
Income related inequality of dental care utilization in Korea

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Objectives: This study investigated horizontal dental inequalities and the impact of rurality and insurance types on dental care utilization among Korean patients, age 18 and older.

Methods: The study employed the 1998 Korea National Health Survey. Horizontal inequalities were measured by comparing the amount of dental visits with the proportion of dental care given for equal need. Zero-inflated negative binomial estimation was applied to estimate the quantities of dental visits after adjusting for dental need.

Results and Conclusion: Horizontal inequality in dental utilization was found to favor the wealthy (horizontal inequality index, HI_{wv} = 0.0536, $p < 0.05$). Due to poorer health and demographic features, rural residents visited dental professionals less often than their urban counterparts (mean dental visits; 0.94 vs. 1.11), although their dental needs were almost equal. Regional health insurance tended to ameliorate inequalities in dental utilization (HI_{wv} = 0.0079, $p = 0.80$), particularly in urban areas (HI_{wv} = -0.0140, $p = 0.73$), while employment-based health plans worsened dental inequality (HI_{wv} = 0.0850, $p < 0.05$). These findings suggest that more attention needs to be paid to the allocation of dental resources and that there needs to be improved access to dental care for low income, rural residents.

Key words: Horizontal Inequality, Rurality, Dental Utilization, Insurance Type

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I. Introduction

Equity is one of the main objectives of a health care system. Attitudes concerning equity and the extent of its application appear to vary from one country to the next and over time (1). Accordingly, the discrepancies among countries primarily reflect variations in social norms and the political environment. The equity issue has been highlighted by recent health care reforms and the public's subsequent reaction. Health care reforms in most countries have been largely focused on the improvement of system efficiency, which was an alternative for the common pressures for cost containment and consumer expectations (2). Meanwhile, the reforms focused on system efficiency germinated concerns regarding the equity of health care financing and provisioning.

Horizontal health inequality quantitatively measures the amount of unequal access to health care given equal health needs. Health need is measured by the utilization that one would expect for an individual, given demographic characteristics and general or dental health status (2). For policy perspective, it is more useful to have a measure of the amount of inequality, rather than just noting its existence (3). Van Doorslaer et al.(4) explored the role of four factors that influence the level of health inequality in selected OECD countries; the level of health care in per capita terms, the public share, the level of income per capita, and the inequality in per capita income. They found that the Gini coefficient proved to have a consistent and significantly positive association with health inequality. Previous studies (2, 5-11) have reported that the overall

amount of health care utilization by low-income patients seemed to exceed that of the higher income group, but in most cases it simply reflects the greater needs of the poor rather than the results of a policy favoring the poor. In the dental field, a concentration idea was adopted to gauge the inequalities in the distribution of dental caries (12). Antunes et al., found that Dental Health Inequality Index was strongly correlated with the Gini index and caries free children (12).

II. Dental health system in Korea

Dental care is mostly provided by private dental practitioners in Korea. The number of dentists in 1998 was 10,113, and equivalent to .28 per 1,000 people (13). Most dentists are in solo practice, but the proportion of solo practitioners is diminishing over time. In particular, since a monetary crisis in 1998, group practice has been growing (14).

Dental insurance is reimbursed by a national third party, National Health Insurance Cooperation (NHIC). It covers basic care such as consultation, endodontic, and restorative dental treatments, but not esthetic treatments, preventive checkups, artificial dentures, or orthodontic care. Cost-sharing consists of co-payments for dental services costs under NHIC and any additional payments that exceed NHIC coverage. Total dental care payments have been almost fixed to around 5% of the total reimbursement provided by NHIC (13).

The Korean health care system uses mixed public and private financing (17). Insurance revenues are financed by three sources: the insured, employers, and the government. For employees of the government,

private schools, and firms, contributions are shared equally with employers and contribution schedules are determined by income strata. On the other hand, the premiums of the self-employed are paid solely by the insured and the contribution schedules are determined by the level of income and property as adjusted by age and gender. The central/local government subsidizes the remainder of the total expenditure of its regional health insurance.

As a public reimbursement system (18, 19) coupled with fee-for-service payment, providers are funded, retrospectively, for services supplied to patients. Almost half of all payments are paid directly from patients and NHIC when a provider bills for services rendered. For health services that are not covered by the national health insurance, providers are free to charge market rates. In this context, providers tend to offer those treatments that are not covered by NHI, notably expensive high-technology procedures. As a result, the financial burden of services not covered by NHI may be greater for lower-income families than for better-off families (20).

The purpose of this study was to measure the inequalities of dental care utilization. With the lack of coverage by NHI, geographic maldistribution of health resources has been a prominent concern in Korea. The combination of these two disadvantages may synergistically worsen income-related horizontal inequality in dental care. Concentrated on these issues, the study focused on two aspects, namely: (1) the overall horizontal inequalities in dental utilization; (2) the effects of policy relevant factors, such as geographic region and insurance type.

III . Methods

1. *Data and measures*

The study population consisted of community-dwelling, non-institutionalized adults aged 18 and older, and was sub-sample of the Korea National Health Survey (KNHS). The sample size of current study was 9183. KNHS was a national survey which employed a stratified survey design and was a part of the 1998 National Health and Nutrition Survey (NHNS) (21). A total of 12,283 Korean households with 39,060 household members took part in the NHNS, which yielded a response rate of 90.8 percent.

For needs adjustment, this study used demographic, general and dental health related measures; age as a continuous measure, a dummy for gender and any limitations of activity, and three categories of self-assessed health status. Dental needs were measured by two components; a dummy for denture wearing and three categories for tooth brushing habits. A characteristic of dental disease is chronic so that healthy oral behavior like tooth-brushing is paramount to prevent major oral illness. Tooth brushing habits were categorized into three levels based on the number and length of brushing in a day.

To convert family income into personal utilization, this study modified income to an equivalence scale taking into account family size and a member's age (22). Several equivalence scale measurements have been used previously used for income adjustment. The U.S. government has

used the Poverty Panel equivalence scale (23), while European countries usually use a modified OECD equivalence scale (24). The current study employed a modified equivalence scale formula:

$$\text{Equivalent scale} = (\text{number of Adults} + 0.5 \times \text{number of children})^{0.5} \quad (1)$$

2. Concentration index and health inequality index

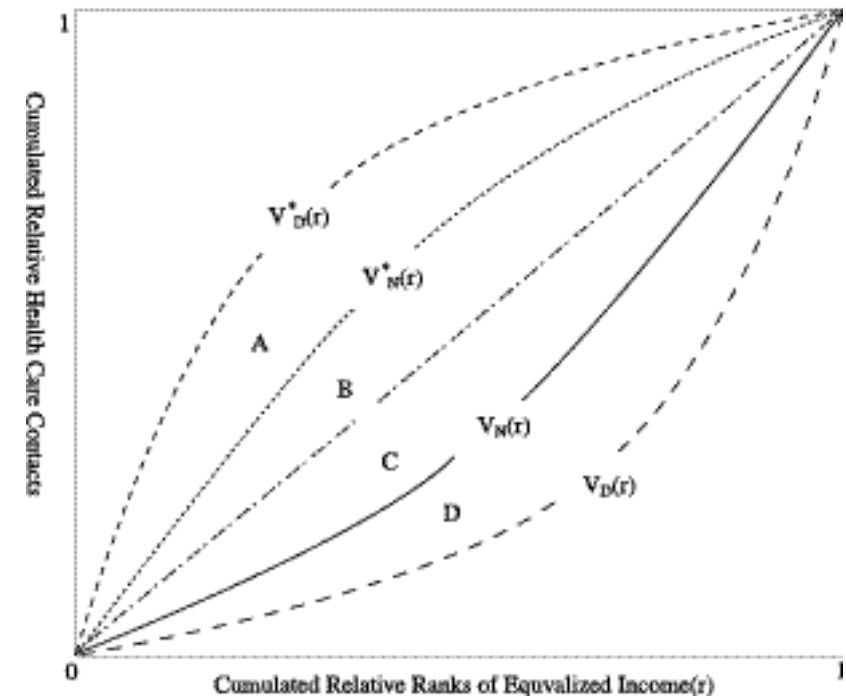
We supposed that there would be continuous measures of dental utilization and income rankings. The dental utilization distributes as shown in Figure 1. C_D , the concentration index of dental care utilization, indicates the degree of inequality in the distribution of dental care utilization and can be measured as (25),

$$C_D = 1 - 2 \int_0^1 V_D(r) dr \quad (2)$$

$V_D(\cdot)$ is a concentration curve for actual dental care utilization. Therefore, C_D is equivalent to the area (A + B + C + D) in Figure 1. In this case, it is positive, meaning that there exists inequitable dental utilization in favor of high income groups.

However, it often needs to be standardized to remove the effects of unavoidable confounding factors such as age, gender, and health status (26, 27). To adjust for the health status of each individual, the current study estimated the needs adjusted amount of dental service using zero-inflated negative binomial estimation, which was the best estimation method among Poisson, negative binomial, two-part model, zero-inflated Poisson, and zero-inflated negative binomial. Then, the needs adjusted concentration index (C_N) was calculated by same manner applied to C_D calculation. This was equivalent to the area (B + C) in Figure 1 where

Figure 1. Concentration Curve for Dental Care Utilization



Note $V_D(r)$: Concentration curve of actual dental utilizations
 $V_N(r)$: Concentration curve for need standardized estimation
 $V_D^*(r)$: Mirror image of $V_D(r)$
 $V_N^*(r)$: Mirror image of $V_N(r)$

dental health need was distributed favoring high-income groups. Meanwhile, if there was no dental care inequality in terms of dental visits or dental need, the concentration curve would coincide with the diagonal and the value of C_D or C_N would be null.

Several methods have been introduced to compute the concentration index (28, 29). An ordinary least square (OLS) regression has been widely used to compute the concentration index of continuous measures (28). The regression coefficient (β_C) is the value of the concentration index.

$$2\sigma_R^2 \left[\frac{y_i}{\mu} \right] = \gamma + \beta_C R_i + e_i, \quad (3)$$

where σ_R^2 is the variance of R_i which is the relative rank of individual i 's income, y_i is the individual's dental utilization and μ is the grand mean of y_i .

Now, the degree of horizontal equity is assessed by comparing the concentration index between actual dental care utilization and its expected share of need as (25),

$$HI_{wv} = 2 \int_0^1 [V_D(r) - V_N(r)] dr = C_D - C_N, \quad (4)$$

where HI_{wv} is the income-related horizontal dental inequality index, and $V_N(\cdot)$ is the concentration curve of the expected dental care after needs adjustment. In Figure 1, one can see that the magnitude of this index is the same as the area (A+D), which is positive, meaning that horizontal dental care delivery is biased towards the high-income group.

The value of these indices ranges from -1 to 1. A sign (negative or positive) of HI_{wv} indicates the favored direction and the absolute value indicates the degree of income-related dental inequalities. For example, the negative HI_{wv} would represent that low income groups obtain a higher share of dental care than their share of the need, depicted as horizontal inequities favoring the worse-off. A zero index value indicates no horizontal inequality. Dental care utilization and needs shares are proportional across the income distribution.

3. Analysis

Sample characteristics and bivariate relationships were examined. The dental visits were treated as count data. Several estimation methods have been introduced for count data analysis to overcome the large proportion

of zeros, zero-truncated pseudo continuity, skewing to the left and long right hand tail distribution. To compute the needs adjusted expected number of dental visits, this study employed the zero-inflated negative binomial model (ZINB). ZINB deals with unobserved population heterogeneity by generating excess zeros (by changing the mean structure) from potential non-users as well as the "Always Zero" group (30). Zero-inflated model computes the probability of an outcome (i.e., event of ambulatory care visit) as follows:

$$P(Y_i = y_i |_{=0}) = P_i + (1 - P_i) * \Psi_i, \quad (5)$$

where P_i is probability of zero event of Y_i , Ψ_i can be Poisson or negative binomial.

Therefore, the expected number based on zero-inflated model is

$$E(y_i | x_i) = P(y_i > 0 | x_i) \times E_2(y_i | x_i), \quad (6)$$

where E_2 denotes expectation with respect to the underlying distribution, $P_2(y_i | x_i)$.

For the statistical inference of the concentration index and the health inequality index, appropriate standard errors needed to be computed. Since data were collected by a multistage sampling scheme, this may result in intra-strata correlation (7, 31). To take intra-strata correlation and serial correlation into account, the study adopted Huber-White correction, instead of the Kakwani correction equation. All analyses were carried out using STATA 7[®] (32) and followed the suggested weighting method by the survey manual and statistical package.

IV. Results

1. Sample characteristics

After classifying the sample into urban vs. rural locale (Table 1), rural residents were found to be older, less-educated, with a higher proportion of physical limitations (4.1% vs. 1.7%), and to have a poorer perceived health status. The difference was especially profound in education; the percentage of less than ten years of educational attainment reached nearly 70% in rural areas and this figure was almost twice that of their urban dwelling counterparts. Nearly 6% more of rural residents reported that their health concerns seemed serious.

2. Dental needs and utilization

Dental health, presented herein, was consistent with the report of the National Dental Health Survey 2000 (33). Rural residents suffered from more dental illness (29.3% vs. 25.6%, Table 1). The proportion of people wearing dentures (the figures presented here excluded dental appliances for orthodontic treatment) and with poor tooth brushing habits was higher in rural areas. For dental visits during the prior 12 months, the difference between urban and rural areas was attributable only to the proportion of one time visitors. The number of those who visited more than twice, who might be inferred as intensive users, was almost the same between the two geographic areas.

Table 1. Distribution and characteristics of subjects by area

		Total (N=9183)	Urban (N=6033)	Rural (N=3150)	p-value*
Age	Mean (SD) [†]	41.8 (15.4)	40.1 (14.4)	48.5 (17.0)	< 0.001
	Gender				
	Female	53.2	52.9	54.4	0.185
	Male	46.8	47.1	45.6	
Education (years)	< 10	36.5	33.9	68.7	< 0.001
	10 - 12	38.8	40.7	23.4	
	> 12	24.7	25.4	8.0	
Self-assessed Health	Excellent	5.7	5.4	4.5	< 0.001
	Very Good	37.3	37.2	34.9	
	Good	35.5	36.9	28.4	
	Poor	18.3	17.5	26.1	
	Very Poor	3.3	3.0	6.1	
Limitations of activity	Yes	2.0	1.7	4.1	< 0.001
	No	98.0	98.3	95.9	
Dental illness [‡]	Yes	26.4	25.6	29.3	< 0.001
	No	73.6	74.4	70.7	
Dentures [‡]	Yes	10.0	9.1	19.7	< 0.001
	No	90.0	90.9	80.3	
Tooth Brushing Habits	Excellent	44.2	46.5	39.1	< 0.001
	Very good	35.5	35.0	33.1	
	Good	16.4	15.0	21.1	
Dentist Visits	Poor	3.9	3.5	6.7	< 0.001
	0	68.3	67.2	72.2	
	1	15.3	16.3	12.1	
	2	5.7	5.7	5.6	
	>= 3	10.7	10.8	10.1	

Notes: *p-value between urban and rural

[‡] Dental illness refers to the rates of those who had dental treatments during the prior two weeks.

[†] SD: Standard Deviation.

[‡] Dentures includes partial dentures as well as full dentures.

3. Health inequalities in dental care

The dental visits tended to increase as equalized household income rose ($C_D = 0.0420$, $p = 0.017$) (Table 2). All C_N 's of the whole population model were negative except the model in which age, gender, and limitations of activity were combined. This means that there is a higher demand for dental care than actual visits. Each need variable had a unique impact on C_N , but all were not statistically significant. C_N for all needs was distributed towards a pro-low income inclination, and C_D was significantly positive. As a result, income-related horizontal dental inequality ($HI_{wv} = 0.0536$, $p = 0.017$) significantly favored high income groups, but it was not as severe as expected.

The study analyzed dental health inequality according to urban vs. rural locale and insurance types (decomposition analyses, Table 2). On average, adjusting for regional differences modestly reduced the degree of inequality (HI_{wv} was changed from 0.0536 to 0.0457). Dental utilization in urban areas was equally distributed across the income ranks (HI_{wv} is positive, but is not statistically significant, $HI_{wv} = 0.0187$, $p = 0.529$), versus severe unequal distribution amongst rural residents.

Similarly, the impact of insurance type was not great ($HI_{wv} = 0.0447$, $p = 0.047$), on the whole. Those with regional health plan coverage, on average, visited dental facilities less than those with an employment based plan ($M = 1111.9$ in urban areas vs. $M = 942.1$ in rural areas), although the share of need was almost equal regardless of health plan ($m = 1068.3$ in urban vs. $m = 1108.9$ in rural). HI_{wv} indices in both health plans were positive, but the index of the employment based plan was much higher in absolute value than the regional plan. The study further analyzed the impact of the combination of geographic locale and health

Table 2. HI_{wv} for Dental need and policy relevant measures

	C_D	C_N		HI_{wv}		M^{\S}	$[m^*]$
		index	p-value	index	p-value		
	0.0420						
Age + Gender + Limit (AGL)	0.0420	0.0007	0.928	0.0413	0.067	1076.7	[1078.4]
AGL + SAH [†]	0.0420	-0.0064	0.447	0.0484	0.032	1076.7	[1080.0]
AGL + Denture	0.0420	-0.0137	0.089	0.0558	0.013	1076.7	[1082.8]
AGL + Brushing	0.0420	-0.0029	0.726	0.0449	0.046	1076.7	[1078.9]
AGL + All [‡]	0.0420	-0.0116	0.153	0.0536	0.017	1076.7	[1079.3]
Rurality	0.0420	-0.0036	0.660	0.0457	0.042		
Urban	0.0015	0.0172	0.077	0.0187	0.529	1111.9	[1068.3]
Rural	0.1095	0.0346	0.023	0.0749	0.009	942.1	[1108.9]
Insurance type	0.0420	0.0026	0.749	0.0447	0.047		
Regional plan	-0.0121	-0.0200	0.067	0.0079	0.795	968.8	[1077.2]
Employer plan	0.0781	-0.0068	0.582	0.0850	0.010	1192.4	[1093.9]
Rural- regional plan	0.0165	0.0056	0.772	0.0221	0.555	846.8	[1099.7]
Rural-employer plan	0.1951	0.0665	0.010	0.1286	0.003	1078.1	[1143.5]
Urban-regional plan	-0.0381	-0.0240	0.070	-0.0140	0.734	1004.3	[1064.2]
Urban-employer plan	0.0327	-0.0169	0.242	0.0496	0.250	1216.1	[1073.2]

Note: p-value was based on robust standard errors

C_D^* , C_N^{**} , and HI_{wv}^{***} refer to the concentration index of dental visits, estimated visits given need, and horizontal inequality, respectively.

[†] SAH refers to self-assessed health status.

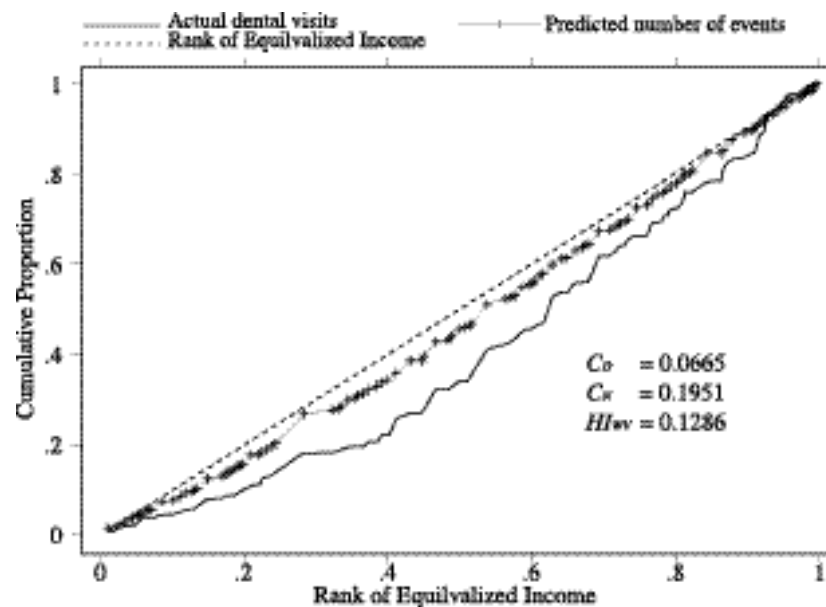
[‡] All include age, gender, physical limitations, SAH, dentures use, and tooth brushing habits.

[§] M and $[m^*]$ refer to the mean of dental visits and its share of need estimated by zero-inflated negative binomial model, respectively (unit: per 1,000 persons).

insurance plan (lower part in Table 2). The lowest dental utilization ($M = 846.8$) was found in rural residents with regional health plans and the highest health inequalities were noted among those with a rural-employment based plan ($HI_{wv} = 0.1286$, $p = 0.003$). Despite low utilization, dental utilization was distributed equally based on the needs

(HI_{wv} was not different from zero) of rural residents with regional health plan coverage. Meanwhile, the index of horizontal inequality in the urban regional plan became more negative ($HI_{wv} = -0.0140$, $p = 0.734$).

Fig. 2. The concentration curves of dental care utilization of rural residents with employment based health plan in Korea



4. Discussion

Higher income groups in Korea used more dental resources than their needs. Previous studies of dental utilization mainly examined the predictors that explained dental utilization patterns, barriers to access and the impact of dental behavior on dental visits. The current study quantified the amount of horizontal inequality in dental care and examined policy relevant variables for in-depth clarification. On the

contrary to medical care including inpatients (16), income related horizontal inequality in Korea favored the better-off. Rural residents used less dental resources, although their dental needs were nearly equal to their counterparts. Regional health insurance tended to ameliorate unequal dental utilization, particularly in urban areas.

The biased dental utilization, favoring the better-off, may be explained by several reasons. Firstly, due to the low co-payment for the basic package, the low-income insured might access dental care with relative ease for basic and acute dental problems. Secondly, there is a severe geographic mal-distribution of dental resources in Korea. Department of Health Resources in the Ministry of Health and Welfare, for instance, reported that more than 92 percent of dental clinics and 100 percent of dental hospitals were located in urban areas in 1998 (13). Finally, patients tend to consider dental problems as non-life-threatening diseases and the most expensive treatments, such as prothodontic, orthodontic, and cosmetic therapy and their materials were not covered by national health insurance. As a result, it is possible that low-income patients with complicated dental problems tended to postpone treatments for as long as possible until they were unable to manage (37, 38).

Income related dental inequalities of this study were consistent with other previous studies (39-43). Lee reported that the factors influencing dental visits in Korea were dental needs, age, rurality, and income (42). A finding of this study was that dental inequalities were concentrated in the indigent and medically vulnerable populations. Horizontal inequalities in rural residents were higher than in the urban population. In this context, a low-income group in the rural area was the most vulnerable population in terms of dental care services.

Andersen contended that dental utilization could be well modeled by

considering social structure, dental health beliefs, and enabling factors, while needs and demographic factors were more salient in hospital services due to their emergent and non-discretionary characteristics (44). However, as Gilbert (45) argued, dental need was a more important predictor in the case of a non-discretionary dental problem, whereas predisposing and enabling factors were crucial in dental check-ups or cleanings. This study found that resource scarcity and a lower proportion of educational attainment in rural Korea might cause a decrease in the utilization level but did not reduce non-discretionary visits. The proportion of patients who frequented the dentist more than twice in a year (we assumed that they had non-discretionary dental problems) was almost the same, regardless of urban or rural locale.

Previous studies that examined the relationship between insurance types and health service utilization in Korea are scanty and regarded only the medical field (46). A study reported that although regional plan holders were more likely to use public health centers, there was no significant difference in outpatient health service utilization between holders with regional insurance plan and those with an employment-based plan (46). This finding was inconsistent with the current study which suggests that holders of an employment based plan used more dental care as a whole but went through higher income related horizontal inequalities than those insured under a regional plan. A feasible explanation regarding higher dental inequalities among those insured by an employment based plan may be that the proportion of low-income to total population was relatively higher among employment based health plan holders (34) compared to regional plan holders. The job conditions of manual laborers, which largely consisted of group projects that were controlled by a scheduled process, made it difficult for workers to take

time off to visit a health care organization (35). In addition, Moon (36) reported that inequalities in the number of physician visits amongst those insured by a regional plan were low, often reversed into favoring the poor. The combined effects of rurality and an employment based health plan made for the highest health inequality in favor of high-income groups, while the HI_{uv} of urban regional plan holders was negative despite being non-significant.

This study had several limitations despite the application of an appropriate survey design, weighting scheme, and count data analysis to increase statistical power. First, health inequality could not be explained by differential access to care if health disparities were a result of differences in the quality of care. Second, omitted variables were of further concern. Two types of variables were omitted; variables related to dental care users and providers. The variables used for standardizing individual health status in this study do not fully incorporate respondents' health status or desire for health care. Illness severity and functional status belong to these categories. Provider characteristics are critical factors that affect dental utilization. These include the demographic and income-leisure characteristics of dental professionals. Finally, the effect of health care financing was not considered. The relationship between financing and the level of utilizations was well established. Out-of-pocket payments deter people, especially the low-income population, from seeking available health care services.

In spite of 1998 survey data analysis (after the separation of dental items from KNHS into National Oral Health Survey in 2000, KNHS did not collect any oral related information, which means that 1998 survey is the latest available data in terms of dental utilization), the results of this study have valuable implications for providers, patients, and oral health

policy planners. The fiscal burden of national health insurance has led to the search for new pathways to enhance health system efficiency. In the dental field, recent reforms have appeared to reduce the public financing burden by relying more on out-of-pocket payments, or curtailing coverage for specific age groups (47). Although such dental reform did not occur in Korea, lack of coverage and treatment patterns, which have relied heavily on new procedures and materials, have raised accessibility and equity issues. This study found dental inequality in favor of the more wealthy. Decomposing analyses revealed that the rural low income who were insured, especially by employment-based plans, were the most vulnerable population in terms of horizontal dental inequality. Policy makers and health professionals need to pay special attention to low income rural residents who hold a regional plan and an employment-based plan in terms of accessibility and horizontal inequality, respectively.

References

- Wagstaff A, van Doorslaer E. “Catastrophe and Impoverishment in Paying for Health Care: With Applications to Vietnam 1993~98” *World Bank, Policy Research Working Paper*. 2002.
- Wagstaff A, van Doorslaer E. “Equity in health care finance and delivery” *Culyer, A. J. and Newhouse, J. P. Handbook of health economics* Elsevier Science B.V. 2000:1803~62.
- Dusheiko M, Gravelle H. “Measuring income related inequality in health within general practices” *The University of York, Center for Health Economics Technical Paper Series 22*. 2001.
- van Doorslaer E, Wagstaff A, Bleichrodt H, et al. “Income-Related Inequalities in Health: Some International Comparisons” *Journal of Health Economics* 1997;16(1):93~112.
- Cisse B, Luchini S. “Equity in Health Care Finance and Delivery: What about Africa?” 2002.
- Gerdtham U, Sundberg G. “Equity in the Delivery of Health Care in Sweden” *Scandinavian Journal of Social Medicine* 1998;26(4): 259~64.
- van Doorslaer E, et al. “Equity in the Delivery of Health Care in Europe and the US” *Journal of Health Economics* 2000;19(5):553~83.
- Wagstaff A, van Doorslaer E, Rutten E. “Equity in the finance and delivery of health care: an international perspective” New York: Oxford University Press; 1993.
- Abasolo I, Manning R, Jones MA. “Equity in Utilization of and Access to Public-Sector GPs in Spain”. *Applied Economics*. 2001;33(3): 349~64.

- Ohkusa Y, Honda C. "Horizontal Inequity in Health Care Utilization in Japan" *Health Care Manag Sci.* 2003;6(3):189~96.
- van Doorslaer E, Masseria C. "OECD Health Equity Research Group Members. Income-Related Inequality in the Use of Medical Care in 21 OECD Countries" *OECD Health Working Papers No.14.* 2004.
- Antunes JL, Narvai PC, Nugent, ZJ. "Measuring inequalities in the distribution of dental caries" *Community Dentistry and Oral Epidemiology* 2004;32(1):41~8.
- Korea Ministry of Health and Welfare. "Health and welfare annual report 2001". Korea, MOHW. 2002.
- Kim HC. "Marketing strategies of a dental clinic" Kyeong-Hee University; 2001.
- Choi JS, Nam JJ, Kim TJ. "Health status and utilization in Korea: 1995 national health and health perception survey" Korea Institute for Health and Social Affairs. 1995.
- Kwon SM, Yang BM, Lee TJ, Oh JH, Lee SH. "Inequalities of health care utilization" 2003 Fall Conference. The Korean Health Economic Association. 2003.
- Colombo F, Hurst J. "Review of the Korean health care system" Paris. OECD. 2002.
- OECD. "The Reform of Health Care: A Comparative analysis of seven OECD countries" Paris: Health Policy Studies No. 2. 1992.
- Oxley H, MacFarlan M. "Health Care Reform: Controlling spending and increasing efficiency" Paris: OECD. 1994
- Yu SH, Anderson GF. "Achieving universal health-insurance in Korea - a model for other developing-countries" *Health Policy.* 1992;20(3): 289~99.
- Korean Institute for Health and Social Affairs. "1998 national health and nutrition survey report" Korean Ministry of Health and Welfare. 1999.
- Aronson JR, Johnson P, Lambert PJ. "Redistributive effect and unequal income tax treatment" *The Economic Journal* 1994;104(423): 262~70.
- John McNeil "Shares of income received by quintiles when equivalent income is used as the measure of income" Housing and Household Economic Statistics Division. U.S.Census Bureau 2001.
- van Doorslaer E, Koolman X, Puffer F, "Equity in the use of physician visits in OECD countries: has equal treatment for equal need been achieved? Measuring up: improving health system performance in OECD countries". Smith: OECD; 2002.
- van Doorslaer E, Wagstaff A, Rutten E. *Equity in the finance and delivery of health Care: an international perspective* Oxford Medical Publications; 1993:49~87.
- Gravelle H. "Measuring income related inequality in health and health care: the partial concentration index with direct and indirect standardization" *The University of York, Discussion Papers in Economics No. 2001/17.* 2001.
- Gravelle H, Sutton M. "Income Related inequalities in self assessed health in Britain: 1979~1995" *Journal of Epidemiology and Community Health.* 2003;57(2):125~9.
- Kakwani N, Wagstaff A, van Doorslaer E. "Socioeconomic inequalities in health: measurement, computation, and statistical Inference" *Journal of Econometrics.* 1997;77(1):87~103.
- Jenkins S. "Calculating income-distribution indexes from micro-data" *National Tax Journal.* 1988;41(1):139~42

- Lambert D. "Zero-inflated Poisson regression, with an application to defects in manufacturing" *Technometrics*. 1992;34(1):1~14.
- van Doorslaer E, Jones MA. "Inequalities in self-reported health: validation of a new approach to measurement" *University of York Centre for Health Economics Technical Paper*. 2002.
- Stata Corp. "Stata Statistical Software: Release 8" College Station, TX: Stata Corp LP. 2002.
- Korean Institute of Oral Health Services. National dental health survey 2000. 2001.
- Hong DS, Ku HK. Social stratification and class. Seoul: Dasan; 1993.
- Lee SY. "Predictors affecting inequalities of health care utilization and contribution rate of health care financing" *Social Security Research*. 1997;10:415~47.
- Moon OR, Lee KS, Lee H J, Shin, et al. "Equity in health care service in Korea" *Social Security Research*. 1995;11(1):105~50.
- Kim IJ, Nam CH. "Knowledge and pattern of dental health care of the community people" *The Journal of Korean Society for Health Education*. 1993;10(1):34~60.
- Park MJ, Kam S, Park JY. "Dental care utilization patterns and dental prosthesis of rural residents" *Journal of Korean Public Health Association*. 1991;17(2):20~36.
- Manski RJ, Magder LS. "Demographic and socioeconomic predictors of dental care utilization" *J Am Dent Assoc*. 1998;129(2):195~200.
- Department of Health and Human Services. "Oral health in America: a report of the Surgeon General" *J Calif Dent Assoc*. 2000;28(9):685~95.
- Gilbert GH, Duncan RP, Heft MW, Coward RT. "Dental health attitudes among dentate black and white adults" *Med Care*. 1997;35(3):255~71.
- Lee HS. "A Study of Dental Health Behavior in Chollabuk-Do, Republic of Korea: A path analysis of the utilization of dental services" *Journal of Korean Academic of Dental Health*. 1993;17(1):121~34.
- Isman R, Isman B. *Oral health America white paper: access to oral health services in the United States, 1997 and Beyond*. Robert Wood Johnson Foundation; 1997.
- Andersen, RM. "Revisiting the behavioral model and access to medical care: does it matter?" *J Health Soc Behav*. 1995;36(1):1~10.
- Gilbert GH, Shelton BJ, Chavers LS, Bradford EH. "The paradox of dental need in a population-based study of dentate adults" *Med Care*. 2003;41(1):119~34.
- Han CH, Hwang BD. *An analysis on the health care utilization by examination into literature [3]*. Institution of Health and Welfare, Kyeong San University. Health and Welfare Studies: 183~198. 1999.
- Saltman RB, Busse R, Mossialos E. *Regulating entrepreneurial behavior in European health care systems*. Buckingham: Philadelphia; 2002:215~31.

Summary

치과의료이용의 형평성

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본 연구는 18세 이상 인구를 대상으로 치과의료 이용의 수평적 형평성과 정책관련 인자의 치과의료 이용 형평성에 미치는 영향도를 분석한다. 수평적 건강불평등은 추정치와 실제 의료 이용간의 차이를 살펴보는 것이다. 1998년 국민건강영양조사를 사용하였고(자료 크기 9183명) 영과잉 음이항분석법(Zero-inflated negative binomial estimation)을 사용하여 건강수준 조정 후 치과의료 이용도를 예측하였다.

치과의료 이용 니드를 표준화하기 위하여 나이, 성별 등의 인구학적 변수와, 일상생활 활동의 제한 여부, 응답자 평가 건강 수준, 구강건강 상태 및 관련행위 등의 변수를 사용하였다. 구강건강의 표준화는 의치장착여부와 잇솔질 행위로 측정하였는데, 의치 장착여부는 구강건강 수준의 대리값으로, 치솔질 시기와 횟수는 구강건강 증진 행위의 대리값으로 사용하였다. 또한 각 가구의 수입정도를 가구원의 효용값으로 환산하기 위하여 각 가구 구성원 수와 구성원들의 나이를 고려한 OECD 등가변환식(equivalence scale)을 이용하였다.

의료이용의 수평적 형평성은 집중계수를 이용하여 측정한다. 집중계수는 다양한 방법으로 구해질 수 있으나 본 논문에서는 카와니(Kakwani)가 제안한 방식을 따른다. 연구자료를 아래의 식으로 변형하여 선형회귀식을 산출할 경우 수입변수의 계수값이 해당 의료이용의 집중계수 값이 되는 방식이다.

$$2\sigma_R^2 \left[\frac{y_i}{\mu} \right] = \gamma + \beta_C R_i + e_i,$$

σ_R^2 는 가구 수입(R_i , 소득 수준을 상대적 순위로 나열한 것)의 분산, i_i 는 개개인의 치과의료 이용 횟수, μ 는 y_i 의 총 평균을 의미한다. 수평적 형평성 HI_{wv} 는 다음 식으로 구한다

$$HI_{wv} = 2 \int_0^1 [V_D(r) - V_N(r)] dr = C_D - C_N,$$

일반 의료이용(입원 및 외래)과는 달리 소득수준이 높을수록 자신의 구강건강 니드 보다 더 많은 구강보건자원을 이용하는 것으로, 농촌지역보다 도시지역이, 직장 가입자가 지역가입자들보다 치과방문 횟수가 많았다. 농촌지역에서 나타나는 치과의료자원의 부족과 저학력 노년층의 존재가 전반적으로 치과의료 이용의 저하를 가져오기는 하지만 2번 이상 치과치료를 이용하는(비선택적 진료) 행태는 농어촌 도시의 구분이 없는 것으로 조사되었다.

기본적 치과치료에 대한 의료보장으로 급성 치과치료의 접근성은 일정 정도 보장되었다고 보여지나 급성 치과치료 이외의 진료는 충족되어지지 못하거나 미루어지고 있다. 이는 치과의료 이용에서 수평적 불평등을 강화하는 요인으로 작용하는데 지역의료보험 가입자의 경우 직장가입자들보다 상대적 의료 불평등이 덜한 것으로 조사되었다.

치과의료 이용에 영향을 주는 인자들 중에서 지역적 요인(농어촌 지역)과 보험형태(직장가입자)의 두 영향이 결합되는 경우 불평등은 더욱 심각해지는 것으로 나타났다. 농어촌지역의 직장가입자들에서 가장 심각한 치과의료이용 불평등이 존재하고 반대로 도시지역 지역가입자들간의 치과의료 불평등은 가장 적었다.

본 연구는 의료의 양적 불평등을 조사한 것으로 치과진료의 질적 차이를 반영하고 있지 못하다. 동시에 의료이용에 영향을 미칠 수 있는 의료공급자의 특성과 건강수준이 충분히 반영되어 있지 않다. 치과진료에서 나타나는 불평등을 극복하기 위하여 치과의료의 접근성이 시급히 개선되어야 한다. 특히 농어촌 지역의 치과의료자원의 부족은 우선적으로 해결되어야 하며 고가의 치과치료가 급여될 수 있도록 급여범위를 확대해 나가야 한다.