The Role of Employment Relations in Reducing Health Inequalities

INEQUALITIES IN MEDICAL CARE UTILIZATION BY SOUTH KOREAN CANCER PATIENTS ACCORDING TO INCOME: A RETROSPECTIVE COHORT STUDY

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This study explores income inequalities in the utilization of medical care by cancer patients in South Korea, according to type of medical facilities and survival duration. The five-year retrospective cohort study used data drawn from the Korean Cancer Registry, the National Health Insurance database, and the death database of the Korean National Statistical Office. The sample consisted of 43,433 patients diagnosed with cancer in 1999. The authors found significant quantitative inequalities as a function of income in the patients' utilization of medical care. Cancer patients from the highest income class used inpatient and outpatient care more frequently than did patients from the lowest income class. Those with higher incomes tended to use more inpatient and outpatient services at major tertiary hospitals, which were known as providing better medical care than other types of hospitals and clinics. Moreover, horizontal inequality in cancer-care expenditures favoring those with higher incomes was observed during earlier periods of treatment. In conclusion, income substantially affects the utilization of inpatient and outpatient services, amount of medical expenditures, and type of medical facilities.

Cancer is the leading disease monitored and managed by the national government in South Korea. Approximately 100,000 new cases and 60,000 deaths are attributed to cancer each year, and increases in incidence and mortality rates related to this disease have been reported (1, 2). Accompanying the rapid economic growth in Korea during the past several decades there has been a rapid expansion in the

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public health insurance system. Currently, 97 percent of Koreans are covered by National Health Insurance (NHI), and the remaining 3 percent are covered by the Medical Aid Program. Despite government efforts to achieve equality in medical care utilization through the implementation of universal NHI, continuing inequality in care has been reported (3–5). Although this type of inequality in medical care utilization has been observed in the United Kingdom, Canada, Finland, and Sweden, where universal coverage provides the majority of health care for the population (6–8), this problem may be more severe in South Korea because of the lower level of NHI benefits compared with these other countries.

Previous studies have demonstrated an association between socioeconomic status (SES) and cancer mortality and survival time, with higher mortality rates and shorter survival periods more prevalent in lower SES groups (9–15). Other studies have also reported socioeconomic inequalities in the utilization of preventive services (e.g., cancer screening) (16–18) and treatment (e.g., chemotherapy or surgery) (19–22). Medical outcomes are obviously influenced by the quality of medical care, which may in turn be affected by the type of medical facilities used for care. For this reason, it is important to examine which types of medical facilities (in terms of primary, secondary, or tertiary; size; and quality) are used by cancer patients in different income classes.

Disparities according to SES in the types of medical facilities used by cancer patients with similar survival times could indicate quality differences in the medical services provided, which in turn could affect patients' survival. Specifically, if medical services were used on the basis of economic status rather than medical needs, and if medical facilities were distributed according to the mechanisms of the market rather than the need for health care, the risk for socioeconomic disparities would increase.

To our knowledge, no studies have addressed inequalities according to income in the utilization of different types of medical facilities by cancer patients. Though past research has examined inequity in the utilization of inpatient cancer services by type of medical facilities (23), the results were limited by inaccurate diagnosis, short period of observation (1 year), and a single study location. Furthermore, no studies have examined differences according to income in the utilization of medical care as a function of survival time.

The purpose of this study was to identify inequalities according to income in the utilization of cancer medical care and to discuss the implications of such disparities for the Korean NHI system in terms of equal access to medical facilities and equity in financing.

MATERIALS AND METHODS

Data

South Korea has maintained a representative population-based cancer registry since 1999. Our study sample consisted of 43,433 cancer patients drawn from the

population of the regionally insured of the NHI. These subjects were selected from 95,869 cancer patients registered in the National Cancer Registry in 1999. Those insured by the South Korean NHI are classified into two populations: the regionally insured and the employee insured. Because data on the NHI year-end contributions in 1998 were criticized for inaccurately reflecting household income (23), we eliminated the employee insured from our sample and limited it to the regionally insured, which represented about 50 percent of the entire South Korean cancer population in 1999. Since 1989, when the Korean government instituted the universal health insurance system, all medical facilities have been statutorily bound to maintain contact with the National Health Insurance Corporation and to provide complete information about the medical services offered at their respective facilities.

To analyze patterns of medical care utilization by income class, we merged the National Cancer Registry database, the NHI claims and eligibility database, and the death data recorded by the Korean National Statistical Office, and used patient registration numbers to link related information. Patients' income status was obtained from the NHI eligibility database. Medical care utilization data from January 1, 1999, through June 30, 2005, were obtained from the NHI benefit database, and death data from 1999 to 2004 were obtained from the Korean National Statistical Office.

Independent and Dependent Variables

Income Class. NHI contribution is a useful surrogate index for actual household income, because it is calculated based on the income, property, and private auto taxes of each household. All household members of the regionally insured group were classified into quintiles from lowest to highest, based on their NHI contribution in 1998. Likewise, all study subjects were classified into these five income classes according to the NHI contribution of their household.

Medical Needs. We used survival time to gauge the medical needs of cancer patients, because there was no cancer stage information in the Korean National Cancer Registry database. We assumed that cancer patients with comparable survival periods would experience symptoms of comparable severity and thus could be classified into the same category of severity. We defined survival period as the length of time between diagnosis and death, and categorized survival time into six groups: <3 months, 3–6 months, 6–12 months, 1–3 years, 3–5 years, and >5 years.

Comorbid Disorders. Because the utilization of medical services varies depending on the existence of comorbid disorders, Charlson's comorbidity index (24) (based on ICD-10 classifications) was calculated from the NHI claim database and classified into scores of 0, 1, and ≥2.

Geographic Regions. Geographic regions were classified as metropolitan, urban, or rural, according to patients' place of residence at time of diagnosis.

Medical Facilities. For this study we classified medical facilities into (*a*) clinics and small hospitals, (*b*) general hospitals, (*c*) tertiary hospitals, and (*d*) four major hospitals. Clinics are small private medical facilities that are devoted to outpatient care and are equipped with up to 30 beds. Small hospitals are equipped with more than 30 beds. General hospitals provide specialist care, with more than 100 beds. Tertiary hospitals, which are usually affiliated with universities, are general hospitals that maintain a certain standard of quality of care, perform research, and also act as teaching facilities. The four major hospitals are tertiary facilities that provide especially excellent medical care and are preferred by patients with serious diseases such as cancer (25).

Medical Care Utilizations and Expenditures. Medical care utilization was defined as the number of inpatient and outpatient visits. Medical care expenditures were defined as the total amount of NHI benefits for medical services from the time of diagnosis to the time of death or to June 2005; this figure excluded expenses paid by patients for medical services not covered by the NHI (certain expensive new drugs or technologies, private rooms, etc.).

Measuring Inequalities

We used the concept of horizontal equality, which refers to equal access for equal needs, to measure inequalities in medical care utilization (26). Horizontal equality in medical care utilization by cancer patients was calculated with the concentration index, a commonly used measure of income-related inequality in health and health care (27). The concentration index results from a bivariate distribution of health and social group ranking. The index is derived from the concentration curve $L(s)$, which graphs the cumulative proportion of health against the cumulative proportion of the population ranked by SES (Figure 1). The concentration index (CI) is defined by twice the area between the concentration curve and the line of equality (the diagonal): $CI = 1 - 2\int L(s)ds$. If poor health is concentrated in the lower socioeconomic group, the health concentration curve is located below the diagonal (as shown). The index is defined as positive when the concentration curve falls below the diagonal and negative when it falls above the diagonal. The concentration index ranges between –1 and +1. In the absence of income-related inequality in health care (concentration index = 0), the concentration curve coincides with the diagonal. A positive concentration index indicates pro-rich inequality, and a negative concentration index indicates pro-poor inequality.

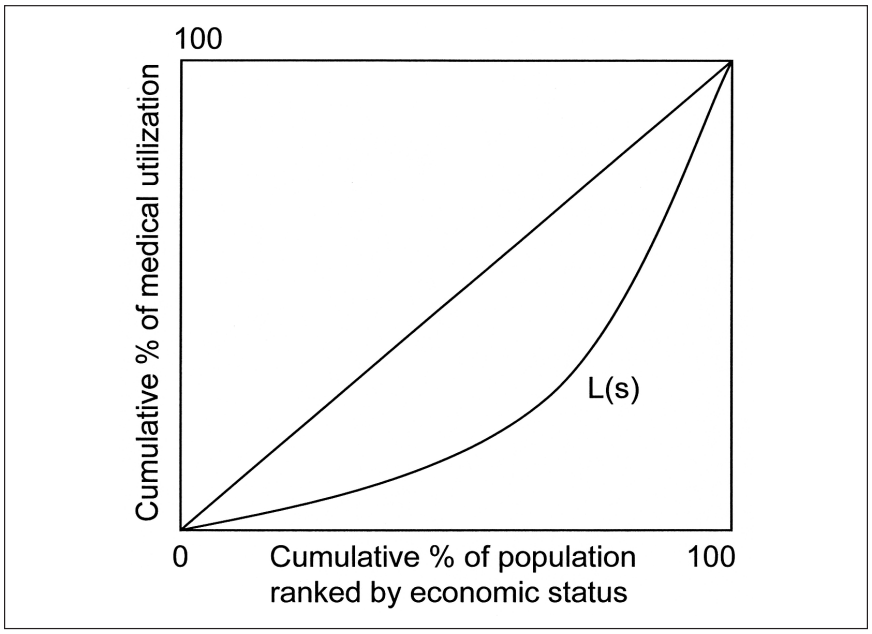

Figure 1. Health concentration curve.

Statistical Analysis

We computed need-expected utilization and expenditure with a generalized linear model (GLM) including the full set of explanatory variables for all cancer patients in this study. Need-expected utilization and expenditure refers to the quantity and cost of the medical care used by cancer patients and calculates whether patients with the same needs are, on average, treated equally. We used age, region, comorbidity, and survival time during each survival period as predictors of need for care. Our concentration index was calculated based on needs-standardized medical care utilization and expenditures, which was adjusted with the aforementioned covariates using a GLM.

RESULTS

Characteristics of Cancer Patients

Of the 43,433 patients in the study, 24,461 were male and 18,972 were female (Table 1). Cancer was most prevalent in men and women aged 55–64 (27.22%). The lowest income class included the greatest number of cancer patients (24.32%). The six leading cancer sites were stomach (20.06%), liver (13.47%),

Table 1

Characteristics of cancer patients in the study sample

	Total		Male		Female	
	n	(%)	n	(%)	n	(%)
Total	43,433	(100.00)	24,461	(100.0)	18,972	(100.00)
Age group, yrs						
<35	3,234	(7.45)	1,272	(5.20)	1,962	(10.34)
35–44	6,601	(15.20)	2,820	(11.53)	3,781	(19.93)
45–54	8,869	(20.42)	5,077	(20.76)	3,792	(19.99)
55–64	11,822	(27.22)	7,715	(31.54)	4,107	(21.65)
65–74	8,656	(19.93)	5,218	(21.33)	3,438	(18.12)
≥75	4,251	(9.79)	2,359	(9.64)	1,892	(9.97)
Region						
Metropolitan	18,286	(42.10)	9,751	(39.86)	8,535	(44.99)
Urban	17,142	(39.47)	9,613	(39.30)	7,529	(39.68)
Rural	8,005	(18.43)	5,097	(20.84)	2,908	(15.33)
Income class						
I (lowest)	10,563	(24.32)	5,387	(22.02)	5,176	(27.28)
II	7,023	(16.17)	4,055	(16.58)	2,968	(15.64)
III	7,581	(17.45)	4,403	(18.00)	3,178	(16.75)
IV	8,339	(19.20)	4,797	(19.61)	3,542	(18.67)
V (highest)	9,927	(22.86)	5,819	(23.79)	4,108	(21.65)
Type of cancer						
Stomach	8,712	(20.06)	5,736	(23.45)	2,976	(15.69)
Lung	5,370	(12.36)	3,980	(16.27)	1,390	(7.33)
Liver	5,849	(13.47)	4,514	(18.45)	1,335	(7.04)
Colon and rectum	4,076	(9.83)	2,186	(8.94)	1,890	(9.96)
Breast	2,785	(6.41)	17	(0.07)	2,768	(14.59)
Cervical	2,351	(5.41)	0	(0.00)	2,351	(12.39)
Other	14,290	(32.90)	8,028	(32.82)	6,262	(33.01)
Comorbidity						
0	20,865	(48.04)	10,346	(42.30)	10,519	(55.44)
1	15,793	(36.36)	9,426	(38.53)	6,367	(33.56)
2+	6,775	(15.60)	4,689	(19.17)	2,086	(11.00)

lung (12.36%), colon and rectum (9.83%), breast (6.41%), and uterine cervix (5.41%). The Charlson's comorbidity index score distribution was as follows: 48.04 percent at 0, 36.36 percent at 1, and 15.60 percent at ≥2. Scores were higher in male subjects.

We calculated the observed cancer survival rate by income class according to survival time (Table 2). For men, the 5-year observed survival rate was lowest in the lowest income class and highest in the highest income class, and the gradient by income class was prominent. For women, the difference between the lowest and highest income classes in terms of 5-year observed survival rate was similar to that for men, but the gradient strength by income class was weaker than that observed for men.

Inequality in Numbers of Hospitalizations and Outpatient Visits by Income Class

Less frequent hospitalization was observed for men and women with lower incomes. Whereas the number of tertiary hospitalizations decreased in this group, the number of general hospitalizations increased, especially in the lowest income group (Table 3). We also observed a prominent difference among income classes in the numbers of hospitalizations at the four major hospitals (p for trend < 0.001). In contrast, the number of hospitalizations at general hospitals

Table 2

Proportion of observed cancer survivors according to survival time, by gender and income class

		Percentage surviving				
Income class	No.	3 months	6 months	1 year	3 years	5 years
Male						
I	5,387	75.00	62.32	47.25	29.10	24.04
II	4,055	77.95	65.30	51.22	34.10	29.05
III	4,403	81.13	68.36	54.32	36.51	30.90
IV	4,797	80.97	68.66	55.61	37.04	31.52
V	5,819	84.51	74.29	61.94	43.42	37.84
Female						
I	5,176	87.45	79.62	71.02	57.14	52.35
II	2,968	91.00	85.18	76.99	63.96	58.88
III	3,178	90.32	84.57	77.64	65.65	60.68
IV	3,542	89.50	83.46	76.05	63.04	58.53
V	4,108	91.00	84.67	77.37	65.72	60.81

Table 3

Concentration indices for total medical care utilization by income class, according to gender and type of medical facilities

	Male					Female				
		Tertiary					Tertiary			
Income class	Total	Four major	Others	General	Small and clinics	Total	Four major	Others	General	Small and clinics
Hospitalizations										
I (lowest)	5.42	0.95	2.04	2.00	0.42	6.00	0.98	2.27	2.37	0.36
II	5.49	0.96	2.27	1.86	0.39	6.21	1.06	2.43	2.33	0.38
III	5.62	1.09	2.41	1.71	0.39	6.10	1.11	2.46	2.14	0.37
IV	5.79	1.17	2.59	1.62	0.39	6.20	1.23	2.54	2.04	0.37
V (highest)	5.91	1.75	2.39	1.40	0.35	6.29	1.58	2.45	1.87	0.37
p for trend	<0.001	<0.001	<0.001	<0.001	0.017	0.078	<0.001	0.008	<0.001	0.947
CI	–0.017	0.085	–0.002	–0.099	–0.063	0.033	0.112	0.041	–0.018	0.029
Outpatient visits										
1 (lowest)	14.47	2.57	5.20	4.82	1.86	19.69	3.43	7.62	6.59	2.05
II	14.78	2.69	6.02	4.20	1.86	19.93	3.62	8.14	6.19	1.97
III	15.15	3.00	6.19	3.98	1.96	20.32	3.69	8.78	5.83	2.04
IV	15.53	3.26	6.75	3.59	1.92	20.44	4.18	8.72	5.61	1.91
V (highest)	16.25	5.21	6.34	2.80	1.88	21.11	5.79	8.53	4.66	2.11
p for trend	<0.001	<0.001	<0.001	<0.001	0.756	<0.001	<0.001	<0.001	<0.001	0.400
CI	–0.023	0.092	–0.008	–0.137	–0.041	0.036	0.119	0.045	–0.034	0.026

Note: CI: concentration index; positive and negative concentration indices indicate pro-rich and pro-poor distributions, respectively. Tertiary: tertiary hospitals (university hospitals in Korea). Four major: the four major hospitals (the best university hospitals in Korea). General: general hospitals (medium-sized hospitals in Korea). Small and clinics: small hospitals and doctors' offices.

increased as income decreased (p for trend < 0.001). Inequality in inpatient care favoring the better-off was evident at the four major hospitals, and inequality in inpatient care favoring the worse-off was evident at the general and small hospitals and the clinics.

Similar to the pattern for inpatient care, the overall utilization of ambulatory (outpatient) care was lower for men and women with lower incomes (see Table 3). Among both female and male patients, the number of class IV or below ambulatory visits to the four major hospitals was lower than the number of class V visits to these facilities (p for trend < 0.001). Inequality favoring the worse-off was seen in general hospitals (p for trend < 0.001).

Our analysis by income class showed that the concentration indices for inpatient and outpatient visits to the four major hospitals were positive and that those for general hospitals were significantly negative for both men and women. Thus, patients in the higher income group had a greater likelihood of receiving inpatient and outpatient cancer care at the best hospitals (i.e., the four major hospitals). In contrast, patients, especially men, in the lower income class were more likely to use lower-quality hospitals (i.e., general hospitals).

We calculated the concentration indices for hospitalizations and outpatient visits based on survival period (Table 4). For men, total utilization of both inpatient and outpatient services favored the higher income groups until 12 months of survival. For women, the higher income groups were favored throughout the entire survival period.

The distribution of concentration indices for hospitalizations and outpatient visits by survival period differed according to the type of medical facilities. The concentration indices for the number of hospitalizations at the four major hospitals were significantly positive for men, with the exception of men who survived for periods greater than 3 years. These indices were also almost all positive for other tertiary hospitals. However, these figures were much closer to zero for men than for women. The indices for the number of hospitalizations in general hospitals were almost all negative, with the exception of men who survived for up to 3 months. The indices were almost all positive for women, with the exception of those with more than 5 years of survival.

The concentration indices for the number of outpatient visits to the four major hospitals by survival period were also positive, with the exception of men with greater than 5 years of survival. The indices for the number of outpatient visits to other tertiary hospitals were almost all positive; the exception was for men with certain durations of survival (1–3 yrs and 5+ yrs). The indices for these tertiary hospitals were closer to zero than were those for the four major hospitals. The indices for the number of outpatient visits to general hospitals were almost all negative, with the exception of men with up to 3 months of survival. With the exception of women who had survived for 1 year, these indices were all positive for women.

Table 4

Concentration indices for total medical care utilization by income class, according to gender, type of medical facilities, and survival period

	Male					Female				
		Tertiary			Small and		Tertiary			Small and
Survival period	Total	Four major	Others	General	clinics	Total	Four major	Others	General	clinics
Hospitalizations										
0–3 months	0.074	0.237	0.085	0.028	0.038	0.085	0.132	0.085	0.077	0.058
3–6 months	0.036	0.179	0.043	–0.030	–0.021	0.073	0.203	0.096	0.021	0.006
6–12 months	0.039	0.180	0.041	–0.036	–0.016	0.083	0.139	0.099	0.025	0.109
1–3 yrs	–0.014	0.127	0.002	–0.122	–0.053	0.073	0.184	0.060	0.022	0.082
3–5 yrs	–0.035	0.001	–0.001	–0.159	–0.086	0.081	0.137	0.095	0.004	0.040
+5 yrs	–0.123	–0.061	–0.106	–0.196	–0.173	0.041	0.120	0.056	–0.012	0.043
Outpatient visits										
0–3 months	0.057	0.155	0.049	0.030	0.046	0.082	0.126	0.077	0.083	0.075
3–6 months	0.012	0.140	0.015	–0.134	–0.013	0.069	0.185	0.068	0.017	0.066
6–12 months	0.027	0.194	0.019	–0.045	–0.008	0.075	0.221	0.063	0.017	0.073
1–3 yrs	–0.019	0.131	–0.011	–0.144	–0.025	0.069	0.180	0.070	–0.003	0.051
3–5 yrs	–0.020	0.123	0.013	–0.188	–0.009	0.062	0.134	0.084	–0.014	0.045
+5 yrs	–0.098	0.005	–0.077	–0.216	–0.127	0.009	0.090	0.021	–0.063	0.000

Note: Positive and negative concentration indices indicate pro-rich and pro-poor distributions, respectively. Tertiary: tertiary hospitals (university hospitals in Korea). Four major: the four major hospitals (the best university hospitals in Korea). General: general hospitals (medium-sized hospitals in Korea). Small and clinics: small hospitals and doctors' offices.

Table 5

Concentration indices for total medical care expenditure by income class according to gender and survival period

Gender	Overall	0–3 months	3–6 months	6–12 months	1–3 yrs	3–5 yrs	+5 yrs
Male	0.0054	0.1258	0.0737	0.0624	–0.0077	–0.0356	–0.0981
Female	0.0415	0.1144	0.0983	0.0830	0.0730	0.0630	–0.0107

Note: Positive and negative concentration indices indicate pro-rich and pro-poor distribution, respectively.

Inequality in Total Medical Care Expenditures per Cancer Patient by Income Class

Table 5 shows the concentration indices for total medical care expenditures by income class according to survival period. For men, the indices were positive until 12 months of survival and were negative thereafter. For women, the indices were positive until 5 years of survival. These results suggest a horizontal inequality favoring the better-off in terms of cancer-care expenditures during earlier periods of cancer treatment (i.e., the most critical time period).

DISCUSSION AND CONCLUSION

This study used data obtained from South Korea's National Cancer Registry database, National Health Insurance claim and eligibility database, and death database of the National Statistical Office to analyze income-related disparities in the utilization of medical care by patients diagnosed with cancer in 1999, over a five-year period. The study showed significant income-related inequalities in medical care utilization, despite the NHI system's emphasis on universal and equal access to health care. In this retrospective cohort study using nationwide data from the time of diagnosis to 5 years of survival, we found that tertiary hospitals and the four major hospitals, which offer high levels of care, were more likely to be used by patients from higher income classes, whereas general hospitals were more likely to be used by patients from lower income classes.

Previous studies have reported inequality in health care utilization according to patients' health insurance status. Sabatino and colleagues (20) reported that unmet needs for care were more common among uninsured survivors than among insured survivors in the United States. In addition, Thorpe and Howard (19) found significant differences between uninsured and insured cancer patients in spending and health care utilization. Health care spending for uninsured cancer patients

represented only 55 percent of that for privately insured patients. Furthermore, the use of health care services was much lower for uninsured cancer patients than for patients with Medicare, Medicaid, or private insurance. Socioeconomic inequalities have been demonstrated not only in the United States, with its privatized health care system, but also in the United Kingdom and Canada, where the entire population is covered by universal systems (6, 7).

With respect to the association between type of medical facilities and treatment outcome, evidence has suggested that high-quality hospitals with higher volumes of procedures have lower mortality rates associated with cancer-related surgery (4, 28, 29). For example, Simunovic and colleagues (30) reported that higher volumes of hospital procedures were correlated with long-term survival among cancer patients in Ontario, Canada. Although previous studies have shown an association between type of medical facilities and patient outcome, no previous studies have examined differences in the utilization of medical care provided by different types of medical facilities, according to patient income.

If economic barriers interfere with the ability of cancer patients to use medical facilities that offer the most appropriate treatment for the severity of their symptoms, survival may be affected. Thus, we can expect higher survival rates in major tertiary hospitals that offer excellent medical care. Our study showed that patients in lower income classes used the well-known major tertiary medical facilities significantly less, and this may have affected their survival rates. Boyd and coauthors (31) explained that the shallow association between SES and cancer survival in Ontario was partly due to the success of the Canadian medical system in removing financial barriers to access to medical care.

Why, then, does South Korea demonstrate inequalities in the utilization of medical care for cancer as a function of income? Although South Korea has universal health care, it does not provide appropriate medical services based on patients' needs. Instead, this system is more likely to operate on the basis of market mechanisms related to economic demands and purchasing power. South Korea's health care system is characterized by a predominance of private providers in the delivery system and lower public expenditures in the financing system. These two factors have exposed South Korea's health care system to greater market forces.

Despite rapidly increasing health care demands and expansion of the NHI, the Korean government has neglected direct investment in health resources and has instead depended on the mobilization of private resources in response to market mechanisms (32). Number of public beds as a proportion of all hospital beds is 96.0 percent in the United Kingdom, 53.1 percent in Germany, and 33.7 percent in the United States. However, in South Korea the proportion is even lower than in the United States, at 17.5 percent (33). The dominance of the private sector in health care provision has led the Korean health care system to exhibit free market characteristics (34).

Public expenditure as a proportion of total health care expenditure in 2005 was 81.9 percent in the United Kingdom, 77.0 percent in Germany, 82.7 percent

in Japan, and 54.4 percent in South Korea (35). Despite universal coverage by the NHI system, co-payments represented 36.9 percent of total health care expenditures in South Korea in 2004 (35). This figure is much higher than the 20.5 percent OECD average. Furthermore, the rate of out-of-pocket payments by cancer patients differed according to medical facilities: 52.2 percent in tertiary hospitals, 45.6 percent in general hospitals, 49.2 percent in small hospitals, and 38.4 percent in clinics. According to a 2004 survey, among Korean cancer patients, out-of-pocket expenses covered by the NHI reached 50.4 percent (36). As a result, 63.7 percent of the population has more than one private health insurance plan, and the total premiums for private health insurance amount to nearly half of total contributions to the NHI scheme (37). In fact, the increasing private sector activity might outpace public sector capacity. The growth of the private health insurance market has been a barrier to expanding the NHI benefits package in South Korea. In particular, access to highly specialized centers such as major hospitals or tertiary hospitals is extremely difficult for the poor, because out-of-pocket payments in these hospitals are significantly higher than those in other facilities.

Limitations of the Study

Our study has some limitations. First, we did not classify the severity of cancer according to stage, which is the variable most consistently associated with survival. Although stage is the most important factor affecting the medical needs of cancer patients, no information on this variable was available in the Korean Cancer Registry until 2007. Thus, we assumed that cancer patients with the same survival duration had similar levels of symptom severity, and we grouped patients according to survival period instead of stage to address issues of severity.

Second, total NHI expenditures for medical care do not represent total medical costs for cancer patients. Total medical care expenditures are calculated by combining the amount paid by the NHI with the co-payments statutorily required from patients using NHI-covered medical services. Therefore, the total medical expenditures of the NHI do not include money spent on medical services not covered by the NHI. In 2004, costs not covered by NHI accounted for 32.7 percent of total medical expenditures (36). Thus, the calculation of total expenditures for medical care, including the costs of medical services not covered by the NHI, entails multiplying total medical expenditures by the NHI by 1.49.

Third, we used insurance contributions as a proxy for income. Although the NHI contributions of the self-employed insured group are calculated primarily on the basis of the insured person's properties, income, motor vehicles, age, and gender, these contributions do not represent actual income, given the practice of underreporting income. Because this practice is probably more prevalent among those with higher incomes, the income of these groups may be an underestimate.

Finally, we did not consider initial, pre-diagnosis health status of cancer patients, because such information was not available in the Korean Cancer Registry. Thus, we assumed that the initial health status of cancer patients was identical irrespective of income class.

Conclusion

This study reveals inequalities in medical care utilization among cancer patients of varying incomes in South Korea. Hart previously described the inverse care law as follows: "The availability of good medical care tends to vary inversely with the need for it in the population served." Hart also emphasized that "this operates more completely where medical care is most exposed to market forces, and less so where such exposure is reduced" (38, 39). Despite South Korea's universal NHI system, and the proposed government task force attempting to provide universal high-quality treatment to meet the needs of cancer patients regardless of income status, our findings suggest the existence of "inverse care" in the utilization of medical services by cancer patients as a function of income.

We recommend the implementation of a national strategy to transform the current health care system into one that is less influenced by market forces, so as to achieve equality in the provision and financing of cancer medical care.

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