

Effects of a Medical Aid program on medical utilization patterns for low-income patients with affective disorder in Seoul

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Abstract

Mental illness has been increasing globally and its global burden of disease has reached a significant level, and urban dwellers have more chances of having worse mental health status due to high population density, isolated social networks. In Korea's medical security system, Medical Aid (MA) program and National Health Insurance (NHI), patients covered by MA pay much smaller out-of-pocket payments for outpatient services because of exempt from hospitalization fees. However, as a result of focusing on improving access to medical services for the urban poor due to lower out-of-pocket payment, their healthcare costs have greatly increased, while their health management has thus far been inadequate. In light of the background, this study investigated the differences in patterns of medical utilization among affective disordered patients covered by the MA program and the NHI system respectively.

Data used for this study were extracted from customized health information data from the National Health Insurance Service (NHIS). The data source used in this study, customized claims data from the NHIS, is census data, which strengthens the representativeness and reliability of the study results. A total of 6754 inpatients (MA: 3327 and NHI 20%: 3327) diagnosed with the affective disorder were retrieved by Propensity Scores Matching (PSM).

The length of stay of MA beneficiaries was found to be longer than that of NHI enrollees. However, the rate of hospital emergency room visits by NHI enrollees was higher than that of MA beneficiaries.

Overall, community-based interventions are required to prevent and treat mental health by providing primary medical care in the community, and linking with mental health centers. Such policies will ultimately improve the financial sustainability of medical security systems.

Abbreviations: CCI = Charlson Comorbidity Index, DRG = Diagnosis-related Group, HIRA = Health Insurance Review & Assessment Service, LOS = length of stay, LTC hospitals = long-term care hospitals, MA = Medical Aid, NHI = National Health Insurance, NHIS = National Health Insurance Service, OOP = out of payment, PSM = Propensity Scores Matching, SMHs = Seoul Metropolitan Hospitals, YLDs = years were lived with disabilities.

Keywords: affective disorders, healthcare utilization, length of stay, Medical Aid, urban poor

1. Introduction

Mental illness has been increasing globally and its global burden of disease has reached a significant level. It is predicted that in the future, one in two people will suffer from mental illness at least once in their lifetime, while one in five people of working-age will suffer from mental health difficulties.^[1] The most known mental illness is affective disorder, including

depression, and as of 2015, approximately 322 million people, or 4.4% of the world's population, suffer from depression, an increase of 18.4% compared to 2005.^[2] As well as being a known major contributor to suicide,^[3] depression also leads to considerable losses in health and functioning. In 2015, over 50 million years were lived with disabilities (YLDs) globally caused by depressive disorders, and depression is ranked as the single largest contributor of all YLDs, at 7.5% of non-fatal

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health loss. Since mental illness leads to direct medical cost, social isolation, and income loss,^[4,5] it is not only an individual problem but also represents a social and economic burden in the long term. Unfortunately, the prevalence rate of depression in Korea is 4.1%, the highest in the WHO Western Pacific Region together with Australia and New Zealand, and the YLD due to depression is 325,944 years, or 7.3% of the Total YLD in Korea.^[5]

Meanwhile, urban dwellers are generally more likely to have worse mental health status than rural dwellers due to the negative impact on the mental health of high population density, pollution, high levels of violence, and isolated social network increases.^[6,7] In particular, low-income urban dwellers are more likely to experience environmental and psychological problems that exacerbate their mental disease.^[8,9] As of 2018, the experience rate of depressive symptoms in Seoul, the capital of the Republic of Korea, was 7.2%.^[10] As mentioned earlier, while the high prevalence rate of depression is a problem in itself, a greater problem is the huge difference in those rates depending on income level. In fact, the gap for depression symptoms experience is approximately twice as large for the highest district (10.8%) as for the lowest (5.1%) in Seoul, Korea.

Korea's medical security system comprises two schemes: Medical Aid (MA) program for the poor and National Health Insurance (NHI) for the remaining population. Patients covered by MA pay much smaller out-of-pocket payments for outpatient services than patients with NHI and, in order to lower the financial barrier, they are exempt from hospitalization fees. However, as a result of focusing on improving access to medical services for the urban poor due to lower out-of-pocket payment, their healthcare costs have greatly increased, while their health management of them has thus far been inadequate. According to previous research, patients covered by the MA program have higher medical utilization, including length of stays and outpatient visits, and poorer health outcomes than NHI patients.^[11–15] Furthermore, isolated and low-income people are more likely to suffer from the worsening severity due to their lack of timely care, and this may, in turn, cause greater medical services usage later on. In 2016, the total cost of medical expenses in Korea was approximately \$61 billion USD, of which medical costs due to mental illness comprised approximately \$4.1 billion USD, or 6.7% of the total. The costs of mental illness paid by the MA program were approximately \$1.1 billion USD, accounting for 28% of total MA expenses. This represents a surprising increase by 52.3% compared to 2009.^[16,17] To effectively manage mental disease like affective disorders, early screening, appropriate medical intervention, and community resource linkage are paramount. Failure to manage patients with the affective disorder early on will make it difficult to later treat these patients and return them to society, thus accruing even greater social costs and resources.

In light of the above, the purpose of this study was to investigate the differences in patterns of medical utilization among affective disordered patients covered by the MA program and NHI respectively. Based on the results, we then provide policy suggestions for low-income patients with affective disorder in urban areas. To identify the impact of the MA program, we investigated the differences of medical utilization between affective disordered patients covered by MA and those covered by NHI, and adjusted comorbidity and its disease severity in the model.

2. Medical Aid program for patient with mental illness in Korea

The MA program is a government medical benefit program in Korea—a public assistance scheme to secure the minimum livelihood for low-income households and to assist self-help by providing medical services. The MA program is primarily focused on National Basic Livelihood Security recipients. The beneficiaries are divided into Types 1 and 2 according to demographic factors, such as age and ability to work. Type 1 MA beneficiaries are those aged under 18 or over 65 who are unable to work. This category also includes people are rewarded for their bravery by being designated as “intangible cultural assets,” people who have been injured or who have died while saving other people or property. Type 2 beneficiaries are those aged between 18 and 65 who are able to work. In Seoul, the ratio of Type 1 to Type 2 beneficiaries is approximately 7 to 3. The two programs offer different medical out-of-pocket expense plans for outpatient/inpatient healthcare services at medical institutions. The out-of-pocket spending of MA beneficiaries is relatively low, ranging from 0% to 15%, compared to NHI enrollees, whose out-of-pocket spending is officially 20% for inpatient healthcare services.^[11]

Meanwhile, since the introduction of the MA program in December 1977, a per-diem payment system, including consultation, admission, meals, medication, and psychotherapy fees, has been applied to patients with mental illness. The per-diem payment is divided into five groups (G1 to G5) depending on the number of neuropsychiatry doctors, neuropsychiatry nurses, and mental health specialists, comprising trained nurses, clinical psychologists, and social workers, per patient. In addition, since 2000, the groups have been further divided into three units to reduce hospital length of stay. Thus, the payment for mental illness in the MA program consists of 15 payment units in total. The per-diem fees for mental illness of MA program in Korea are shown in Table 1.

3. Materials and methods

3.1. Study sample

As described above, Korea has a separate health coverage system for low-income people, but all of their medical information is collected by the National Health Insurance Service (NHIS) corporation just like those who are covered by NHI. Therefore, we used customized health information data from the NHIS to estimate the differences in healthcare utilization derived from health coverage schemes. Customized health information data refers to the health information data that are collected, managed, and maintained by the NHIS to be modified as requested for the purpose of policy and academic research.^[18] The study was

Table 1
Per-diem fees for mental illness of Medical Aid program in Korea.

LOS				
Groups	1–90 d	91–180 d	181–360 d	Over 361 d
G1	44.7	42.4	40.2	40.9
G2	41.2	39.1	37.1	37.7
G3	32.4	30.8	29.2	29.7
G4	28.9	27.5	26.0	26.5
G5	27.0	25.6	24.3	24.7

LOS = length of stay.

approved by the Korea National Institute for Bioethics Policy (KONIBP) Institutional Review Board (IRB No. P01-201703-22-006). These data include the claims data of all patients in Korea and can also be used to estimate patients' economic status based on each patient's health insurance contribution. Since, as census data, these data are nationally representative, reliability is guaranteed. We used customized health information data from 2013 to 2015, and extracted the total number of Affective disorder patients (ICD code 30-F39) among MA beneficiaries and NHI enrollees living in Seoul. Specifically, to ensure a similar economic status between the two groups, we extracted the economically lower 20% of NHI enrollees based on their health insurance contributions, where MA beneficiaries consist of low-income people and the socially vulnerable class. After that, we staged propensity score matching (PSM) to evaluate the effect of the MA program by considering the variables. PSM is widely used in observational studies to reduce selection bias. Observational studies lack randomization; hence, statistical inferences without bias adjustments usually include observed or unobserved effects of covariates.^[19] We included the factors "sex," "age," "residence," and "existence of chronic diseases" in PSM, and estimated the propensity scores for MA patients and the economically lower 20% of NHI patients. We matched one MA patient to one NHI patient (1:1 matching) by using propensity scores. In so doing, this study attempted to grasp the difference in healthcare utilization between MA beneficiaries and NHI enrollees derived from the health coverage scheme. The unit for analysis was disease episode.

3.2. Measurement

3.2.1. Outcome variables. Length of stay (LOS) was calculated as the total number of days for which a patient was hospitalized. To measure the rate of emergency room visits, we referred to clauses and items of claims data, and we considered the rate of patients who paid health expenses for emergency room visits or return visits to other hospitals.

3.2.2. Independent variables. The following individual level variables were included in the analysis: sex (man, woman), age (0–14, 15–44, 45–64, over 65), Diagnosis-related Group (DRG) severity (0, over 1), Charlson Comorbidity Index (CCI), existence of chronic diseases, and health coverage schemes (MA beneficiaries, lower 20% of NHI enrollees). The DRG severity, a putative indicator to classify the severity level of diseases from 0 to 3, is calculated by a DRG Grouper software program in the Health Insurance Review & Assessment Service (HIRA) in Korea. A higher DRG score implies a higher level of disease severity. We reclassified the DRG severity variable into two categories: 0 and over 1. The CCI comprises an evaluation method for disease severity obtained by conducting two steps: giving a weighted value to each of 19 diseases, and revising the sum of weighted values. Generally, the sum of the weighted values is categorized as scores into "0, 1, 2, over 3,"^[20–22] and the severity level of a patient's disease can be estimated from the CCI scores, where a higher score indicates a higher level of disease severity. The CCI includes the following diseases: myocardial infarction, congestive heart failure, peripheral vascular and cerebrovascular disease, dementia, chronic pulmonary disease (mild, severe-moderate), connective tissue disorders, gastric and gastrojejunal ulcers, diseases of the liver (mild), diabetes without complications, diabetes with end-organ, hemiplegia (paraplegia), renal disease (mild, moderate to severe

insufficiency), non-metastatic cancer, leukemia, lymphoma, multiple myeloma, disease of the liver (moderate to severe), metastatic cancer, and AIDS. The existence of chronic diseases is divided into two groups: patients diagnosed with at least one chronic disease and patients who are not. The following medical institution level variables were also included: classification of medical institutions (general hospital, hospital, and clinic), number of doctors, specialist ratio, number of nurses, number of beds, long-term care (LTC) hospitals (whether hospitals are included in LTC hospitals or not), Seoul Metropolitan Hospitals (SMHs) (whether hospitals are included in SMHs or not), and medical treatment year (2013, 2014, and 2015).

3.3. Statistical analysis

3.3.1. Regression analysis. The following statement describes a model for these estimation methods, where Y_i comprises the outcome variable, such as LOS, total health expenditure, and rate of emergency room visits and X_i comprises the individual (i)'s characteristics using healthcare services and medical institution.

$$\{P_r(Y_i = 1|X_i)\} = \gamma_{00} + \gamma_{10}X_i + \epsilon_i$$

4. Results

4.1. Descriptive statistics

The descriptive statistics of the study sample are presented in Table 2. In this study, 3327 disease diagnosis episodes of MA beneficiaries and the lower 20% of NHI enrollees were included respectively. Men and women were distributed similarly in each group and year. In terms of age group, most patients were in the 15 to 44 and 45 to 64 year age-groups. When examining disease severity, the rate of DRG severity 0 was higher than that of DRG severity over 1. Regardless of health coverage schemes, over 75% of patients have at least one chronic disease. For the classification of medical institutions, the distribution differed between the two groups. Over 50% of MA inpatients visited hospitals, while the distribution of the lower 20% of NHI inpatients was almost equal among medical institutions. The rate of visiting LTC hospitals and SMHs of MA inpatients was higher than that of the lower 20% of NHI inpatients. For healthcare utilization, the LOS and total health expenditure of MA inpatients were longer and higher respectively than the lower 20% of NHI inpatients.

4.2. Results of regression analysis

The regression results related to LOS are shown in Table 3. Model 2 shows the association between length of stay and individual factors, including sex, age, and severity of diseases such as DRG severity and CCI, and the health coverage scheme. When examining individual factors, the 15 to 44, 45 to 64, and over 65 years age groups had significantly longer stays than the 0 to 14 age group, and the effect increased as patients became older. Patients who were diagnosed with chronic diseases stayed longer than patients with no chronic diseases. The health coverage scheme was significantly associated with length of stay, with MA patients' length of stay longer than that of the lower 20% of NHI patients. When examining medical institution covariates, hospital inpatients stayed longer in inpatient clinics.

Table 2
Descriptive characteristics of study sample, length of stay, and visiting emergency room rates.

Classification	Variable	2013		2014		2015	
		Medical Aid (n = 1089)	NHI 20% (n = 1134)	Medical Aid (n = 1104)	NHI 20% (n = 1005)	Medical Aid (n = 1134)	NHI 20% (n = 1188)
Individual-level	Sex						
	Men (%)	55.2	55.7	53.7	54.4	52.6	51.2
	Women (%)	44.8	44.3	46.3	45.6	47.4	48.8
	Age groups						
	0–14 yr old (%)	5.3	15.3	2.1	3.6	1.2	4.2
	15–44 yr old (%)	46.4	37.6	45.0	35.9	45.9	43.1
	45–64 yr old (%)	43.3	37.5	47.6	43.3	47.2	38.6
	Over 65 yr old (%)	5.1	9.6	5.3	17.2	5.7	14.1
	DRG severity						
	DRG severity 0 (%)	57.4	66.4	56.5	56.7	57.4	53.2
DRG severity over 1 (%)	42.6	33.6	43.5	43.3	42.6	46.8	
CCI Score	0.1	0.2	0.2	0.3	0.1	0.2	
Existence of chronic diseases (%)	76.8	77.3	75.4	79.7	77.1	78.3	
Medical institution-level	Type of medical institution						
	General hospital (%)	14.8	38.8	17.2	41.9	17.9	41.0
	Hospital (%)	62.8	31.2	65.5	42.3	63.5	36.9
	Clinic (%)	22.4	30.0	17.3	15.8	18.6	22.1
	LTC hospital (%)	4.6	2.6	6.2	4.3	8.0	4.1
Seoul Metropolitan Hospital (%)	11.4	4.5	10.0	5.7	11.2	5.7	
Healthcare utilization	Length of stay (d)	52.0	27.1	46.2	32.9	50.8	27.2
	Over 90 days of LOS (%)	17.8	6.1	14.7	8.4	15.3	7.1
	Over 180 days of LOS (%)	6.2	2.0	6.3	3.0	6.9	2.3
	Total medical expenditure (USD)	2070.3	1850.8	1807.8	2305.2	2013.7	1999.0
	Paid by NHI (USD)	2012.5	1434.3	1775.2	1780.3	1971.1	1547.8
	Paid by OOP (USD)	47.8	403.7	25.8	507.1	31.1	441.8
	Total medical expenditure per day (USD)	39.8	68.4	39.2	70.1	39.7	73.6

*The fees were converted into US dollars using an exchange rate of 1 USD = 1141.46 Korean Won (average exchange rate during the period 2015–2017).

CCI = Charlson Comorbidity Index, DRG = Diagnosis-related Group, HIRA = Health Insurance Review & Assessment Service, LOS = length of stay, LTC hospitals = long-term care hospitals, MA = Medical Aid, NHI = National Health Insurance, OOP = out of payment, PSM = Propensity Scores Matching, SMHs = Seoul Metropolitan Hospitals, YLDs = years were lived with disabilities.

The higher the rate of medical specialists in medical institutions, the longer inpatients stayed. In addition, the lengths of stay of inpatients visiting LTC hospitals and SMHs were shorter than those of inpatients who did not visit those hospitals. The medical treatment year had negative associations with the length of stay for 2014 and 2015 compared to 2013.

The associations between visiting emergency room rates and predictors are provided in Table 4. For the age groups, compared to the 0 to 14 age group, the 15 to 44 age group had positive associations with visiting emergency room rate. For the health coverage scheme, the likelihood of visiting the emergency room of the lower 20% of NHI patients was higher than the likelihood for MA patients. Regarding the classification of medical institutions, the rate of emergency room visits of patients in general hospitals was higher than patients in clinics.

5. Discussion

In Seoul, the rate of experiencing depressive symptoms per 100,000 people is 7.2% (as of 2018), which is the highest rate among provinces in Korea.^[10] The general consensus seems to be that mental illnesses, such as serious cases of depression, can lead to suicide or suicide attempts.^[23,24] In fact, according to the national survey on mental illness in Korea, 57% of those who committed suicide, 74% of those who planned to commit suicide, and 75% of those who attempted to commit suicide had experienced mental disability.^[25] Especially, low-income groups

living in cities have limited socio-economic resources for their health. In this context, this study was designed to ascertain whether low-income people with depression residing in Seoul have different medical utilization patterns depending on their type of health coverage scheme, and to draw up suggestions on depression management policy for the urban poor. The main findings drawn from this research are as follows.

Concerning LOS, consistent with prior studies, patients covered by the MA program had longer LOS than those covered by NHI.^[12–15] This result can be interpreted in two ways. First, the main reason for longer length of stay is “Moral hazard” on both the supply and demand sides.^[11,26] On the demand side, patients covered by the MA program feel free from the burden of considering length of stay because their hospitalization costs are negligible. On the supply side, there is a provider-side effect whereby the providers increase the quantity of healthcare services because they do not have to consider patients’ out-of-pocket spending.^[11] Second, the hospital admission of low-income patients with mental disease has the probability of “social hospitalization” as well as disease-induced hospitalization. Even if they are discharged from hospital, they are likely to be isolated once more due to their low levels of social support and lack of ability to utilize community resources. Although Seoul is a large city, one of the reasons a mentally ill patient cannot leave the hospital is a lack of community resources to care for the patient.^[27] Meanwhile, patients with depression who have been hospitalized in LTC hospitals are likely to have lower

Table 3
Regression analysis results—length of stay.

	Estimate	SE	P> t
Intercept	5.656	5.869	.335
Individual-level predictors			
Sex (men, reference)			
Women	−0.998	1.100	.364
Age groups (0–14, reference)			
15–44	7.633	2.556	.003
45–64	10.806	2.590	<.0001
Over 65	15.388	3.012	<.0001
DRG severity (0, reference)			
Over 1	−0.330	1.201	.784
Charlson Comorbidity Index (CCI)			
Existence of chronic diseases (n/a, reference)	6.699	1.397	<.0001
20% of NHI participants (Medical Aid recipients, reference)	−7.192	1.134	<.0001
Medical institution-level predictors			
Type of medical institutions (clinics, reference)			
General hospitals	0.245	2.596	.925
Hospitals	23.608	1.674	<.0001
The number of doctors	0.000	0.007	.959
The rate of medical specialist	10.558	4.116	.010
The number of nurses	−0.002	0.004	.585
The number of beds	0.004	0.003	.263
Inclusion in LTC hospitals (n/a, reference)	−7.073	2.543	.005
Inclusion in Seoul Metropolitan Hospitals (n/a, reference)	−12.395	1.994	<.0001
Treatment year (2013, reference)			
2014	−3.087	1.332	.021
2015	−3.258	1.311	.013
R ² -square	0.116	Adjusted R ² -square	.113

CCI=Charlson Comorbidity Index, DRG=Diagnosis-related Group, HIRA=Health Insurance Review & Assessment Service, LOS=length of stay, LTC hospitals=long-term care hospitals, MA=Medical Aid, NHI=National Health Insurance, OOP=out of payment, PSM=Propensity Scores Matching, SMHs=Seoul Metropolitan Hospitals, YLDs=years were lived with disabilities.

LOS. Patients with depression who are hospitalized in hospital-level medical institutions ($30 \leq \text{hospital beds} < 100$) are the most likely to increase the number of days of hospitalization. Unlike other countries, Korea has LTC hospitals for the elderly and, in this study, we confirmed that there is a higher chance of a shorter LOS in LTC hospitals than in other types of hospital. This is because most patients who are hospitalized in LTC hospitals are suffering from senile diseases rather than depression. In fact, the main reasons for hospitalization at LTC hospitals in Korea are dementia, essential hypertension, cerebral infarction, diabetes mellitus, and chronic obstructive pulmonary diseases (COPD).^[28] In other words, patients with depression are rarely admitted to LTC hospitals, and even if they are hospitalized, they are likely to be transferred to another hospital after a short period. It also seems that the LOS of patients with depression in hospitals owned by Seoul Metropolitan Government was relatively short due to an effective collaboration between local resources, thus meaning that patients do not stay longer than necessary in such hospitals. Seoul has various programs to provide appropriate health, welfare, and medical services to patients in the community. The integrated health care, a typical

Table 4
Regression analysis results—the rate of visiting emergency room.

	Estimate	SE	P> t
Intercept	0.303	0.062	<.0001
Individual-level predictors			
Sex (men, reference)			
Women	0.013	0.012	.274
Age groups (0–14, reference)			
15–44	0.051	0.027	.064
45–64	0.026	0.028	.347
Over 65	0.026	0.032	.422
DRG Severity (0, reference)			
Over 1	0.020	0.013	.110
Charlson Comorbidity Index (CCI)			
Existence of chronic diseases (n/a, reference)	−0.007	0.015	.652
20% of NHI participants (Medical Aid recipients, reference)	0.028	0.012	.017
Medical institution-level predictors			
Type of medical institutions (clinics, reference)			
General hospitals	0.153	0.027	<.0001
Hospitals	−0.032	0.018	.068
The number of doctors	0.000	0.000	.955
The rate of medical specialist	−0.156	0.043	.000
The number of nurses	0.000	0.000	.699
The number of beds	0.000	0.000	.608
Inclusion in LTC hospitals (n/a, reference)	0.048	0.026	.072
Inclusion in Seoul Metropolitan Hospitals (n/a, reference)	0.017	0.021	.410
Treatment year (2013, reference)			
2014	0.010	0.014	.478
2015	0.002	0.014	.891
R ² -square	0.065	Adjusted R ² -square	.062

CCI=Charlson Comorbidity Index, DRG=Diagnosis-related Group, HIRA=Health Insurance Review & Assessment Service, LOS=length of stay, LTC hospitals=long-term care hospitals, MA=Medical Aid, NHI=National Health Insurance, OOP=out of payment, PSM=Propensity Scores Matching, SMHs=Seoul Metropolitan Hospitals, YLDs=years were lived with disabilities.

example of a project directly related to SMH, launched in 2013 to provide low income patients with the linkage services they need including living assistance, community health centers, LTC facilities, and local community centers and medical services. Depression management is likely to be effective when multiple interventions, such as provision of primary medical care in the community, connection to mental health centers, provision of visiting health care services to prevent social isolation, and running suicide prevention calls, are provided simultaneously.^[29] To effectively manage patients with depression at a national level in the future, it is necessary to expand the project by linking even private hospitals and community resources.

Concerning emergency room visits, patients covered by the MA program tended to visit the emergency room less than those covered by the NHI. This may be the result of medical culture and regulation rather than well-functioning health management of patients covered by the MA program. Patients on the MA program are more likely to use inpatient care than emergency room visit due to extremely low out-of-pocket payment. In fact, if Type 1 beneficiaries use a general hospital emergency room, their out-of-pocket payment is approximately \$2 USD and just

5% of the total examination fees. In addition, the majority of patients who visit the emergency room due to depression are classified as non-emergency patients, and must pay an additional fee called the emergency patient management fee, which ranges from \$48.90 to \$56.40, depending on the type of hospital in Seoul. However, all medical expenses are free if they are admitted to the hospital. Both Type 1 and Type 2 beneficiaries are likely to prefer hospitalization. While they pay 15% in out-of-pocket payment and 15% of their examination expenses when using a general hospital emergency room, they only pay 10% of total medical expenses when admitted.

Thus far, we have discussed the institutional effects on the medical use of low-income depression patients living in Seoul. However, this study has the following limitation. First, the factors that affect medical use can comprise gender, age, income, disease severity, health care characteristics, and institutions as well as health beliefs and health behaviors. It is difficult to ascertain people's current health habits and use of resources in the community through NHI claim data. In this study, NHI data were used due to a lack of data source that included both health behaviors and medical use in Korea. In particular, NHI data were representative and reliable because they reflect actual medical use for all low-income patients living in Seoul, unlike the survey or sample data. Also, the outcome variables in this study, the length of stay and emergency room visits, are generally decided by doctor's diagnosis and call. For low-income patients' treatment, however, doctors decide and prescribe to the patients by considering multiple factors, patients' clinical condition, patients' needs, and care environment including home and community. Thus, it is necessary to pay attention to interpretation where it is not possible to know whether the factors affecting the outcome variables, LOS and emergency room visits, are the patients' care environment or needs through the secondary data used in this study.

Affective disorders have significant consequences across the lives of those affected, contributing to poorer educational outcomes, higher rates of unemployment, and poorer physical health. Therefore, it is important to form policies that allow patients with mental disease to escape from isolation and that provide appropriate services for them in the community. Managing people with mental health problems not only increases the financial stability of the health insurance system, but is also a key factor in enhancing the sustainability of the MA program. Community-based interventions can both prevent and treat depression, and prevent suicide, but in many countries people with mental illness have difficulties accessing appropriate mental health care in a timely manner. We hope that this study will help countries or researchers who are grappling with depression management and suicide prevention policies.

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Author contributions

Changwoo Shon drafted research, provided the research design, and developed the research hypothesis. Jungah Kim analyzed the data and developed the research hypothesis. Myoungsoon Yoo approved the protocols to be followed in the study. All authors

were involved in the manuscript review, revision, and final approval process.

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References

- [1] Organization for Economic Cooperation and Development. The OECD Mental Health Work policy framework. OECD Policy Framework. 2015.
- [2] World Health Organization. The ICD-10 Classification of Mental and Behavioural Disorders: Clinical Descriptions and Diagnostic Guidelines. Geneva: World Health Organization; 1992.
- [3] Liang Y, Yang M, Zhao G, Mao Y, Zhang L, Hu Z. Relationship between mortality in people with mental disorders and suicide mortality in China during 2000 to 2014. *Medicine* 2020;99:e18611.
- [4] Üstün TB, Ayuso-Mateos JL, Chatterji S, Mathers C, Murray CJ. Global burden of depressive disorders in the year 2000. *Br J Psychiatry* 2004;184:386–92.
- [5] World Health Organization. Depression and Other Common Mental Disorders: Global Health Estimates. 2017; World Health Organization.
- [6] Srivastava K. Urbanization and mental health. *Ind Psychiatry J* 2009;18:75–6.
- [7] Reddy VM, Chandrashekar C. Prevalence of mental and behavioural disorders in India: a meta-analysis. *Indian Journal Psychiatry* 1998;40:149–57.
- [8] Patel V. Poverty inequality and mental health in developing countries. Oxford: Oxford University Press; 2001. pp. 247–62.
- [9] Almeida-Filho N, Lessa I, Magalhães L, et al. Social inequality and depressive disorders in Bahia, Brazil: interactions of gender, ethnicity, and social class. *Soc Sci Med* 2004;59:1339–53.
- [10] Seoul Mental Health Statistics. 2018. Available at: <http://www.seoulmentalhealth.kr/reference/subject.jsp?openMode=qut1>. Accessed February 14, 2022.
- [11] Kim J, Shon C. The effects of health coverage schemes on length of stay and preventable hospitalization in Seoul. *Int J Environ Res Public Health* 2018;15:772.
- [12] Dallal RM, Datta T, Braitman LE. Medicare and Medicaid status predicts prolonged length of stay after bariatric surgery. *Surg Obes Relat Dis* 2007;3:592–6.
- [13] Lee DW. Healthcare utilization and out-of-pocket spending of Medical Aids recipients in South Korea: a propensity score matching with National Health Insurance participants. *Korean J Health Econ Policy* 2016;22:29–49.
- [14] Kim J, Yim E, Bae H, Ko Y. Comparison of healthcare utilization between National Health Insurance and Medical Aid Program: a propensity score matching approach the Korean Social Security Association. *Korean Soc Secur Stud* 2018;34:55–77.
- [15] Lee YJ. Differences of cancer patients health care utilizations between Medical Aid Program and National Health Insurance in the Elderly. *J Korea Contents Assoc* 2011;11:270–9.
- [16] National Health Insurance Service. National Health Insurance Statistical Yearbook in 2016. 2017.
- [17] National Health Insurance Service. Medical Aid Statistical Yearbook in 2016. 2017.
- [18] National Health Insurance Sharing Service. 2019. Available at: <https://nhiss.nhis.or.kr/bd/ay/bdaya001iv.do>. Accessed October 6, 2020.
- [19] Lee DK. An introduction to propensity scores matching methods. *Anesthesiol Pain Med* 2016;11:130–48.
- [20] Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chronic Dis* 1987;40:373–83.
- [21] Choi WH, Yoon SJ, Ahn HS, Kyung MH, Kim KH, Kim KU. The prediction of health care outcome of total hip replacement arthroplasty patients using Charlson Comorbidity Index. *Korean J Hosp Manag* 2009;14:23–35.
- [22] Kim EJ. The association between co-morbid and co-morbidity index and the burden of cancer with surgery: Ph.D. Thesis, Korea University, Seoul, Korea; 2011.

- [23] Guze SB, Robins E. Suicide and primary affective disorders. *Br J Psychiatry* 1970;117:437–8.
- [24] McDaid D, Hewlett E, Park A-L. Understanding effective approaches to promoting mental health and preventing mental illness. OECD Health Working Paper. 2017.
- [25] Welfare DoHaE. pidemiologic Studies on Depression and Suicide in 2011. 2012.
- [26] Shin Y. On the appropriate use of health services. *Forum Health Welf* 2006;91–101.
- [27] Min EH. Introduction and application of social services in mental health area. *Korea Acad Mental Health Soc Work* 2009; 13–26.
- [28] Roh OH, Lee CH, Park A, Kim KH. A study on characteristics of medical expenses and the hospitalization period of hospitalized patients using diem payment system at convalescent hospitals. *J Korea Acad Ind Coop Soc* 2016;17:407–14.
- [29] HeoF DS . Depression and suicide in Korean society. *J Korean Med Assoc* 2011;54:356–7.