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Title: Health inequalities of 57,541 prisoners in South Korea: a comparison with the general population

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Title: Health inequalities of 57,541 prisoners in South Korea: a comparison with the general population

Abstract

Objectives. This study aimed to examine health disparities between prisoners and the general population in South Korea.

Methods. We sought to estimate the prevalence of 17 physical and mental diseases using the nationwide medication prescription dataset among the total population of prisoners (N = 57,541) in South Korea. The age- and sex- standardized prevalence ratio (SPR) were estimated to compare the disease prevalence between the prisoners and the general population. The disease prevalence for the general population were calculated from the prescription dataset for a representative of the Korean population (N = 926,246) from 2013 Korean National Health Insurance Service-National Sample Cohort. Further, the disease prevalence of prisoners was compared to that of the low-income general population (N = 159,781).

Results. Compared to the general population, prisoners had higher prevalence of almost all physical and mental diseases, including hyperlipidemia (SPR=20.18, 95% CI 19.43-20.94), pulmonary tuberculosis (SPR=9.58, 95% CI 7.91-11.50), diabetes (SPR= 6.13, 95% CI 5.96-6.31), cancer (SPR=2.36, 95% CI 2.07-2.68), and depression (SPR=46.73, 95% CI 44.14-49.43). When additionally compared with a low-income population segment, the disease prevalence among prisoners were still higher for most diseases including pulmonary tuberculosis (SPR=6.39, 95% CI 5.27-7.67) and depression (SPR=34.71, 95%CI 32.79-36.72).

Conclusion. We found that prisoners were more likely to be unhealthy than the general population, even in comparison with a low-income segment of the general population.

Keywords: Correctional health; prison health; prison healthcare; prison inmates; South Korea

Introduction

Globally, there are more than 10 million people in prison, and this number is steadily on the increase [1]. The United States prison population was the world's largest, with 2.2 million in 2015, followed by China with 1.6 million and Russia with 0.6 million [2]. In South Korea there are more than 54,000 prisoners, representing a rate of 106 per 100,000 based on an estimated national population of 51.17 million in 2019 [1, 3] .

Prisoners are one of the most vulnerable populations. Not only do they became marginalized through detention in prison and the attendant poor living conditions, but most also come from socio-economically disadvantaged backgrounds [4-6]. Although prisoners have a constitutional right to health under international human rights law [7], previous studies indicate that prisoners' access to health care and the quality of that care are often deficient [8, 9]. Thus, they are more likely to have poor health status while in the prison which has the effect of widening the health inequality gap in society [5, 6, 10]. Further, the health of prisoners can ultimately have considerable influence on society, including the increased spread of infectious diseases or creating substantial financial burdens when they return to the community. Thus, it is necessary to pay attention systematically and systemically to the health of prisoners during their prison stay.

Many studies have consistently shown that prisoners have poorer health status than the general population [4, 11-14]. Two studies in United States and Mexico reported that prisoners had higher prevalence of several infectious and chronic diseases including hepatitis, hypertension, diabetes, angina, myocardial infarction, and cancer than the representative general population sample [15, 16]. A review paper of 62 studies gathered from 12 developed countries found that prisoners were more likely to have a mental disorder compared with the general population, suggesting that typically about one in seven prisoners have psychotic

illnesses and/or major depression [17].

However, previous literature regarding health disparities of prisoners has the following two limitations. First, most of previous studies analyzed the dataset of prisoners in a single institution, or data from either federal or state prisons alone or jail systems alone [16, 18, 19]. US researchers have examined the health problems of prisoners using the national representative survey dataset generated by the US Census Bureau in 2002 and 2004 [16, 20]. Beyond the US Census Bureau survey, we found only one national level study in Japan that examined the incidence of tuberculosis among prisoners compared with the general population using the annual reports on correctional statistics [19]. Second, most of previous studies assessed disease prevalence based on the dataset collected by self-reporting [21-23]. Considering that the prisoners are not readily able to visit doctors, it seems probable that certain conditions are under-reported in surveys. For example, incarcerated women who have high cholesterol were less likely to be aware of their status than non-incarcerated women in a study from North Dakota [24]. At the same stduy, on the other hand, inmates may have greater screening opportunity for other conditions such as chronic viral hepatitis, than individuals in the community [24].

To fill these gaps in knowledge, this study aimed to explore health disparities between prisoners and the general population in Korea, comparing the prevalence of 17 physical and mental diseases using medication prescription dataset between the prisoners and the general population in South Korea. Furthermore, to explore whether the health disparities are caused by their socio-economically disadvantaged backgrounds or not [4-6], we additionally compared the prevalence among prisoners with those in a low-income general population.

Methods

Data sources and study population

In South Korea, about 58,000 people were imprisoned in 53 correctional facilities on 2016. The South Korean government runs 52 correctional facilities under four regional corrections headquarters in Seoul, Daegu, Daejeon, and Gwangju. About 300 prisoners are housed at one additional facility, which has been privately run since the end of 2010. This study included a total population of 57,541 prisoners in all 52 government correctional facilities. Data were drawn from official prison records, which were collected on September 30, 2016 by the Republic of Korea Ministry of Justice and publicly reported for the first time in a report of the National Human Rights Commission of Korea (ISBN: 978-89-6114-520-6 93330) [25].

We compared prison data with a large nationally representative administrative dataset from the National Health Insurance Service-National Sample Cohort (NHIS-NSC), a population-based cohort established by the Korean NHIS. The NHIS was initiated in 1963 in Korea according to the National Health Insurance Act, and all Korean citizens were mandated to participate in this program. Currently, the Korean NHIS maintains and manages all data of Korea's health service utilization. The detailed structure and function of NHIS are described elsewhere [26]. NHIS-NSC comprised 2.2% of the total eligible Korean population in 2002, and participants were followed until 2013. We used a dataset obtained in 2013 from NHIS-NSC in South Korea. This dataset contained 1,014,730 individuals, of which we included 926,246 individuals in our study after excluding participants who were <10 years old because this population does not exist in prisons.

Additionally, considering the prisoners are more likely to have socio-economically disadvantaged backgrounds, we compared the prevalence between the prisoners and low-

income general population. Study population of NHIS-NSC was divided into three groups: 1) national medical aid beneficiaries, 2) the self-employed, insured group, and 3) employed, insured group. National medical aid beneficiaries were defined as eligible recipients under the Medical Care Assistance Act which was enacted to contribute to the improvement of national health and the enhancement of social welfare by providing medical benefits to indigent people (e.g. recipients of medical benefits under the National Basic Living Security Act and disaster victims in South Korea), similar to Medicaid in the US. The latter two groups were sub-classified into 10 segments according to the income level. Income level was not based on the personal income but on the total income of all household members adjusted according to the number of household members. There was no overlap between self-employed or employed, insured groups and national medical aid beneficiaries. For additional analysis, the low-income general population was defined as the lowest two segments (0-20 %) of income level or those who were national medical aid beneficiaries (hereafter referred to as low-income general population) Consequently our study population group consisted of 159,781 individuals.

Disease prevalence

Disease prevalence was measured based on prescribed medications for each disease, both among prisoners and the general population. Investigated diseases were: *physical diseases*: 1) hyperlipidemia, 2) myocardial infarction, 3) pulmonary tuberculosis, 4) viral hepatitis, 5) diabetes, 6) lumbar sprain, 7) angina pectoris, 8) hypertension, 9) cancer, 10) lumbar disc herniation, 11) cerebral infarction, 12) cerebral hemorrhage, 13) fracture, and 14) pneumonia; and *mental diseases*: 15) depression, 16) schizophrenia, and 17) insomnia.

Prisoners in South Korea may access medical services from 1–5 attending doctors and nurses inside every prison. For the mental diseases that require specialized services not normally offered in prisons, designated psychiatrists visit the prison regularly. When sick, prisoners apply to visit the prison doctor's office to get medical treatment. If prison doctors determine that they cannot provide adequate treatment, prisoners visit a hospital outside the prison to get proper treatment, accompanied by several prison officers. Both in prison and at outside hospitals, the prison administrative system registers when prisoners are prescribed a medicine for the name of diagnosed diseases and documents how many prisoners have taken a prescribed medication. As the information reported on the prison system was only published for one day, specifically September 30, 2016, disease prevalence was calculated by dividing the number of prisoners who had taken a prescribed medicine by the total population of prisoners on that date. This includes the number of prisoners who was prescribed before and has been taking it until that day as well as who are newly prescribed on that day.

Likewise, disease prevalence in the general population was also measured based on prescribed medication data from NHIS. Koreans are covered by health insurance when they receive medical care and buy prescription medications, and data are recorded in NHIS with a specific diagnosis code. NHIS uses the Korean Classification of Diseases, 6th edition (KCD-6) as a disease classification code. Based on prison data, we defined individuals with specific diseases in the general population as those who bought doctor-prescribed medications with specific KCD codes (Appendix Table 1). Unlike the prison data, the NHIS data do not provide information on how many individuals in the general population have taken a prescribed medication, but only does provide information on how many individuals were newly prescribed medication on a given day. In order to make the data comparable, we used

prescription information from 14 days (September 24, 2013–October 7, 2013) for calculating prevalence in the general population.

Statistical analysis

Indirect standardization was performed to assess whether the disease prevalence in the prisoners differed from that in the general population when age and sex of prisoners were taken into account. The prevalence found in the prison population were compared with the expected prevalence (when adjusted for age and sex) from the general population. The results are presented as standardized prevalence ratio (SPR) with 95% confidence intervals (CI) [27]. All statistical analyses were performed with STATA/SE version 13.0 (StataCorp, College Station, TX, USA).

Results

Table 1 shows a sex- and age-specific distribution of the prison and general population. As of September 30, 2016, a total population of 57,541 prisoners were incarcerated in 52 prisons in South Korea. The vast majority of prisoners (53,767; 93.4 %) were men. Most of the prisoners (74.7 %) were in the 30-59 years age group, while 1.6 % were in the ≥70 years age group. (Table 1)

The prevalence and age- and sex-adjusted SPRs for each disease are shown in Table 2. The most frequent diseases among prisoners in South Korea were chronic diseases. Of 57,541 total prisoners, 8,286 (prevalence: 14.4 %) had hypertension , 4,868 (8.5 %) had diabetes, and 2,764 (4.8 %) had hyperlipidemia. The prevalence of mental diseases including depression (2.1 %) and insomnia (1.2 %) was generally high.

Not surprisingly, the prevalence of almost all diseases was significantly higher among prisoners than expected based on the age- and sex- specific prevalences in the general population (SPR>1). For example, prisoners had 18.45-46.73 times higher prevalence for mental diseases including depression (SPR=46.73, 95% CI 44.14-49.43), schizophrenia (SPR=40.91, 95% CI 37.22-44.87), and insomnia (SPR=18.45, 95% CI 17.11-19.87), compared with the general population. Significanly higher prevalences for several other diseases were also observed among prisoners than among the general population, including hyperlipidemia (SPR=20.18, 95% CI 19.43-20.94), pulmonary tuberculosis (SPR=9.58, 95% CI 7.91-11.50), diabetes (SPR=6.13, 95% CI 5.96-6.31), and cancer (SPR=2.36, 95% CI 2.07-2.68). Further, even when compared to the low-income population, the trend of higher prevalence among prisoners was still present for most diseaes including hyperlipidemia

(SPR=20.18, 95% CI 19.43-20.94), pulmonary tuberculosis (SPR=6.39, 95% CI 5.27-7.67) and depression (SPR=34.71, 95%CI 32.79- 36.72). (Table 2)

Discussion

The present study showed that the overall health of prisoners in Korea is poorer than that of the general population. Compared with the general population, prisoners had a higher prevalence for 17 diseases including hyperlipidemia, pulmonary tuberculosis, cancer, and depression, regardless of whether physical or mental and acute or chronic diseases. These findings are consistent with previous international studies on health disparities of prisoners [4, 11-16, 19-21, 28-30].

The consistent results across the disease outcomes are quite understandable considering living conditions in prison. Prisoners share close living spaces with others, including cells, showers, hygiene facilities and recreation areas. Not only may it cause a great deal of stress to prisoners but also provide fertile grounds to transmit disease directly. The more overcrowded the prison, the greater those negative effects on prisoners' health will be. Korea is among the many countries where prison overcrowding is severe. According to the OECD statistics in 2016, facility capacities in Korea are exceeded by 120 percent, ranking the second highest rate among OECD countries following Hungary (131%) [31]. This information can be useful in understanding our results that the prevalence of infectious diseaes; for example, pulmonary tuberculosis and viral hepatitis were about 9.58 and 7.27 times higher among prisoners than in the general population, respectively. Likewise, it is plausible that the prevalence of every measured mental disease among prisoners was well over ten times higher than in the general population.

However, another factor which merits consideration is that the higher prevalence of disease among prisoners may be related to the medical environment of prisons. Although every prison in Korea has one or more attending doctors inside the prison, there is a limited

number of doctor-hours available per day to fill the demand; it is not easy for prisoners to get timely and appropriate medical care in prison [14]. Prisoners usually have to wait for long times in queue before they can see a doctor, and sometimes their requests for healthcare service are rejected by prison officers if the symptoms do not seem to be severe. Further, when they need to see a hospital doctor outside the prison for getting necessary medical treatment, waiting times may become even longer. This can negatively impact the health of prisoners by increasing stress, exacerbating the disease onset and ultimately increase the severity of illness [25]. This can be a crucial issue, particularly for prisoners with mental diseases requiring specialized services which can not attended to by general practitioner doctors in prison. This should be considered in the context of our findings that both the prevalence of major depression and schizophrenia were more than 40 times higher among prisoners than among the general population. On the contrary, prisoners are known to be particularly concerned about their health and well-being, having a greater desire to medical checkup. It could thus be argued that there is a possibility that the medicine may be over-prescribed to prisoners compared with the general population. The prevalence of diseases with mild symptoms, in particular, is likely not to be free from this effect [32]. Using prior knowledge that the majority of prisoners have deprived backgrounds [4-6, 33], we can also consider that the higher disease prevalence among prisoners might be caused by their personal circumstances and lifestyle before imprisonment. For example, according to the 2011–2012 National Inmate Survey by the Bureau of Justice Statistics in the United States, among those who reported ever having a chronic condition, more than 70% of both prisoners and jail inmates reported that they had a chronic condition at admission [34]. One study in South Korea have also found that the lowest income (Class 5) group showed a significantly higher 3-year cancer mortality rate ratio than the highest income (Class1) group (2.06 for

males, 1.49 for females), followed by national medical aid beneficiaries (1.79 for males, 1.41 for females) [35]. Notably however, our study showed that prisoners still had higher prevalence for most diseases when we compared disease prevalence with the low-income population. This may indicate that imprisonment can have an negative impact on health of prisoners which exceeds that of their prior backgrounds.

Limitations and Strengths

Several limitations of this study should be noted. First, age distribution within the ≥ 70-years age group might differ between in the prison and in general populations. Because of the limited data available on prisoners, we could not fully determine the details of the full age range above 70-years old. If the gap of distribution within ≥70-years age group between two populations is large, the expected number of prisoners with diseases in the ≥70-years age group may be biased. Second, we could not exclude the possibility that SPRs might be over- or under-estimated due to the differences in the range of cases included between datasets thereby causing prevalence discrepancies. For a given date, the data for the general population only includes those who have been newly-prescribed the medication on that particular day. In the prison dataset, however, on a given day it is not possible to differentiate those who were newly-prescribed with those who are currently taking the medication but were prescribed previously. To minimize the possibility of SPRs overestimation, we calculated the prevalence of the general population from the 14 days of data we specifically chose - 7 days before and after from when we calculated the prevalence of the prisoners.

Nonetheless, it was difficult to rule out this possible discrepancy completely. In addition, the prevalence among the general population was calculated using the diagnostic code assigned to the doctor′s prescription in the health insurance claim data, which may differ from the actual diagnosis naime in the medical record. Thus, we tried to reduce this effect by including the diagnostic codes associated with the diagnostic names used for comparison, as widely as possible. As a final limitation, there were differences between the two datasets in the method and timing of data collection to record cases. While cases in prison data were reported with diagnostic names, those in the data of the general population were reported with specific diagnosis code. Although we tried to comprehensively include all diagnostic codes which were related to the matched diagnostic names in the prison data, it may potentially not be exactly matched. Furthermore, we used data from the same month and the date(s) in prison and the general population datasets to minimize seasonal effects that can affect the prevalence, but there is a limit in that there is a three-year difference in the timing of data collection.

Despite these limitations, this study also has strengths. To date, there is no health information on Korean prisoners using total population data. To our knowledge, this is the first study to describe health status of prisoners in South Korea. Further, we used the information of the general population from a large, nationally representative dataset to compare disease prevalence with the total population of prisoners, hence it may be less affected by selection bias. Additionally, because we used the administrative record data for both prisoners and the general population, this study was relatively free from recall error and misreporting problems compared to previous studies using survey data. Finally, most previous studies compared the health of prisoners with those of the entire general population,

but we additionally compared disease prevalence between prisoners and a low-income segment of the general population.

Conclusions

Until now reports on the health of prisoners in South Korea have been rare, despite a large and growing prisoner population. Findings in this study highlight that Korean prisoners have a higher prevalence of several physical and mental diseases than not only the general population, but a low-income segment of the population. This study suggests that overcrowind would be a important factor expected to have a wide-ranging effect on prisoners well-being and on their living environment. Considering even the effect on their medical environment including the waiting time for proper treatment, preventing prison overcrowding can be a key and effective initiative to improve the health outcomes in prison.

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Compliance with ethical standards

Conflict of interest: The authors have no conflicts of interest to declare for this study

Ethics approval: The study was conducted using previously collected de-identified data that are freely available; hence, it was deemed exempt by Korea University Institutional Review

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Author Contributions

Conceptualization: S-S Kim, S Yoon. Data curation: S Yoon, J Yoon. Data analysis: S Yoon, J Yoon, B Choi. Writing – original draft: S Yoon. Writing – review & editing: S Yoon, S-S Kim , Y-S Ju, J-H Kim, B Choi. Funding acquisition: S-S Kim.

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Age (yr)	Total		Men		Women	
	Prison population	General population[1]	Prison population	General population	Prison population	General population
10–19	839 (1.5)	124,284 (13.4)	803 (1.5)	65,314 (14.1)	36 (1.0)	58,970 (12.7)
20–29	8,052 (14.0)	131,922 (14.2)	7,664 (14.3)	68,823 (14.9)	388 (10.3)	63,099 (13.6)
30–39	12,398 (21.5)	155,953 (16.8)	11,673 (21.7)	79,526 (17.2)	725 (19.2)	76,427 (16.5)
40–49	16,072 (27.9)	176,668 (19.1)	15,032 (28.0)	89,769 (19.4)	1,040 (27.6)	86,899 (18.7)
50–59	14,526 (25.2)	159,483 (17.2)	13,478 (25.1)	80,399 (17.4)	1,048 (27.8)	79,084 (17.0)
60–69	4,707 (8.2)	89,336 (9.6)	4,262 (7.9)	43,260 (9.4)	445 (11.8)	46,076 (9.9)
≥70	947 (1.6)	88,600 (9.6)	855 (1.6)	34,561 (7.5)	92 (2.4)	54,039 (11.6)
Total	57,541 (100.0)	926,246 (100.0)	53,767 (93.4)	461,652 (49.8)	3,774 (6.6)	464,594 (50.2)

Values are presented as number (%).
[1]Korean nationwide random sample cohort.

Table 1. Table 1. Age distribution of study population by gender.

Table 2. SPR of health outcomes between prison population and the general population in South Korea

Diseases	Prison population (N=57,541)	General population (N=926,246)	Age- and Sex-SPR (95% CI)	Low-income population[1] (N=159,781)	Age- and Sex-SPR (95% CI)
	Prevalence, n (%)	Prevalence, n (%)		Prevalence, n (%)	
Physical					
Hyperlipidemia	2,764 (4.8)	2,735 (0.3)	20.18 (19.43, 20.94)	530 (0.3)	20.18 (19.43, 20.94)
Pulmonary tuberculosis	115 (0.2)	175 (0.02)	9.58 (7.91, 11.50)	35 (0.02)	6.39 (5.27, 7.67)
Viral hepatitis	554 (1.0)	795 (0.1)	7.29 (6.70, 7.92)	137 (0.1)	6.60 (6.06, 7.17)
Diabetes	4,868 (8.5)	12,631 (1.4)	6.13 (5.96, 6.31)	2,758 (1.7)	4.96 (4.82, 5.10)
Myocardial infarction	263 (0.5)	731 (0.1)	5.60 (4.94, 6.31)	163 (0.1)	12.52 (11.06, 14.13)
Lumbar sprain	622 (1.1)	1,827 (0.2)	5.41 (4.99, 5.85)	364 (0.2)	5.65 (5.22, 6.12)
Hypertension	8,286 (14.4)	32,650 (3.5)	4.56 (4.47, 4.66)	6,930 (4.3)	4.40 (4.30, 4.49)
Angina pectoris	401 (0.7)	1,672 (0.2)	4.72 (4.27, 5.20)	381 (0.2)	4.01 (3.63, 4.42)
Cancer	238 (0.4)	2,254 (0.2)	2.36 (2.07, 2.68)	421 (0.3)	2.13 (1.86, 2.41)
Lumbar disc herniation	348 (0.6)	2,855 (0.3)	2.26 (2.03, 2.51)	685 (0.4)	1.65 (1.48, 1.83)
Cerebral hemorrhage	34 (0.1)	288 (0.03)	2.00 (1.39, 2.79)	85 (0.1)	0.85 (0.59, 1.19)
Cerebral infarction	139 (0.2)	1,589 (0.2)	1.96 (1.65, 2.31)	373 (0.2)	1.48 (1.24, 1.75)
Fracture	155 (0.3)	1,794 (0.2)	1.94 (1.64, 2.27)	412 (0.3)	1.50 (1.28, 1.76)
Pneumonia	40 (0.1)	740 (0.1)	1.18 (0.84, 1.60)	175 (0.1)	0.91 (0.65, 1.24)
Mental					
Depression	1,215 (2.1)	692 (0.1)	46.73 (44.14, 49.43)	144 (0.1)	34.71 (32.79, 36.72)
Schizophrenia	450 (0.8)	158 (0.02)	40.91 (37.22, 44.87)	44 (0.03)	20.45 (18.61, 22.43)
Insomnia	701 (1.2)	960 (0.1)	18.45 (17.11, 19.87)	217 (0.1)	12.09 (11.21, 13.02)

SPR, standardized prevalence ratio

[1]Individuals who belong to the lowest 20% of household income level or who are medical aid beneficiaries.

Appendix Table 1. Diagnosis codes to define diseases in the general population from Korean National Health Insurance Service-National Sample Cohort data using the Korean Classification of Disease, 6th edition [a]

Disease	Diagnosis code
Physical	
Hyperlipidemia	E78.0–E78.5
Myocardial infarction	I21–I22, I24–I25
Pulmonary tuberculosis	A15–A16
Viral hepatitis	B15–B19
Diabetes	E10–E14
Lumbar sprain	S33.5–S33.7
Angina pectoris	I20
Hypertension	I10–I15
Cancer	C00–C97
Lumbar disc herniation	M51.0–M51.1
Cerebral infarction	I63
Cerebral hemorrhage	I60–I62, S06.4–S06.6
Fracture	M80, M84.4, M90.7, M49.5, M84.3, M48.4, M 96.6, S02, S12, S22, S32, S42, S52, S62, S72, S82, S92, T02, T08, T10, T12, T14.2
Pneumonia	J12–J18
Mental	
Depression	F32–F33
Schizophrenia	F20
Insomnia	G47.0, F51.0

[1]Modified version of the International Classification of Disease-10 for the Korean healthcare system.

Age (yr)	Total		Men		Women	
	Prison population	General population[1]	Prison population	General population	Prison population	General population
10–19	839 (1.5)	124,284 (13.4)	803 (1.5)	65,314 (14.1)	36 (1.0)	58,970 (12.7)
20–29	8,052 (14.0)	131,922 (14.2)	7,664 (14.3)	68,823 (14.9)	388 (10.3)	63,099 (13.6)
30–39	12,398 (21.5)	155,953 (16.8)	11,673 (21.7)	79,526 (17.2)	725 (19.2)	76,427 (16.5)
40–49	16,072 (27.9)	176,668 (19.1)	15,032 (28.0)	89,769 (19.4)	1,040 (27.6)	86,899 (18.7)
50–59	14,526 (25.2)	159,483 (17.2)	13,478 (25.1)	80,399 (17.4)	1,048 (27.8)	79,084 (17.0)
60–69	4,707 (8.2)	89,336 (9.6)	4,262 (7.9)	43,260 (9.4)	445 (11.8)	46,076 (9.9)
≥70	947 (1.6)	88,600 (9.6)	855 (1.6)	34,561 (7.5)	92 (2.4)	54,039 (11.6)
Total	57,541 (100.0)	926,246 (100.0)	53,767 (93.4)	461,652 (49.8)	3,774 (6.6)	464,594 (50.2)

Values are presented as number (%).
[1]Korean nationwide random sample cohort.

Table 1. Table 1. Age distribution of study population by gender.

Table 2. SPR of health outcomes between prison population and the general population in South Korea

Diseases	Prison population (N=57,541)	General population (N=926,246)	Age- and Sex-SPR (95% CI)	Low-income population[1] (N=159,781)	Age- and Sex-SPR (95% CI)
	Prevalence, n (%)	Prevalence, n (%)		Prevalence, n (%)	
Physical					
Hyperlipidemia	2,764 (4.8)	2,735 (0.3)	20.18 (19.43, 20.94)	530 (0.3)	20.18 (19.43, 20.94)
Pulmonary tuberculosis	115 (0.2)	175 (0.02)	9.58 (7.91, 11.50)	35 (0.02)	6.39 (5.27, 7.67)
Viral hepatitis	554 (1.0)	795 (0.1)	7.29 (6.70, 7.92)	137 (0.1)	6.60 (6.06, 7.17)
Diabetes	4,868 (8.5)	12,631 (1.4)	6.13 (5.96, 6.31)	2,758 (1.7)	4.96 (4.82, 5.10)
Myocardial infarction	263 (0.5)	731 (0.1)	5.60 (4.94, 6.31)	163 (0.1)	12.52 (11.06, 14.13)
Lumbar sprain	622 (1.1)	1,827 (0.2)	5.41 (4.99, 5.85)	364 (0.2)	5.65 (5.22, 6.12)
Hypertension	8,286 (14.4)	32,650 (3.5)	4.56 (4.47, 4.66)	6,930 (4.3)	4.40 (4.30, 4.49)
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Cerebral infarction	139 (0.2)	1,589 (0.2)	1.96 (1.65, 2.31)	373 (0.2)	1.48 (1.24, 1.75)
Fracture	155 (0.3)	1,794 (0.2)	1.94 (1.64, 2.27)	412 (0.3)	1.50 (1.28, 1.76)
Pneumonia	40 (0.1)	740 (0.1)	1.18 (0.84, 1.60)	175 (0.1)	0.91 (0.65, 1.24)
Mental					
Depression	1,215 (2.1)	692 (0.1)	46.73 (44.14, 49.43)	144 (0.1)	34.71 (32.79, 36.72)
Schizophrenia	450 (0.8)	158 (0.02)	40.91 (37.22, 44.87)	44 (0.03)	20.45 (18.61, 22.43)
Insomnia	701 (1.2)	960 (0.1)	18.45 (17.11, 19.87)	217 (0.1)	12.09 (11.21, 13.02)

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