Direct and Indirect Effects of Health and Household Medical Expenditures on Poverty

Hak-Ju Kim[1]

Abstract

The purpose of this study is to explore the direct and indirect effects of the health and household medical expenditure as well as socio-demographic characteristics of households to probability of being in poverty. The independent variables included socio-economic characteristics such as householder's sex, age, education level, and employment status, household equalized income, medical expenditure burden in a household, while the dependent variable is whether to be in poverty or not. According to the path analysis, health status is appeared to be the indirect factor that most significantly influenced the probability of being in poverty, while the household equalized income is a significant variable that may give a direct effect on poverty.

1. INTRODUCTION

Concern on increasing health care expenditures is not a new phenomenon. Better quality of services, either preventive or curative, can make difference to one's health status. However, utilizing these services can lead to individuals having to pay catastrophic proportions of owned available economic resources (or borrowed from financial institutions) and push many low-income households into poverty. In Korea, however, prior studies on health care expenditures mainly focus on examining the national health expenditures (NHE) or individuals' out-of-pocket expenditure or measuring income elasticity of demand. Little is known about important factors in determining household medical expenditures as well as its direct and indirect effects on the prevalence of poverty.

Thus, the purpose of this study is to present a detailed analysis of household medical expenditures in order to improve our understanding of the factors that contribute to household health expenditure as well as to estimate direct and indirect effects on poverty in households.

---

[1] Assistant professor at Dept of Social Welfare of Gyeongsang National University.
 Email: lionking@nongae.gsnu.ac.kr

The detailed research questions addressed here are 1) how do household medical expenditures and its burden, in comparison to households vary during the last seven years? And 2) what variables are important in determining the level of household medical expenditures burden? 3) How large are the direct and indirect effects of health status and medical expenditure burden on household poverty?

2. LITERATURE REVIEW

Only few studies on Korea have examined the household medical expenditures and analyzed variables which may explain the cross-sectional heterogeneity of the dependent variable. For example, using the Korean urban household survey data from 1982 to 1993, Park (1995) run time-series analysis of household medical expenditure and estimated income elasticity of medical expenditure. The result revealed that household medical expenditure has increased 12.8% on yearly average during the period and the rate of increase of total household expenditure was reported as much as 14.8%, where the relative size of medical expenditures are reduced from 5.98% to 4.76%. After adjusting for the age of household head and number of household members, the estimated value of income elasticity of expenditures was 0.91, which tells us that medical expenditure in household is inelastic. Park (1994) has studied key factors which may affect individual's out-of-pocket expenditures using the national health interview survey in 1989. The OLS regression results showed that the number of visits on hospitals and clinics and whether or not having chronic illnesses are the most significant determinant of one's expenditures, which seem to be a proxy to the amount and strength of utilization. Furthermore, types of health insurance, education, residence of stay, and subjective health are revealed as significant explanatory variables on the individual's spending, while one's sex, age, and living standard does not give a significant influence to the out-of-pocket expenditure. Another study by Chung(2001) have divided all the household into three different types according to the age of household head: elderly, pre-elderly, and non-elderly household. The study examined the differences in household medical expenditures among types of elderly households. The result indicated that there is a significant difference and it results from various propensity to spending on drugs and medical aid instruments. Also, education, income, householder's sex, and marital status appeared to be significant. However, the urban household survey data often used in previous studies do exclude the one-person household and respondents in non-urban areas. Thus, prior estimates have provided an incomplete picture of the adverse impact of health care expenditures on low-income households. In addition, there are many unanswered questions on health medical expenditures, such as its mediating role between health and poverty.

3. CONCEPTUAL FRAMEWORK

Figure. 1. Conceptual framework of household medical expenditure and poverty
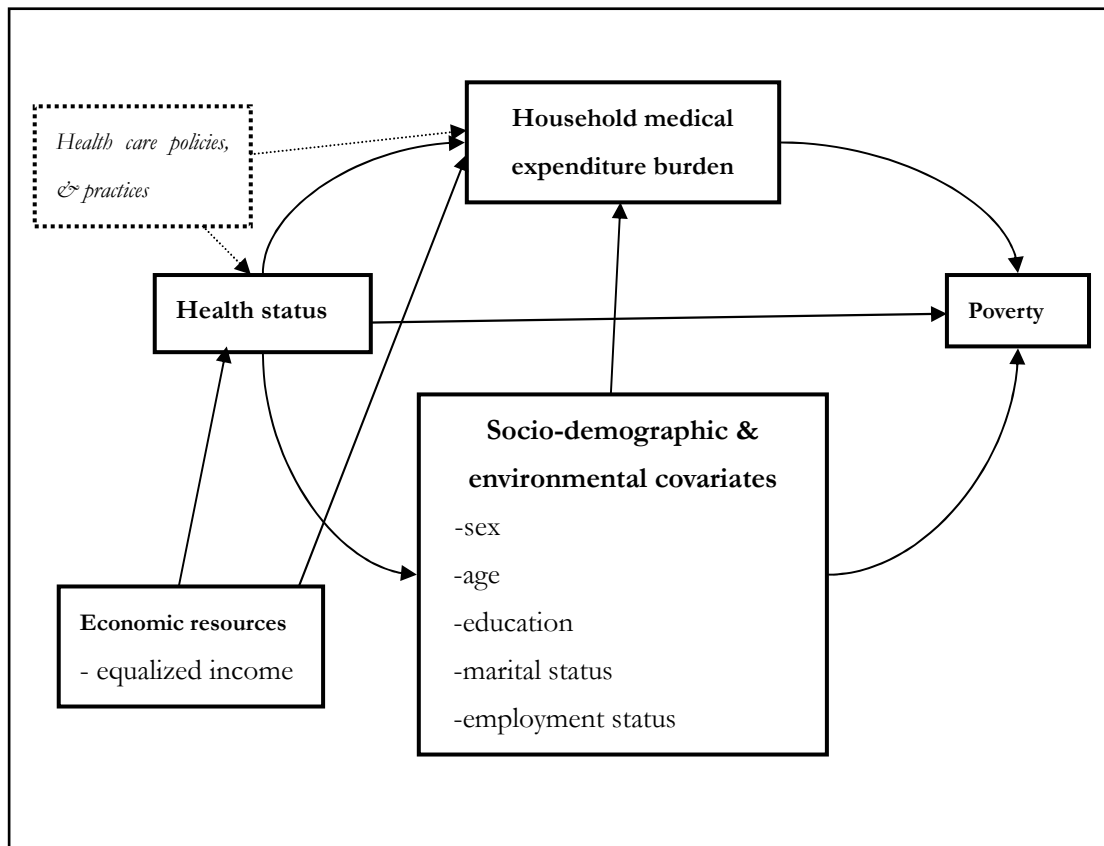
The direct and indirect effect of health and household medical expenditures on poverty is based on the above conceptual framework linking health status to poverty (see fig. 1). The framework suggests that poor health status can affect poverty through its effect on household medical expenditure burden, socio-demographic (sex, age, education, marital status, employment status), and economic covariates (household income, assets, etc). Health status may also affect the household medical expenditure burden, which obviously affect whether they will be impoverished or not. Health status of householders and other socio-demographic and economic covariates are jointly increasing or decreasing health expenditure burden in a household. Finally, household medical expenditure burden, health, and socio-demographic and economic covariates can also increase the prevalence of being poverty. If one's health status is jeopardized, household medical expenditure burden might increase which will be adjusted by socio-demographic and environmental covariates. Households with poor health would be at increased risk of being in poverty if health care policies or practices are not adequate or absent. Health care policies might help unhealthy households meet this need by providing a quality of health care at free or reduced-cost.

4. DATA AND VARIABLES

For the purpose of this study, the data are drawn from the Korean Labor and Income Panel Study (KLIPS). The KLIPS is a longitudinal survey of a representative sample of the South Korean population. The samples are randomly drawn with equal probability from 7 metropolitan cities and the burden areas in 8 provinces in Korea. In 2004, 11,661 individuals aged 15 years old and over are selected from 4,762 households, excluding Jeju Island (Korean labor institute, 2005). I also computed the household medical expenditure burden (HMEB), to assess equity among subgroups of the household population. The HMEB is the average household medical spending to adjusted income ratio and is estimated as the mean of the ratios between the two numbers for each individual (as opposed to the ratio of the mean of household medical expenditure to the mean of income). Household equalized income is defined as the individual's share of household income. In detail, the independent variables included socio-economic characteristics such as householder's sex, age, education level, and employment status, self-rated health, and household equalized income, medical expenditure burden in a household, while the dependent variable is whether to be in poverty or not. A measure of poverty used for this study is the relative poverty index. Since a standard of living which seems to be higher than what is needed just to satisfy basic needs, it is defined as 4 persons households who earn less than 50% of the median annual income on recommendation of OECD.

5. METHODS

Descriptive statistics of household characteristics were examined for each variable. Models were tested via path analysis, which involved three separate multiple regression equations, one for each endogenous variable in the model. A minimum of $p \leq 0.05$ was considered statistically significant. As depicted in Figure 1, endogenous variables are those dependent variables that are pointed at by prior predictor variable. Stepwise multiple regressions begin by selecting the predictor variable that shares the greatest amount of statistically significant variance with the dependent variable. More hypothesized predictors are then allowed into a new equation only if they explain additional unique variance in the dependent variable (as reflected by a statistically significant increase in the adjusted R^2). The standardized, partial correlation of predictor variable with its dependent variable is displayed as a path coefficient (beta weight). Indirect effects are determined by multiplying the statistically significant beta weights taken from those direct paths that connect a predictor variable to its designated dependent variable. If there exists more than one significant indirect path between a predictor

340

and its dependent variable, products of beta weights are summed to produce the total indirect effect of one variable on another.

6. RESULT

Table 1. Descriptive Statistics of Householder and household characteristics: 2004 (N=3,670)

(Unit; %, 10,000 won)

		All		Medical expenditure		Percentage of being in relative poverty
		N	(%)	Mean	S.E	
Sex	Male	3,056	85.03	5.71	13.29	18.95
	Female	614	14.97	5.35	12.25	52.51
Education	Elementary	848	20.62	6.82	13.93	52.44
	Middle	608	14.87	6.89	13.28	26.88
	High	1,295	34.15	4.86	13.56	18.68
	College & above	919	30.36	5.05	11.38	9.19
Marital status	Married	2,810	77.66	6.02	13.64	17.52
	Single	146	4.79	2.68	8.02	25.70
	Separated/Divorced	187	4.74	3.91	8.98	45.31
	Windowed	527	12.81	5.25	12.49	54.61
Employment status	Regular	1,272	35.93	4.74	13.26	7.22
	Temporary	106	2.67	4.78	10.51	22.04
	Daily	250	6.54	5.59	13.52	27.65
	Employer	301	8.50	6.37	14.68	7.99
	Self-employed	697	17.73	4.55	8.51	23.06
	Family business	32	0.75	7.24	9.24	17.44
	Unemployed	1,010	27.88	7.42	15.04	50.54
Self-rated health	Very Healthy	88	2.54	3.69	5.99	12.00
	Healthy	1,580	43.65	4.00	8.29	12.19
	Fair	1,157	31.76	5.53	14.77	21.93
	Poor	701	18.08	8.02	14.90	49.84
	Very Poor	144	3.96	14.94	25.50	59.94
		Mean	S.E			
Age		51.40	13.44	-	-	-
# of HH members		3.14	1.30	-	-	-
# of HH employed members		1.37	0.92	-	-	-
HH annual equalized income		1679.32	1848.06	-	-	-

*All numbers in cells are weighted.

Characteristics of the household sample in 2004 are described in table 1. As expected, most of household head are men (85.03%) and female heads only consist of about 15 percent of total households. 64 percent of the sample have high school or above level of education. In regard to employment status, thirty five percent (n=1,272) of household heads identify themselves as being regular employees, while about twenty eight percent (n=1,010) are unemployed. Self-employed workers are approximately eighteen percent of total householders, with 8.5 percent of employers (n=301). Nearly half of respondents reported that they are either to be healthy or very healthy. Findings also reveal that difference in medical expenditure of "very unhealthy" group is approximately five times higher than the "very healthy." The mean age of the sample at the time of 7th survey is 51.4 years (S.E=13.44).. The average number of household member is 3.14 persons (S.E=1.30) and 1.37 persons are employed on average. The annual mean equalized income is reported 16,790 thousand won.

In order to provide context for the analysis of this study, means of household medical expenditure and the prevalence of poverty are examined and discovered to be varied by socio-demographic diversity of sample households. Those who are married, lower educated, and with poorer health tend to spend higher medical expenditures. Over fifty percent of household heads with only elementary education, widowed, unemployed, being female or very unhealthy appeared to be poor households in each subgroup by characteristics. The relative poverty rates of whose health status corresponds to either unhealthy or very unhealthy are 49.8% and 59.9% respectively.

Table 2. Demographic characteristics according to medical expenditure burden (HMEB)*: 2004 (N=3,670)

(Unit: %, 10,000 won)

		HMEB		Category by HMEB			
		Mean	S.E	<5%	<10%	<20%	>=20%
Sex	Male	0.61	8.36	73.07	11.81	7.13	7.99
	Female	0.98	34.48	56.74	15.16	13.27	14.84
Education	Elementary	1.24	30.52	47.80	18.47	14.81	18.93
	Middle	0.52	7.52	64.17	13.86	9.90	12.07
	High	0.34	7.73	77.25	10.16	6.87	5.72
	College & above	0.72	6.69	81.83	9.8	3.89	4.48
Marital status	Married	0.54	6.64	81.73	6.47	5.60	6.20
	Single	0.21	2.53	72.67	12.24	7.07	8.03
	Separated/Divorced	2.33	22.27	66.26	14.21	7.45	12.08
	Windowed	0.95	37.07	55.67	14.27	15.16	14.90
Employment status	Regular	0.17	2.23	83.41	8.52	4.48	3.59
	Temporary	0.31	2.60	78.35	6.89	7.08	7.68
	Daily	0.67	15.56	64.61	19.87	8.77	6.75
	Employer	1.66	11.18	83.95	9.20	3.01	3.84
	Self-employed	0.16	1.55	71.93	13.33	6.02	8.72
	Family business	2.84	18.36	66.30	17.96	9.94	5.80
	Unemployed	1.32	28.56	50.04	16.10	15.35	18.51
Self-rated health	Very Healthy	3.16	29.26	83.68	7.78	4.43	4.11
	Healthy	0.14	1.32	82.69	9.33	3.75	4.23
	Fair	0.58	5.82	73.79	11.57	7.41	7.22
	Poor	0.53	4.05	43.14	20.40	17.64	18.82
	Very Poor	6.17	74.87	29.34	17.10	19.13	34.43
				Mean			
Age				48.87	56.75	59.45	60.79
# of HH members				3.27	3.03	2.81	2.54
# of HH employed members				1.50	1.25	1.03	0.86
HH equalized income				1979.82	1177.90	941.16	661.21

*Note: Household medical expenditure burden (HMEB) stands for Household medical expenditure, divided by Household equalized income and all numbers in cells are weighted.

Because the amount of medical expenditures in a household is limited to the available budget constraint, it is a better measure to use the household medical expenditure burden

(HMEB) instead of the nominal amount of expenditures. Regarding the household medical expenditure burden, those with very poor health reported to spend 6.17 times of equalized income. Table 2 illustrates the mean of HMEB and the percentage by HMEB categories: four HMEB categories were created in order to describe socio-demographic diversity for household of different HMEB. Approximately 15 percent of female households spend more than 20% of their household income. Householders' "preferences" (i.e., willingness to spend more of medical expenditures) for HMEB are captured by creating a four-category variable. These special needs categories are very safe (under 5% of the medical expenditure/equalized income), safe (under 5%), fair (5-10%), high (10-20%), and extremely (20% and over) in order to describe households' "preferences." It is found that mean ages in the sample is relatively equally distributed.

Table 3. Household medical expenditure: 1999, 2001, 2002, 2003, & 2004

Year	Total		Quintile 1(lowest)		Quintile 2		Quintile 3		Quintile 4		Quintile 5(richest)		Ratio
	M	% change	M	% change	M	% change	M	% change	M	% change	M	% change	of DI
1998	128.15	-	87.57	-	72.52	-	110.77	-	134.11	-	236.78	-	-
1999	100.72	5.16	67.59	4.28	90.4	3.80	108.27	4.80	114.79	4.59	120.88	8.30	1.94
2000	108.29	-	-	-	-	-	-	-	-	-	-	-	-
2001	117.95	4.94	62.37	4.37	86.53	4.42	112.96	5.37	134.67	5.08	186.69	5.40	1.99
2002	137.23	5.03	60.76	4.84	99.08	4.49	130.22	4.72	161.66	5.15	225.29	5.88	2.70
2003	150.60	5.36	68.37	4.61	114.72	5.15	143.07	4.75	173.14	5.61	246.90	6.62	2.61
2004	165.36	5.65	72.58	4.70	120.62	5.39	157.52	5.10	194.07	6.37	272.00	6.61	2.74
PC(%)	Δ0.29	Δ0.09	▽0.17	Δ0.10	Δ0.66	Δ0.42	Δ0.42	Δ0.06	Δ0.45	Δ0.39	Δ0.15	▽0.20	

*Note: missing values in cells are omitted due to the lack of variables in the specific wave.

The average household medical expenditure figures demonstrate that own expenditures increased for the last seven years. In table 3 households are divided into quintile categories according to household equalized income: from those in quintile 1 who are "lowest" to who are "richest." In the right-side column of the mean value of medical expenditure in each income group, its percentage change of the household medical expenditure is reported in comparison to the year 1998, along with mean values of the expenditure. The percentage change has consistently increased in general in each income category, except for the lowest income group. When comparing the mean values of medical expenditure for the lowest income groups with the richest income group, the gap (Ratio of DI) significantly become grown up to about fifty percents (1.94 in 1999 to 2.74 in 2004).

Table 4. Household medical expenditure burden: 1999, 2001, 2002, 2003

	Total		Quintile 1(lowest)		Quintile 2		Quintile 3		Quintile 4		Quintile 5(richest)		Ratio
Year	HMEB	S.E	HMEB	S.E	HMEB	S.E	HMEB	S.E	HMEB	S.E	HMEB	S.E	of DI
1998	-	-	-	-	-	-	-	-	-	-	-	-	-
1999	0.75	4.44	2.13	10.35	0.73	1.17	0.61	1.50	0.35	0.61	0.20	0.57	10.65
2000	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	0.15	1.18	0.61	2.79	0.09	0.16	0.07	0.21	0.05	0.17	0.03	0.07	20.33
2002	0.16	1.47	0.68	3.42	0.08	0.12	0.05	0.11	0.04	0.07	0.03	0.04	22.67
2003	0.21	6.47	1.01	15.45	0.08	0.12	0.05	0.08	0.04	0.10	0.03	0.06	33.67
PC(%)	Δ1.07		Δ0.12		Δ1.26		Δ1.26		Δ2.66		Δ4.70		

Table 4 shows the time-series trend of household medical expenditures divided by household equalized income. In 1999, the HMEB is 2.13 (S.E=10.35) the lowest income category, where the richest reported 0.20 (S.E=0.57) (10.65 times). Four years later, the HMEB has been reduced on a large scale for every income groups but the gap between the richer and lower income has enlarged, rather than declining: 0.03 (S.E=0.06) for the uppest and 1.01 (S.E. =15.45) for the lowest respectively (33.67 times).

Table 5. Multiple regression results for path analysis

	Self-rated health (5=very poor, 1=very healthy)		HMEB		Poverty	
	Beta	b	Beta	b	Beta	b
Sex	-0.237	-0.097 ***	-0.038	-0.010	-0.104	-0.090 ***
Age	0.132	0.161 ***	0.176	0.134 ***	0.029	0.075 ***
Education	-0.131	-0.157 ***	0.037	0.027	-0.009	-0.023
Employment Status	0.087	0.233 ***	0.004	0.007	0.010	0.058 **
Marital status	0.008	0.010	-0.128	-0.096 ***	-0.002	-0.006
Equalized income	-0.073	-0.094 ***	-0.887	-0.671 ***	-0.257	-0.665 ***
Self-rated health			0.239	0.151 ***	0.038	0.082 ***
HMEB					-0.020	-0.068 **
F value	250.040***		526.810***		429.860***	
Adjusted R^2	0.291		0.562		0.544	

* b is the standardized coefficient.

The first two rows of table 5 show the regression results for estimating poor self-rated health status. Employment status is the most strong predictor variable (beta=0.087, p <.001)

on poor health, with age (beta=0.132, *p* <.001), level of education (beta=-0.131, *p* <.001), sex (beta=-0.237, *p* <.001), and equalized income (beta=-0.073, *p* <.001). Particularly, the female, older, less educated, lower income is closely related to one's poorer health status. In total, its adjusted R-square value on health regression is 0.291, which implies only 29.1% of variances is explained by input variables. Household medical expenditure burden is also regression on health as well as socio-economic covariates. After controlling for sex, age, education, equalized income (beta=-0.887, *p* <.001) and self-rated health (beta=0.239, *p* <.001), age (beta=0.176, *p* <.001), and finally marital status (beta=-0.128, *p* <.001) are still significant predictor variables on the medical expenditure burden. The adjusted R-square, which explains the model fitness, is 0.562. In household poverty focusing on the final outcome variable, 54% of the variance in household poverty was accounted for by the hypothesized model. Household equalized income had the strongest total effect on being in poverty (beta =.-257, *p* <.001), closely followed by the direct effects of self-rated health status (beta = .038, *p* <.001), Sex (beta = -0.104, *p* <.001), Age (beta =0.029, *p* <.001), Employment status (beta = 0.010, *p* <.01) influenced poverty directly. The variables included in the path analysis can explain about 54.4% of the total variance.

Table 6. Direct and Indirect Effects of key variables on poverty

Variable	Direct effect	Causal effects	Total induced effect
		Indirect effect	
sex	-0.140	sex->health->Poverty (-0.237)*(0.038)=	-0.00901
age	0.029	age->health->Poverty age->health->HMEB->Poverty (0.132)*(0.038)+(0.132)*(0.038)*(-0.020)=	0.00492
Employment Status	0.010	Employment status->health->Poverty (0.087)*(0.038)=	0.00331
Eq income	-0.257	Eq income->health->Poverty Eq income->HEMB->Poverty Eq income->health->HEMB->Poverty (-0.073)*(0.038)+(-0.128)*(-0.020)+(0.132)*(-0.073)*(-0.020)=	-0.00002
Poor Health	0.038	health->Poverty health->HEMB->Poverty (0.038)+(-0.073)*(-0.020)=	0.03946
HMEB	-0.020	HEMB->Poverty 없음	-0.02000

The above table 6 presents total (direct and indirect) effects of key variables on poverty. It summarizes the direct and indirect effects of each predictor variable on each hypothesized endogenous/dependent variable. Examination of these total effects facilitates explanation of how predictor variables both directly and indirectly influenced dependent variables.

7. CONCLUSION

The purpose of this study is to explore the direct and indirect effects of the health and household medical expenditure as well as socio-demographic characteristics of households to probability of being in poverty. According to the path analysis, poor health status acts as the strong indirect predictor that significantly influenced the probability of being in poverty, while the household medical expenditure burden and income variables are statistically significant variable that may give a direct effect on poverty, along with socio-demographic covariates. In addition, though it is revealed the medical expenditure in household continued to increase, the gap in the medical expenditure burden between the upper and lower income groups has been widened after the economic crisis. Household health expenditure burden (household medical expenditure to household equalized income) has increased in proportion to the number of household members and the age of householder, and was higher in the households whose householder's occupation corresponded to regular workers, rather than those in irregular jobs or unemployed. It is particularly higher in the households whose heads is unmarried or poorer health status.

Protecting the economically vulnerable households from catastrophic medical payments is widely accepted as a desirable objective of health care policy (Kawabata, Xu, & Carrin, 2002; Musgrove, 2000; Russel, 1997; WHO, 2000; WHO, 2002). However, the answer to the question of seeking a balanced point between increasing household medical expenditures and benefits is not easy job. First of all, as well as strengthening the coverage of health insurance, it is required to return 'consumer choices' back to individuals for encouraging sound competitions in the health care market. Detailed information on quality of services should be combined with a comprehensive reform in payment system that rewards physicians and hospital administrators for a decent quality of service at reasonable price. A comprehensive reform of health care finance - the way the funds are raised and the way they are paid out – can bring about the necessary organizational changes that will give physicians the information, infrastructure, and incentive to deliver cost-effective care to the entire population (Bodenheimer and Fernanderz, 2005).

REFERENCE

박재용, 남시현. 도시가계의료비 지출추이 및 예측. 예방학회지 1995;28(2):347-363

박현애., 송건용. 개인지출의료비의 결정요인 분석. 간호학논문집 1994;(8)1:41-51

정순희. 노인가계의료비 지출에 관한 연구. 한국노인복지학회 2001 여름호.

Bodenheimer T & Fernanderz (2005) A. higher and rising health care costs. Part 4: can costs be controlled while preserving quality? Annual of Internal Medicine. 143: 26-31.

Filmer D, Hammer J, Prichett L. Weak links in the chain II: a prescription for health policy in poor countries. World Bank Res Observer 2002; 17; 47-66.

Kawabata K, Xu K, Carrin G. Preventing impoverishment through protection against catastrophic   health expenditure. Bull World Health Organ 2002; 80:612.

Musgrove P. Public spending on health care: how are different criteria related? Health Policy 2000; 53:61-67.

Russel S, Gilson L. Use fee policies to promote health service access for poor: a wolf in sheep's clothing? Int J Health Service 1997; 27:359-79.

WHO. The world health report 2000: health systems: improving performance. Geneva: World Health Organization, 2000.

WHO. The World Health Report 2002. Geneva: World Health Organization 2002.