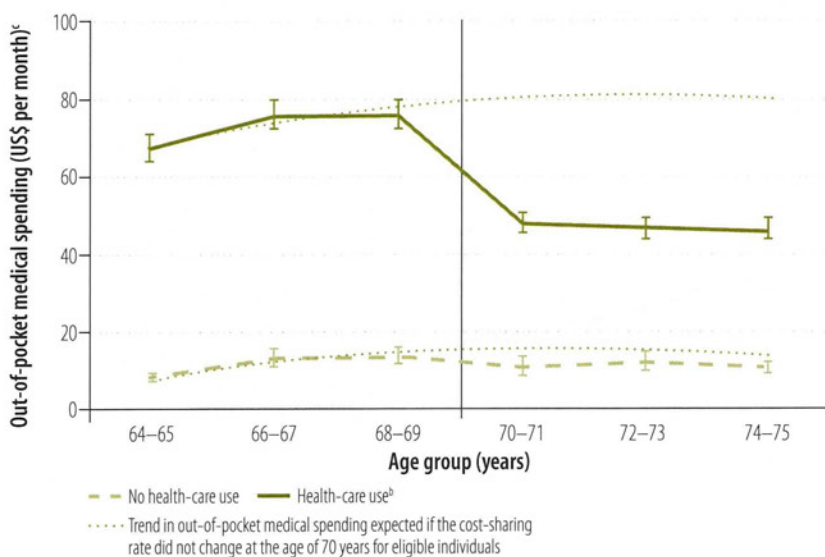
The vertical bars represent standard errors.

^a Mental health was evaluated on a scale of 0 to 24 points using a reversed version of Japanese Kessler-6 scale, such that 24 was best.

^b The cost-sharing rate decreased from 30% to 10% at the age of 70 years for eligible individuals, who had an annual taxable income under 12 000 United States dollars (US\$).

^c Health-care use reported at the time of the 2007 Comprehensive Survey of People's Living Conditions.

Fig. 5. Effect of reduced cost sharing at age 70 years on out-of-pocket medical spending of eligible individuals^a using and not using health-care,^b Japan, 2007



US\$, United States dollars.

The vertical bars represent standard errors.

^a The cost-sharing rate decreased from 30% to 10% at the age of 70 years for eligible individuals, who had an annual taxable income under 12 000 United States dollars (US\$).

^b Health-care use reported at the time of the 2007 Comprehensive Survey of People's Living Conditions.

^c Spending in Japanese yen was converted into US\$ using the rate that applied in July 2007 of approximately 120 Japanese yen per US\$.

not among non-eligible participants (OR: 0.984; $P=0.960$). When we incrementally narrowed the age range of participants included in the analysis from the initial 64 to 75 years, the estimated effect of reduced cost sharing on mental health became progressively larger: β_3 was 0.66 ($P < 0.001$) for the age range 64 to 75 years, 0.69 ($P=0.022$) for the range from 67 to 72 years and 1.19 ($P=0.047$) for the range from 69 to 70 years. Finally, of the 11 dichotomous indicators for the different age thresholds investigated, only that for a threshold of 70 years was associated with a significant discontinuity in mental health scores.

Discussion

In this nationally representative study, we found that a reduction in health-care cost sharing from 30% to 10% at the age of 70 years was associated with a significant decrease in out-of-pocket medical spending and a significant improvement in mental health in Japanese adults. There was also a relative improvement in physical health in those eligible for the reduction by comparison with those who were not eligible, but it was not significant. Nevertheless, the relative improvement in physical health was similar to that observed in a larger longitudinal study,¹⁸ which suggests that our study was not adequately powered to detect this effect. Furthermore, the sharp regression discontinuity design captured only the immediate effect of the cost sharing reduction and may have missed improvements that become manifest over time.

Our findings are largely consistent with previous studies of the effect that providing Medicare coverage in the United States after the age of 65 years has on health-care utilization and health outcomes: coverage was associated with an abrupt increase in health-care utilization and improvements in physical and mental health, mortality and disparities in disease control.^{9,14-19} In addition, higher cost sharing among insured adults has been linked to less use of clinical services and adverse effects on health outcomes.^{8,9,14-20,36}

Our findings on out-of-pocket medical spending are consistent with the results of the RAND Health Insurance Experiment,¹² which reported

that reduced cost sharing substantially increased both total health-care utilization and total health-care spending. Although we could not measure total health-care spending directly, we were able to estimate it in the following way. Data from a separate nationally representative survey indicate that out-of-pocket spending on services included in Japan's universal insurance coverage programme constitutes 70% of all out-of-pocket medical spending by elderly Japanese adults whose health care is covered by the programme, while spending on services that are not covered (e.g. over-the-counter medications) accounts for the remaining 30%.³⁷ If total health-care spending is unchanged by reduced cost sharing, out-of-pocket spending by eligible adults should decrease to one third (i.e. from 30% to 10%). However, the observed value of out-of-pocket medical spending by eligible adults aged between 70 and 71 years was 29% higher than expected, which suggests that both total health-care spending and utilization had increased substantially and that this may have influenced mental and physical health.

The mental health gains we observed suggest that reduced cost sharing helped alleviate depression and anxiety, which are known to be the largest contributors to disability globally.³⁸ Surprisingly, the improvement in mental health was even observed in individuals who were not using health-care services, which suggests that reduced cost sharing may have affected mental health in several ways. Individuals may have benefited from increased use of health-care services or from the greater sense of security provided by more affordable insurance coverage.

Policy implications

One topic for debate is whether, from a societal or governmental perspective, the gain in mental health linked to reduced cost sharing is worth the associated increase in health-care spending.^{39–41} Fostering a sense of security is one of the core functions of universal health insurance coverage and our findings suggest that the Japanese government

has ameliorated the burden of mental illness among the elderly by reducing their cost-sharing rate.^{3,42,43} However, because of fiscal constraints, in April 2008 the Japanese government decided to raise the cost-sharing rate from 10% to 20% after the age of 70 years, perhaps in 2012 or 2013.^{24,44} This decision is likely to become a major issue in the next national election. Closer follow-up of the effect of this policy change on population health and medical expenditure would provide the information policy-makers in medium- to high-income countries need to design a system of universal health insurance coverage that incorporates the optimum cost-sharing rate for elderly populations.

Limitations

A lack of survey data on chronic conditions prevented us from being able to identify individuals with treatable chronic conditions, such as cardiovascular disease and diabetes, whose health status may have been particularly affected by reduced cost sharing.^{14,15,18}

In addition, because our study used a cross-sectional rather than a longitudinal design, the results may have been affected by selection bias. For example, in general, individuals who were not using health care between the ages of 64 and 69 years were more likely to use health care after the age of 70 years following the cost sharing reduction.¹² However, those who did not start using health care after the age of 70 years were likely to be healthier than those who did. The effect would be an abrupt change in the composition of cross-sectional comparison group samples, which would probably lead to an underestimate of the mental and physical health benefits for the group using health care and an overestimate of the benefits for those not using health care. Thus, although strong conclusions can be drawn from our analysis about changes in mental health for the entire study sample, the results obtained by stratifying participants by use of health care should be interpreted with caution.

Finally, the fact that our study did not have a randomized experimental

design makes it impossible to infer a cause and effect relationship when interpreting the findings. In particular, because eligibility for the cost-sharing reduction was determined by income, it was not possible to match the income distribution in eligible and non-eligible groups. Nevertheless, we used a strong regression discontinuity design to control for all observed and unobserved characteristics that trended smoothly with age in our study sample.^{32,45,46} Furthermore, our analysis included difference-in-difference comparisons that adjusted the effect of cost sharing on eligible adults for changes in physical and mental health observed in the non-eligible, or control, group.

In summary, a reduction in health-care cost sharing at the age of 70 years was associated with lower out-of-pocket medical spending and improved mental health in Japanese adults. This finding suggests that governments in medium- and high-income countries with universal health insurance coverage can reduce the burden of depression and anxiety by modifying cost sharing. The proposed increase in patient cost sharing currently under consideration by the Japanese government deserves close scrutiny because it may have an adverse effect on the mental, and possibly physical, health of older adults. ■

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Competing interests: None declared.

ملخص

الفوائد الصحية لخفض تقاسم التكاليف من جانب المرضى في اليابان

عن القيم المتوقعة على أساس الاتجاه الذي لوحظ في الأعمار التي تتراوح من 64 إلى 69 عامًا. إلا أنه بالنسبة للبالغين المؤهلين ممن تتراوح أعمارهم من 70 إلى 75 عامًا، كان الإنفاق من الأموال الخاصة أكثر انخفاضًا بشكل كبير (الاحتمالية < 0.001) وكانت الصحة النفسية أفضل بشكل كبير (الاحتمالية < 0.001) عن المتوقع. علاوة على ذلك، تشابهت فوائد الصحة النفسية لدى الأفراد الذين كانوا يستخدمون ولا يستخدمون خدمات الرعاية الصحية (الاحتمالية = 0.502 للتفاعل). ومال التحسن في الصحة البدنية بعد عمر 70 عامًا لدى البالغين المؤهلين لانخفاض تقاسم التكاليف إلى الزيادة عنه لدى البالغين غير المؤهلين (الاحتمالية = 0.084).

الاستنتاج ارتبط انخفاض تقاسم التكاليف بانخفاض الإنفاق الطبي من الأموال الخاصة وتحسين الصحة النفسية لدى البالغين اليابانيين الأكبر سنًا.

الغرض تقييم التأثير على الإنفاق الطبي من الأموال الخاصة والصحة البدنية والنفسية الناتج عن خفض اليابان لتقاسم تكاليف الرعاية الصحية من 30٪ إلى 10٪ عند بلوغ سن الفرد 70 عامًا. الطريقة تم استقاء بيانات الدراسة من استقصاء متعدد القطاعات ممثل للواقع على الصعيد الوطني تم إجراؤه في عام 2007 على عينة من 10293 بالغًا تتراوح أعمارهم من 64 إلى 75 عامًا. وخضعت الصحة البدنية للتقييم باستخدام مقياس من 16 نقطة استنادًا إلى البيانات التي يفصح عنها الأشخاص والمعنية بالصحة العمومية والتنقل والرعاية الذاتية وأنشطة المعيشة اليومية والألم. كما خضعت الصحة النفسية للتقييم باستخدام مقياس من 24 نقطة استنادًا إلى أداة كسلر-6 - للضائقة النفسية غير المحددة. وتم تقييم تأثير خفض تقاسم التكاليف باستخدام تصميم انقطاع الارتداد. النتائج بالنسبة للبالغين الذين تتراوح أعمارهم من 70 إلى 75 عامًا الذين يحصلون على دخل يجعلهم غير مؤهلين لخفض تقاسم التكاليف، لم يختلف الإنفاق من الأموال الخاصة أو النتائج الصحية

摘要

日本降低病人费用分担的健康益处

目的 评估日本将达到70岁的人的医疗保健费用分担从30%减至10%对现款医疗费用和身体及心理健康的影响。

方法 研究数据来自2007年对10293位64至75岁的成年人的全国代表性横断面调查。基于有关一般健康、活动性、自理、日常生活活动和病痛的自报数据，采用16分制评估身体健康状况。基于非特异性心理困扰的Kessler-6仪器，采用24分制评估心理健康状况。使用回归间断设计估计降低费用分担的影响。

结果 对于其收入水平使其无资格享受降低费用分担政策且年龄在70至75岁的成年人，无论是现款费用还是健

康状况都不同于在基于64-69岁的人群中观察到的趋势期望值。然而，对于享有资格的70至75岁的成年人，现款费用显著低于预期 ($P < 0.001$)，心理健康状况显著好于预期 ($P < 0.001$)。这些差异突现在70岁的人群中。此外，在使用和不使用医疗保健服务的个人当中，心理健康状态的益处相似 (交互作用 $P = 0.502$)。有资格享受降低费用共享政策的70岁之后的成年人的身体健康的改善程度有大于无资格的成年人的趋势 ($P = 0.084$)。结论 降低费用分担与更少的现款医疗费用和更好的日本老年人的心理健康存在关联。

Résumé

Avantages sanitaires de la réduction du partage des coûts au Japon

Objectif Évaluer l'incidence sur les dépenses médicales personnelles et la santé physique et mentale de la réduction de 30% à 10% du partage des coûts de soins de santé lorsque les individus atteignent 70 ans.

Méthodes Les données de l'étude proviennent d'une enquête nationale transversale, effectuée en 2007, sur 10 293 adultes âgés de 64 à 75 ans. Leur santé physique a été évaluée au moyen d'une échelle de 16 points, basée sur des données autodéclarées de santé générale, de mobilité, de soins auto-administrés, d'activités de la vie quotidienne et de douleur. Leur santé mentale a été évaluée au moyen d'une échelle de 24 points sur la base de l'instrument Kessler-6 de détresse psychologique non spécifique. L'effet de la réduction du partage des coûts a été estimé en utilisant une approche de discontinuité de la régression.

Résultats Pour les individus âgés de 70 à 75 ans inéligibles, en raison de leurs revenus, à une réduction du partage des coûts, ni les dépenses de santé personnelles ni les résultats sanitaires ne différaient des valeurs attendues, sur la base de la tendance observée chez les 64 à 69 ans.

Toutefois, pour les individus âgés de 70 à 75 ans ayant droit à cette réduction, les dépenses personnelles étaient significativement plus faibles ($P < 0,001$) et leur santé mentale significativement meilleure ($P < 0,001$) que prévu. Ces différences sont apparues brutalement à l'âge de 70 ans. En outre, les avantages en termes de santé mentale étaient similaires chez les individus recourant ou non aux services de santé ($P = 0,502$ pour l'interaction). L'amélioration de la santé physique après l'âge de 70 ans chez les adultes éligibles à une réduction du partage des coûts avait tendance à être supérieure à celle des adultes inéligibles ($P = 0,084$).

Conclusion La réduction du partage des coûts était associée à une baisse des dépenses médicales personnelles et à une amélioration de la santé mentale des personnes âgées japonaises.

Резюме

Повышение эффективности здравоохранения при сокращении участия пациентов в покрытии затрат в Японии

Цель Оценить, как сокращение участия пациентов, достигших 70-летнего возраста, в покрытии затрат на медицинское обслуживание в Японии с 30% до 10% влияет на суммы, выплачиваемые за медицинские услуги, а также на физическое и психическое здоровье.

Методы Данные для исследования получены из проведенного в 2007 г. национально-репрезентативного перекрестного анкетирования 10293 взрослых пациентов в возрасте от 64 до 75 лет. Состояние физического здоровья оценивалось при помощи теста из 16 пунктов на основании данных, предоставленных участниками, о состоянии здоровья в целом, подвижности, уходе за собой, ежедневной деятельности и болевых ощущениях. Состояние психического здоровья определялось с помощью теста из 24 пунктов, основанного на методе оценки неспецифических психических расстройств Kessler-6. Влияние сокращения участия пациентов в покрытии затрат оценивалось с использованием модели разрывной регрессии.

Результаты Для взрослых пациентов в возрасте от 70 до 75 лет, чей доход лишил их права на сокращение участия в покрытии

затрат, ни оплачиваемые пациентами расходы, ни состояние их здоровья не отличались от значений, полученных на основании тенденций, которые наблюдалась у 64-69-летних. Однако для имеющих такое право взрослых пациентов в возрасте от 70 до 75 лет оплачиваемые пациентами расходы на медицинское обслуживание были значительно ниже ($P < 0,001$), а психическое здоровье значительно лучше ($P < 0,001$) ожидаемых. Данные различия начинали резко проявляться в возрасте 70 лет. Более того, польза для психического здоровья пользовавшихся и не пользовавшихся медицинским обслуживанием лиц была сходной ($P = 0,502$ для взаимосвязи). Улучшение физического здоровья у взрослых старше 70 лет, имеющих право на сокращение участия в покрытии затрат, было более заметным чем у тех, кто такого права не имел ($P = 0,084$).

Вывод Сокращение участия в покрытии затрат продемонстрировало уменьшение оплачиваемых пациентом расходов на медицинское обслуживание, а также лучшее психическое здоровье у японцев пожилого возраста.

Resumen

Beneficios sanitarios de la participación reducida en los gastos en Japón

Objetivo Evaluar el efecto de la reducción del 30% al 10% de la participación en los gastos de asistencia sanitaria sobre los gastos médicos directos y la salud física y mental en personas mayores de 70 años en Japón.

Métodos Los datos de estudio se obtuvieron de una encuesta transversal representativa realizada a nivel nacional entre 10.293 adultos con edades comprendidas entre los 64 y los 75 años. La salud física se evaluó por medio de una escala de 16 puntos en función de los datos dados por los encuestados sobre salud general, movilidad, cuidados personales, actividades de la vida diaria y dolor. La salud mental se evaluó por medio de una escala de 24 puntos en función del instrumento Kessler-6 para la angustia psicológica no específica. El efecto de la participación reducida en los gastos se calculó utilizando un diseño de regresiones en discontinuidad.

Resultados Entre los adultos con edades comprendidas entre los 70 y 75 años, cuyos ingresos no les permitían ser seleccionados para la participación reducida en los gastos, ni los gastos directos ni los costes

sanitarios difirieron de los valores esperados en función de la tendencia observada entre los adultos con edades comprendidas entre los 64 y los 69 años. No obstante, los gastos directos fueron significativamente inferiores ($P < 0,001$) y la salud mental fue significativamente mejor ($P < 0,001$) de lo esperado entre los adultos elegibles con edades comprendidas entre los 70 y los 75 años. Estas diferencias surgieron de manera repentina a la edad de 70 años. Además, los beneficios sobre la salud mental fueron similares tanto en individuos que utilizaban los servicios de asistencia sanitaria como en aquellos que no lo hacían ($P = 0,502$ de interacción). La mejora en la salud física a partir de los 70 años en adultos elegibles para la participación reducida en los gastos mostró una tendencia superior que en los adultos no elegibles ($P = 0,084$).

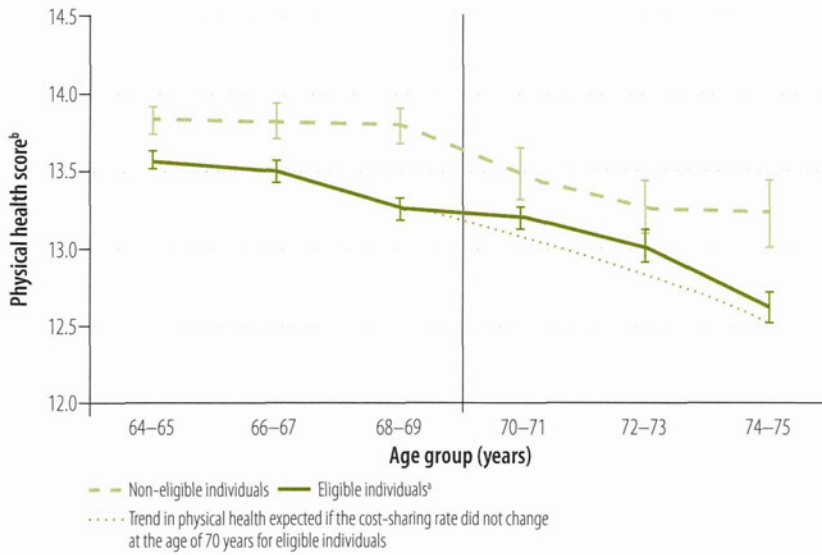
Conclusión La participación reducida en los gastos se asoció con la reducción de los gastos médicos directos y mejoró la salud mental de los adultos japoneses de mayor edad.

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Fig. 2. Effect of reduced cost sharing at age 70 years^a on physical health,^b Japan, 2007

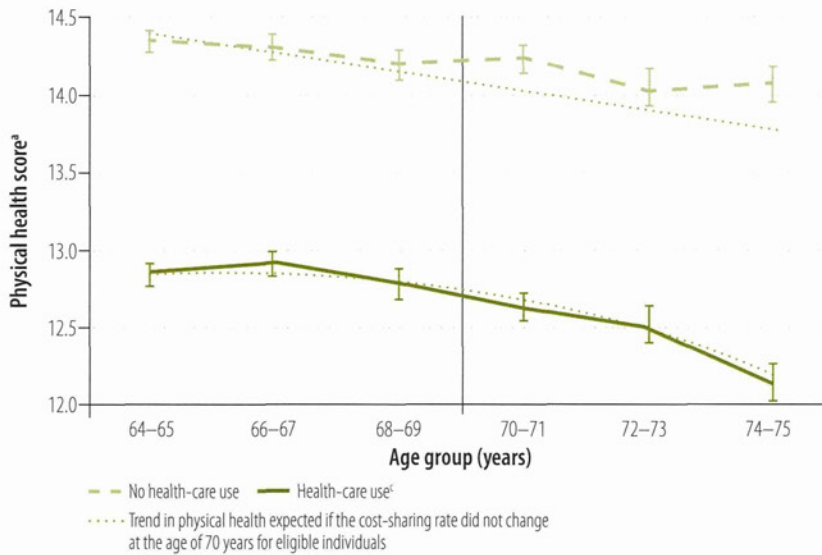


The vertical bars represent standard errors.

^a The cost-sharing rate decreased from 30% to 10% at the age of 70 years for eligible individuals, who had an annual taxable income under 12 000 United States dollars (US\$).

^b Physical health status was evaluated on a scale of 0 to 16 points and was calculated as described in a footnote to Table 1.

Fig. 6. Effect of reduced cost sharing at age 70 years on the physical health^a of eligible individuals^b using and not using health-care,^c Japan, 2007



The vertical bars represent standard errors.

^a Physical health status was evaluated on a scale of 0 to 16 points and was calculated as described in a footnote to Table 1.

^b The cost-sharing rate decreased from 30% to 10% at the age of 70 years for eligible individuals, who had an annual taxable income under 12 000 United States dollars (US\$).

^c Health-care use reported at the time of the 2007 Comprehensive Survey of People's Living Conditions.