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Research paper

Increase in the prescription rate of antidepressants after the Sewol Ferry disaster in Ansan, South Korea



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ABSTRACT

Background: Previous pharmaco-epidemiological studies have reported increases in the prescription of psychotropic medications after a disaster, reflecting post-disaster changes in psychiatric conditions and mental health service utilization. We investigated changes in the prescription of psychotropic medications in the Danwon district of Ansan city (Ansan Danwon) compared to a control community before and after the Sewol Ferry disaster on April 16, 2014.

Methods: Data was collected from the Korean Health Insurance Review and Assessment Service database. We analyzed the prescription rates of psychotropic medications including antidepressants, anxiolytics, and sedatives/hypnotics, and investigated whether the time-series pattern of monthly prescriptions per 100,000 people was different in Ansan Danwon compared to that in Cheonan city after the Sewol Ferry disaster through difference-in-differences regression analysis.

Results: Ansan Danwon showed a significantly greater increase (5.6%) in the prescription rate of antidepressants compared to Cheonan city following the Sewol Ferry disaster. There were no significant differences in changes in the prescription rates of anxiolytics or sedatives/hypnotics. In the secondary analysis, a significantly greater increase in the prescription rate of antipsychotics was observed in Ansan Danwon compared to a control community after the disaster.

Limitations: We could not exclude the possibility that other events influenced changes in the prescription rates of psychotropic medications during the study period.

Conclusions: Pharmaco-epidemiological studies on psychotropic medication prescription after a disaster provide important information about population-level mental health. Our results suggest that the Sewol Ferry disaster exerted a harmful effect on the mental health status of the affected community.

1. Introduction

A disaster is an unanticipated, large-scale, catastrophic event that threatens the lives of individuals or a large group of people, and can cause social network collapse, the substantial loss of social resources, and adverse effects on community physical and mental health status (Birur et al., 2017). Traumatic events related to disaster can lead to severe, long-lasting psychological distress at an individual or population level (Usher et al., 2012). Previous studies have documented the increased prevalence of psychiatric conditions such as depression, anxiety, suicidal behaviors, post-traumatic symptoms, and substance

abuse in the aftermath of disasters (Birur et al., 2017; Kolves et al., 2013; Tang et al., 2014; Vlahov et al., 2006). At a population level, manmade disasters are associated with more serious psychological consequences than natural disasters affecting a similar quantity of loss and damage, as they subvert basic social emotions of trust and solidarity (Morgan and Bhugra, 2010).

Several studies have indicated that individuals indirectly exposed to disaster such as residents living in close proximity to a disaster event can also experience post-traumatic psychological symptoms (i.e., in the absence of direct exposure) (DiMaggio et al., 2007; Galea et al., 2002a; Lee et al., 2017). For example, indirect exposure of New York City

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residents to the large-scale terrorist attack in New York City on September 11, 2001 through mass media, family, or friends was associated with severe psychological distress (Chen et al., 2003; Galea et al., 2002a, 2002b). These results warrant better investigation of the adverse effects of disasters on mental health status at a population level.

Numerous pharmaco-epidemiological studies have utilized changes in prescription rates or the utilization of psychotropic medication as a proxy measure of post-disaster changes in psychiatric conditions or mental health service utilization in residents of disaster-affected regions (Boscarino et al., 2003; DiMaggio et al., 2007; Rossi et al., 2011; Trifiro et al., 2013; Usher et al., 2012). For example, Usher et al. found that the new prescription rate of antidepressants was increased in the affected community after Cyclone Yasi in North Queensland, Australia (Usher et al., 2012). Another study on the September 11, 2001 New York City terrorist attack indicated that the prescription rate of selective serotonin reuptake inhibitors (SSRIs) was increased after the terrorist attack among individuals residing within 3 miles of the World Trade Center site (DiMaggio et al., 2007). Pharmaco-epidemiological studies on psychotropic medication use after a disaster provide important information about population-level mental health service utilization as well as critical information for effective public health planning after disasters (Boscarino et al., 2003). Additional studies investigating changes in prescription rates of psychotropic medications in affected regions following disaster are thus necessary.

On April 16, 2014, the Sewol Ferry, a South Korean ship carrying 476 passengers from Incheon to Jeju Island, sank disastrously off the southwestern coast of the Yellow Sea. Among 305 passengers who were reported deceased or missing, 250 were students of Danwon High School on a school excursion. The high school is located in the Danwon district of Ansan city, Gyeonggi-do province, and most of the victims and their family members and relatives were residents of Ansan city. The disaster elicited enormous shock and overwhelming grief across South Korea, and has left a lasting mark on the community of Ansan city. Even though the Sewol Ferry disaster did not take place in physical proximity to the residence of the victims, about 800 Ansan city residents were family members of the victims, and thousands were acquaintances that were indirectly exposed to the disaster (Yang et al., 2015). Furthermore, residents were exposed to the scene of the capsized and sinking ferry as well as rescued crew members leaving most passengers onboard by a live broadcast (Woo et al., 2015). The delayed rescue effort, the government's incompetence in the process of the rescue operation, and the moral hazard of the captain and crew aggravated emotions of embitterment in residents of the affected community after the disaster (Park et al., 2016). Above all, the fact that most of the victims were young students accentuated the effects of the tragedy on the local community; in the sociocultural context of South Korea, the accidental death of youths in particular can lead to severe and prolonged grief reactions from affected families and acquaintances.

Only one previous study has described the adverse effects of the Sewol Ferry disaster on the mental health status of Ansan city residents (Yang et al., 2015). Yang et al. (2015) conducted a self-administered questionnaire survey in Ansan city 4–6 months after the disaster and investigated the prevalence of psychiatric symptoms. The authors found that respondents from Ansan city were significantly more likely to have depression, stress, anxiety, somatic symptoms, and suicidal ideation compared to those from other cities in Gyeonggi-do province (Yang et al., 2015); however, this study was based on a relatively small sample size (918 and 923 respondents from the Danwon and Sangnok districts in Ansan city, respectively) compared to previous pharmaco-epidemiological studies investigating the effects of disaster on local residents (e.g., 103,788 participants in the study by Rossi et al., 2011). Furthermore, no study to date has examined changes in the prescription rates of psychotropic medications in Ansan city after the Sewol Ferry disaster as a proxy measure of mental health service utilization and a macroscopic indicator of mental health status at a population level.

The goal of this study was to investigate changes in the prescription rates of psychotropic medications in the Danwon district of Ansan city (Ansan Danwon) following the Sewol Ferry disaster compared to a control community. We hypothesized that the disaster adversely affected the mental health status of residents in Ansan Danwon and caused a larger increase in the prescription rates of psychotropic medications compared to other regions. Our *a priori* hypothesis was as follows: Ansan Danwon will show greater increases in the prescription rates of antidepressants, anxiolytics, and/or sedatives after the Sewol Ferry disaster compared to a control community.

2. Methods

2.1. Data source

We used the Korean Health Insurance Review and Assessment Service (HIRA) database to collect data about the prescription rates of psychotropic medications before and after the Sewol Ferry disaster. In South Korea, all medical services are financially covered by the National Health Insurance (NHI) system, and medical suppliers must report information regarding medical services and patient personal details to the HIRA, which subsequently reviews and assesses the reimbursement of medical care (Shin et al., 2015). Data collected by the HIRA include information about medication prescription and health care utilization for approximately 50 million people in South Korea (Shin et al., 2017). We obtained data about the monthly prescription of antidepressants, anxiolytics, and sedative/hypnotics to outpatients in Ansan Danwon between January 2013 and June 2016. According to the anatomical therapeutic chemical classification system of World Health Organization (WHO), 351 medications were included as antidepressants (N06A), 158 medications were included as anxiolytics (N05B), and 70 medications were included as hypnotics or sedatives (N05C). The classification of psychotropic medications in the HIRA corresponds with the WHO classification system. Medications not covered by health insurance were not included in the dataset.

To compare prescription rates (i.e., prescriptions per 100,000 people) between Ansan Danwon and a control community, Cheonan city in Chungcheongnam-do province was selected as a control community in consideration of its demographic characteristics, industrial structure, and economic level. Both communities are newly developing cities in South Korea with mixed characteristics of urban and rural areas. The populations of Ansan Danwon on January 2013 and June 2016 were 333,496 and 316,833 people, respectively; and the populations of Cheonan city on January 2013 and June 2016 were 582,837 and 610,108 people, respectively. The populations of the 2 communities stratified by age and sex are described in Table 1. A map of the affected community (i.e., Ansan Danwon) and the control community (i.e., Cheonan city) is shown in Fig. 1. All data from the HIRA were anonymized and did not contain any personal identification information. The study protocol was approved by the institutional review board of Kyung Hee University Hospital and conformed to the tenets of the Declaration of Helsinki.

2.2. Statistical analysis

Our analysis tested the following null hypothesis: average changes in the monthly prescription rates of antidepressant, anxiolytics, and/or sedatives/hypnotics after the Sewol Ferry disaster (April 2014) did not differ between Ansan Danwon city and Cheonan city. A difference-in-differences (DID) regression was used for the analysis. The DID method is a statistical technique that calculates the effect of a treatment (i.e., independent variable) on time-series outcomes by measuring differences in average changes in a dependent variable over time between a treatment group and control group. This method has been used by numerous studies in the field of public health to investigate the effect of intervention or treatment on time-series patterns of prescription rate

Table 1
Populations in Ansan Danwon and Cheonan city stratified by age and gender.

Age	Ansan Danwon			Cheonan city		
	Male	Female	Total	Male	Female	Total
0 ~ 10 years	20,116 (11.7)	17,436 (10.8)	37,552 (11.3)	37,065 (12.5)	34,586 (12.0)	71,651 (12.3)
11 ~ 20 years	27,057 (15.7)	24,578 (15.2)	51,635 (15.5)	44,126 (14.9)	40,378 (14.1)	84,504 (14.5)
21 ~ 30 years	24,812 (14.4)	22,661 (14.0)	47,473 (14.2)	43,112 (14.6)	41,632 (14.5)	84,744 (14.5)
31 ~ 40 years	29,990 (17.4)	27,092 (16.8)	57,082 (17.1)	54,613 (18.5)	50,903 (17.7)	105,516 (18.1)
41 ~ 50 years	34,820 (20.2)	32,659 (20.2)	67,479 (20.2)	52,949 (17.9)	49,951 (17.4)	102,900 (17.7)
51 ~ 60 years	24,035 (14.0)	20,456 (12.7)	44,491 (13.3)	36,708 (12.4)	33,724 (11.7)	70,432 (12.1)
61 years +	11,138 (6.5)	16,646 (10.3)	27,784 (8.3)	27,091 (9.2)	35,999 (12.5)	63,090 (10.8)
Total	171,968 (100.0)	161,528 (100.0)	333,496 (100.0)	295,664 (100.0)	287,173 (100.0)	582,837 (100.0)

Total population numbers (percentages) reflect data from January 2013.

(King et al., 2013; Liu et al., 2011; Meeker et al., 2016). As a primary analysis, we investigated whether the time-series patterns of monthly prescriptions of antidepressants, anxiolytics, and/or sedative/hypnotics per 100,000 people in Ansan Danwon were different from those in Cheonan city following the Sewol Ferry disaster. In the DID regression analysis, the effects of independent variables including the community (Ansan Danwon vs. Cheonan city), events (after the disaster vs. before the disaster), and the interaction term on prescription rates of psychotropic medications were calculated. Significance of the interaction term was our main outcome in the DID regression analysis. Additionally, we used log-transformed values of psychotropic medication prescription rates because prescription rates did not follow a normal distribution. All statistical analyses were performed using SAS Enterprise Guide version 4.3 (SAS Institute Inc., Cary, NC, United States), and the values were considered statistically significant at $P < 0.05$.

3. Results

Between January 2013 and June 2016, total numbers of psychotropic medication prescriptions per 100,000 people for outpatients in Ansan Danwon were as follows: 79,817 antidepressant prescriptions, 189,104 anxiolytic prescriptions, and 31,780 sedative/hypnotic prescriptions; for the same period, total numbers of prescriptions per 100,000 people in Cheonan city were as follows: 78,180 antidepressant prescriptions, 132,724 anxiolytic prescriptions, and 27,266 sedative/hypnotic prescriptions.

In the DID regression analysis, Ansan Danwon showed a significantly greater increase in the prescription rate of antidepressants compared to Cheonan city following the Sewol Ferry disaster (difference of 5.6%, $P = 0.003$; Table 2 and Fig. 2). Ansan Danwon showed a non-significant trend of a greater increase in the prescription rate of sedative/hypnotics compared to Cheonan city after the disaster (difference of 6.9%, $P = 0.086$). Finally, there was no significant difference in changes in the prescription rates of anxiolytics between Ansan Danwon and Cheonan city after the disaster ($P > 0.1$).

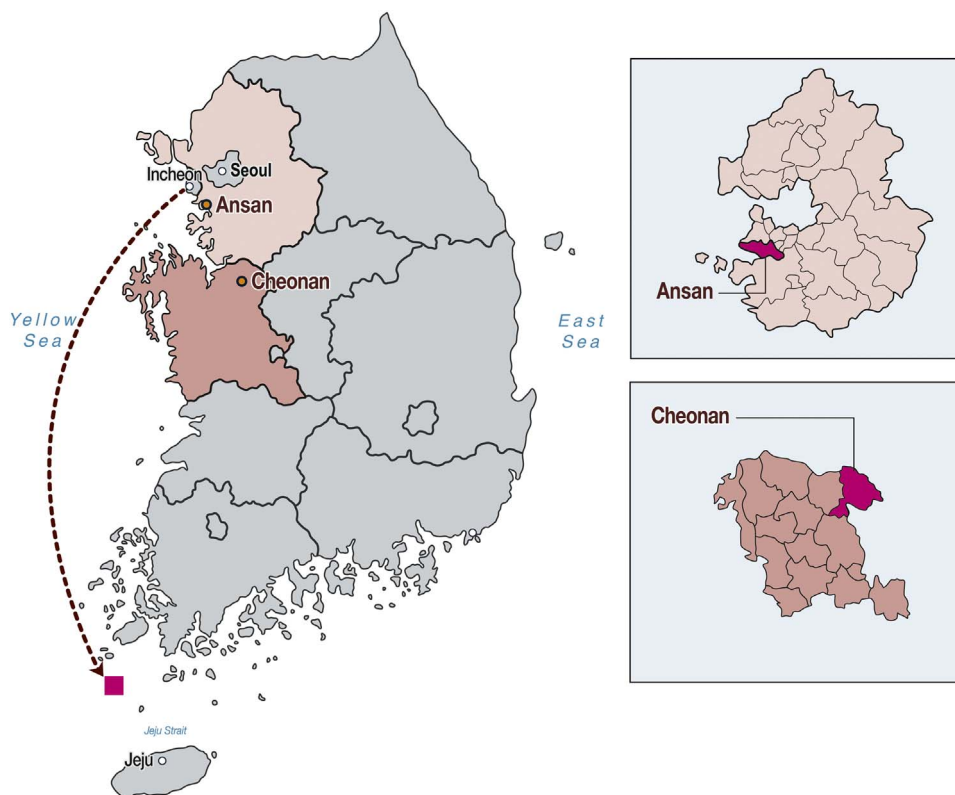


Fig. 1. Maps of the affected community (Ansan Danwon) and the control community (Cheonan city). The rectangle with pink coloring represents the location of the Sewol Ferry disaster. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article).

Table 2
Difference in differences regression analysis of changes in the prescription rates of psychotropic medications in Ansan Danwon and Cheonan city before and after the Sewol Ferry disaster.

Psychotropic medication	Independent variable	Category	Estimate	Exp (Estimate)	Standard error	P-value
Antidepressant	Community	Cheonan city	reference	reference	0.014	0.275
		Ansan Danwon	-0.015	0.985		
	Disaster	Before	reference	reference	0.012	< 0.0001
After	0.075	1.078				
	Community*Disaster		0.054	1.056	0.017	0.003
Anxiolytics	Community	Cheonan city	reference	reference	0.020	< 0.0001
		Ansan Danwon	0.331	1.393		
	Disaster	Before	reference	reference	0.018	< 0.0001
After	-0.117	0.889				
	Community*Disaster		0.037	1.038	0.025	0.142
Sedatives/hypnotics	Community	Cheonan city	reference	reference	0.031	0.001
		Ansan Danwon	0.110	1.117		
	Disaster	Before	reference	reference	0.027	0.618
After	-0.014	0.987				
	Community*Disaster		0.066	1.069	0.038	0.086

Log-transformed values of psychotropic medication prescription rates were used for the analysis.
Exp (Estimate): exponential value of "Estimate."

In the total population combining residents of Ansan Danwon and Cheonan city, the prescription rate of antidepressants significantly increased between before and after the disaster (difference of 7.8%, $P < 0.0001$), while the prescription rate of anxiolytics significantly decreased (difference of 11.1%, $P < 0.0001$; Table 2). The prescription rate of sedatives/hypnotics did not change between before and after the disaster ($P > 0.1$). Across the whole period from January 2013 to June 2016, the prescription rate of antidepressants was not significantly different between Ansan Danwon and Cheonan city ($P > 0.1$); however, the prescription rates of anxiolytics and sedatives/hypnotics were significantly higher in Ansan Danwon compared to Cheonan city (anxiolytics: difference of 39.3%, $P < 0.0001$; sedatives/hypnotics: difference of 11.7%, $P = 0.001$; Table 2).

In a secondary analysis, we explored changes in the prescription rates of antipsychotics in Ansan Danwon and Cheonan city following the disaster using the same statistical methods as those in the main analysis of antidepressant prescriptions. We found that Ansan Danwon had a significantly greater increase in the prescription rate of antipsychotics compared to the control community following the disaster (difference of 11.5%, $P < 0.0001$; Supplemental Table 1), supporting the results of our main analysis. We also investigated the short-term effects of the disaster on changes in the prescription rates of psychotropic medications in Ansan Danwon compared to a control community. In this analysis, we examined changes in psychotropic medication prescriptions between January 2013 and June 2014 (3 months after the

disaster) using the same statistical methods as those in the main analysis. We observed no significant difference between Ansan Danwon and Cheonan city with regard to changes in the prescription rates of antidepressants, anxiolytics, sedative/hypnotics, or antipsychotics after the disaster (all $P > 0.05$, Supplemental Table 2).

4. Discussion

In the present study, we observed that the population of Ansan Danwon showed significantly greater increases in the prescription rate of antidepressants compared that in a control community after the Sewol Ferry disaster. Our study result is consistent with previous pharmaco-epidemiological studies reporting increased prescription rates of antidepressants after disasters including a cyclone, earthquake, and terrorist attack (DiMaggio et al., 2007; Rossi et al., 2011; Trifiro et al., 2013; Usher et al., 2012). DiMaggio et al. investigated the prescription rate of SSRIs among New York State Medicaid enrollees living within 3 miles of the World Trade Center before and after the terrorist attacks of September 11, 2001 and found that prescription rate of SSRIs during 3 months after the disaster was increased compared to that during the previous 8-month period (DiMaggio et al., 2007). Trifiro et al. investigated the prescription rates of antidepressants and antipsychotics in L'Aquila, Italy after an earthquake resulting in 309 deaths and more than 1000 injuries, and found that antidepressant prescriptions after the disaster were increased compared to those in a control

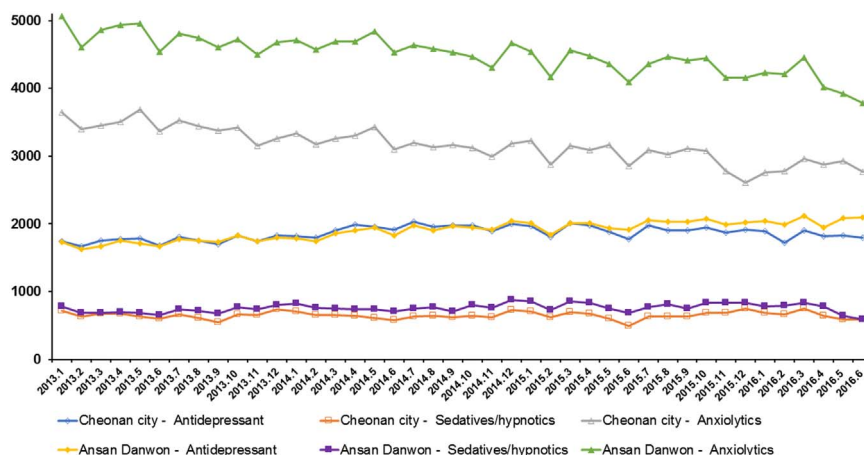


Fig. 2. Monthly prescriptions of antidepressant, anxiolytics, and sedatives/hypnotics per 100,000 people between January 2013 and June 2016 in Ansan Danwon and Cheonan city.

community (Trifiro et al., 2013). These studies suggest that changes in antidepressant prescriptions after a disaster may reflect community-level effects of the disaster. Our result is also consistent with a previous study on community mental health after the Sewol Ferry disaster in Ansan city, which found that psychiatric symptoms such as depression, stress, anxiety, somatic symptoms, and suicidal ideation were higher among residents of Ansan city compared to a control community (Yang et al., 2015). Further supporting our findings, the Korean Community Health Survey, an annual national survey conducted by the Korea Centers for Disease Control and Prevention, found that the age-standardized rate of depressive symptoms increased from 9.8% in 2013 to 13.0% in 2014 in Ansan Danwon, and that Ansan Danwon had the highest prevalence of depressive symptoms among 254 communities in South Korea in 2014 (Yang et al., 2015). However, another study uncovered no significant changes in antidepressant prescriptions after a disaster. Beaglehole et al. investigated the prescription patterns of psychotropic medications after a series of earthquakes in Canterbury, New Zealand and did not identify a difference between antidepressant prescription rates in the affected region versus the rest of New Zealand after the disaster (Beaglehole et al., 2015). Rather, the study identified a short-term increase in the prescription rates of anxiolytics and sedatives/hypnotics about 1 month after the most devastating earthquake. We believe that further studies are required to evaluate the long-term effects of disaster on antidepressant prescription and use in local affected communities.

Several hypothetical explanations may account for a larger increase in antidepressant prescriptions in the Ansan region compared to Cheonan city after the Sewol Ferry disaster. First, exposure to a disaster is associated with the population-level onset of several psychopathologies including post-traumatic stress disorder (PTSD), major depressive disorder (MDD), and other anxiety disorders (e.g., generalized anxiety disorder, panic disorder, and phobias). The reported prevalence rates of PTSD and MDD after a disaster were 5–10% (Goldmann and Galea, 2014). Considering that antidepressants are the primary pharmacotherapy for the above-mentioned psychiatric disorders (Antai-Otong, 2007; Belmaker and Agam, 2008; Hoffman and Mathew, 2008), an increase in the prescription rate of antidepressants in Ansan Danwon may have been related to new-onset psychiatric conditions in the population. Second, disasters can aggravate pre-existing psychiatric symptoms (Goldmann and Galea, 2014), influencing antidepressant utilization in residents with pre-existing psychiatric predispositions or disorders in the affected community. Several lines of evidence indicate that individuals with pre-existing mental health problems including depression or anxiety disorder may be more vulnerable to psychological traumatization after a disaster (Goldmann and Galea, 2014; Morgan and Bhugra, 2010). Third, the effects of the Sewol Ferry disaster on the affected community compared to unaffected communities can be explained considering the social context of the disaster. The Sewol Ferry caused the deaths of 305 people, including 250 Ansan Danwon high school students ages 16–17. Considering that the Sewol Ferry disaster directly affected 926 family members of the victims, 808 of which were residents of Ansan city, it is possible that the disaster disrupted social network cohesion in the community. The weakening of social cohesion between individuals in a community after a disaster can result in demoralization, disorganization, and disintegration at a population level, producing harmful effects on community mental health (Morgan and Bhugra, 2010). Indeed, the sudden loss of family members, relatives, close friends, or acquaintances due to a disaster heightens the risk of mental health problems including PTSD, MDD, psychosomatic pain, and prolonged grief disorders (Kristensen et al., 2012). Furthermore, repetitive broadcasts about the disaster by mass media can accentuate the collective traumatization of residents in a disaster-affected community (Jones et al., 2016; Woo et al., 2015). We suspect that all 3 of the aforementioned hypotheses explain the effects of the Sewol Ferry disaster on mental health and antidepressant prescription rates in Ansan city compared to other communities.

Further studies are required to better elucidate the mechanism and nature of the adverse effects of a disaster on mental health status of the affected community.

In this study, we identified a larger increase in the prescription rate of antidepressants but not anxiolytics or sedatives/hypnotics in Ansan Danwon compared to Cheonan city after the Sewol Ferry disaster. Furthermore, the prescription rate of anxiolytics in the combined populations of Ansan Danwon and Cheonan city showed a significant reduction after the Sewol Ferry disaster. A previous pharmaco-epidemiological study explored changes in the prescription rate of anxiolytics following a disaster at the population level; Usher et al. did not identify any changes in the prescription rate of anxiolytics in North Queensland, Australia after cyclone Yasi over 6 months after the disaster, but did observe a reduction in prescriptions 1 month after the disaster (Usher et al., 2012). Another study by Beaglehole et al. also did not identify any significant change in the prescription rate of anxiolytics or sedatives/hypnotics after the Canterbury earthquakes, but did observe a short-term increase in these medication prescriptions at 1 month after the most devastating earthquake (Beaglehole et al., 2015). Our results are similar to the above-mentioned studies; however, we do not have a clear explanation for the overall decrease in anxiolytic prescriptions or lack of change in sedative/hypnotic prescriptions after the disaster. In South Korea, the prescription rate of benzodiazepines is higher than that among other Organization for Economic Cooperation and Development (OECD) member countries, especially among elderly individuals (OECD, 2015; Oh et al., 2014). Hence, the prescription of benzodiazepines for more than 1 month has been prohibited by the South Korean government since 2010. The prescription rate of benzodiazepines in South Korea has accordingly exhibited a gradual decline since 2011 according to the HIRA (total prescriptions in 2011: 34,305,000; total prescriptions in 2015: 31,863,000). Thus, benzodiazepine-related public health policies restricting benzodiazepine prescriptions may have affected our result regarding anxiolytics. Future pharmaco-epidemiological studies should investigate changes in the prescription pattern of psychotropic medications to disentangle these complex issues.

In the secondary analysis, we observed a significantly greater increase in the prescription rate of antipsychotics in Ansan Danwon compared to a control community after the disaster. Low-dose antipsychotics are commonly prescribed for the treatment of anxiety, agitation, depression, or insomnia (Rossi et al., 2011). Consistent our results, several pharmaco-epidemiological studies have reported significant increases in the prescription rates of antipsychotics after a disaster (Rossi et al., 2011; Trifiro et al., 2013). With regard to the short-term effects of the disaster, we similarly did not identify any significant differences in psychotropic medication prescription rates between Ansan Danwon and Cheonan city after the disaster. Yet, Beaglehole et al. reported short-term increases in the use of anxiolytics and sedatives/hypnotics 1 month after a devastating earthquake (Beaglehole et al., 2015), and Trifiro et al. similarly indicated increases in the prescription rates of antidepressants and antipsychotics 2 months after an earthquake (Trifiro et al., 2013). We do not have a clear explanation as to why we only observed a significant increase in antidepressant and antipsychotic prescriptions in the affected community in the long term rather than in the short term after the disaster. We suspect that the sociocultural context of South Korea including high stigmatization of mental health service utilization and/or culture-influenced personal beliefs regarding natural recovery from psychiatric illness may have caused traumatized individuals to delay necessary psychiatric treatment after the disaster (Han et al., 2016). Further studies are required to resolve this issue.

Our study had several limitations. First, we cannot exclude the possibility that other events may have influenced psychotropic medication prescription during the study period. For example, there was an outbreak of Middle East Respiratory Syndrome coronavirus (MERS-CoV) infection between May and December of 2015 in South Korea,

with 186 patients diagnosed and 38 deaths; this may have caused a decrease in general medical service utilization during the end of our study period (Kim et al., 2017). Nonetheless, the MERS-CoV pandemic was a nation-wide phenomenon and did not specifically influence the public health status of Ansan Danwon or Cheonan city. Thus, we believe that the 2015 MERS-CoV outbreak in South Korea minimally affected our results. Second, we did not investigate sociodemographic or clinical factors potentially contributing to increases in the rate of antidepressant prescription in Ansan Danwon compared to the control community. Exploring these factors may be useful for identifying individuals with greater vulnerability to mental health problems or drug abuse or misuse after a disaster (Trifiro et al., 2013).

In conclusion, we investigated changes in the time-series pattern of psychotropic medication prescriptions in a disaster-affected community using antidepressant, anxiolytic, and sedative/hypnotic prescription data from Ansan Danwon before and after the Sewol Ferry disaster. The prescription rate of antidepressants showed a greater increase in Ansan Danwon compared to the control community in the aftermath of the Sewol Ferry disaster. This result suggests that disasters have negative effects on local community mental health status. Pharmaco-epidemiological studies on disaster events and psychotropic medication prescriptions provide indirect evaluations of disaster effects at the population level. Future studies are required to elucidate the psychosocial mechanism underlying changes in the prescription of psychotropic medications following a disaster.

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Appendix A. Supplementary material

Supplementary data associated with this article can be found in the online version at <http://dx.doi.org/10.1016/j.jad.2017.05.026>.

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