◼ ORIGINAL ARTICLE

Prefectural difference in spontaneous intracerebral hemorrhage incidence in Japan analyzed with publically accessible diagnosis procedure combination data: possibilities and limitations

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OBJECTIVES: Annually reported, publically accessible Diagnosis Procedure Combination (DPC) data from the Japanese government is a part of the total DPC database of the Japanese medical reimbursement system for hospitalization. Although medical issues can be evaluated with these data promptly, the applicability of these data in epidemiological analyses has not been assessed.

METHODS: We performed analyses using only statistical indices reported on the a government website. As a preliminary step, the prefectural consistency of spontaneous intracerebral hemorrhage (sICH) was examined with prefectural mortality over 20 years. Then the prefectural incidence of sICH for four years was calculated, utilizing publically accessible DPC data. To determine its reliability, the consistency was examined, and correlations were analyzed with three prefectural factors expected to have an effect: the elderly rate, mortality due to sICH, and the non-DPC bed rate. In addition, a comparison model between prefectures with this method was developed by analyzing other prefecture-specific factors.

RESULTS: Prefectural mortality due to sICH and prefectural sICH incidence in the DPC database were both consistent over the years. Prefectural sICH incidence had a constant positive correlation with the elderly rate, a partial correlation with mortality due to sICH, but no correlation with the non-DPC bed rate, which is one of the major biases when utilizing the DPC database. In the comparison model, the factors of low income and alcohol consumption showed increased sICH incidence.

CONCLUSIONS: Although careful attention to its limitations is required, publically accessible DPC data will provide insights into epidemiological issues.

KEY WORDS: Database, Incidence, Mortality, Cerebral hemorrhage

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INTRODUCTION

Although many reports have estimated spontaneous intracerebral hemorrhage (sICH) incidence in certain regions [1,2], no nationwide survey capturing all sICH patients has been reported. To obtain the exact sICH incidence, all newly diagnosed sICH cases in the population with available baseline information must be captured, which is difficult even in a small community, and any reported sICH incidence should be regarded as involving some error. Although higher age [1] and male [1,3] increases sICH incidence, even after adjusting for these factors, large regional differences are likely to exist [2]. Hence, estimated sICH incidences in certain regions should not be interpreted

as having universal meaning. These estimations would have significance if they were comparable among different regions.

The recent expansion of electronic medical records has enabled large amounts of information to be prepared for medical analysis [4]. In Japan, a novel medical reimbursement system for hospitalization, named the Diagnosis Procedure Combination (DPC) system, was launched in 2003, based on electronic medical records from physicians, submitted by hospitals participating in this system to the Japan Ministry of Health, Labor, and Welfare (JMHLW) [5]. These data are analyzed by the government and the summarized data are officially reported once a year. The number of hospitals submitting their hospitalized patient information to the DPC system (DPC hospitals) has gradually increased over 10 years, and as of March 2015, among 894,216 general beds for admission in Japan, 582,367 beds have been covered by the DPC system, which is 65.1% of the total. The DPC system is believed to cover approximately 90% of the total number of acute inpatient hospitalizations [6,7], as most active hospitals are now DPC hospitals. Since the information from DPC hospitals directly relates to the reimbursement of hospitalization expenses, the data are carefully checked at each hospital, and the submitted information is investigated by the government. The platform format of submissions is uniform throughout the nation, and the data to be submitted includes: age, sex, primary diagnosis, consciousness status and comorbidities on admission, all interventions performed during admission, and activity status at discharge [8]. We believe the quality of the DPC database is quite high in spite of its size.

However, in utilizing publically accessible DPC data, careful attention should be paid to the limitations of the data [5]. As illustrated in Figure 1, the actual sICH incidence in Japan is unknown because of uncaptured sICH patients at hospitals that
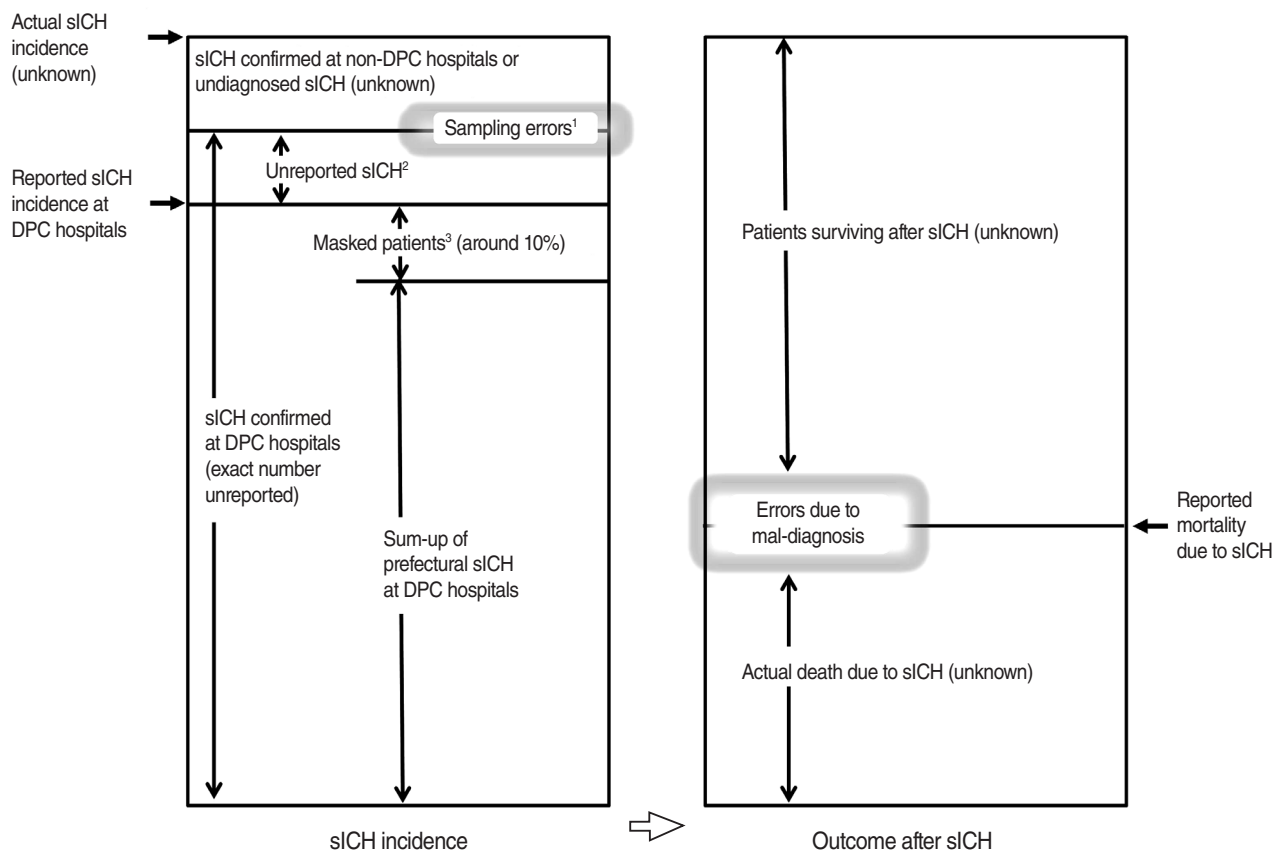
Figure 1. Conceptional diagram indicating the relation between sICH incidence and mortality due to sICH. sICH, spontaneous intracerebral hemorrhage; DPC, Diagnosis Procedure Combination. [1]Sampling errors in obtaining patients in the DPC database include misdiagnosis and inappropriate coding or double counts of the same patients. [2]Unreported sICH patients from publically accessible DPC data include patients who died or were discharged within 24 hours. [3]Masked patients are unreported patients treated at hospitals with fewer than 10 patients in a year. Specifically, for sICH patients, patients with ICH due to arteriovenous malformation rupture will be involved due to the lack of corresponding codes.

do not submit DPC data (non-DPC hospitals). Although the number of sICHs at DPC hospitals is known by JMHLW, patients who died within 24 hours are not reported to the public; thus the number of sICHs that can be gathered from publically accessible DPC data is smaller than the number contained by the whole DPC database. In publically accessible DPC data, numbers fewer than 10 in the segmentalized fields of each hospital according to the DPC codes are masked, although the total patient numbers of DPC hospitals are reported. When obtaining prefectural patient numbers by summing up the patient numbers of the hospitals in the same prefectures, this masking will result in a further reduction in the number of patients compared with the total patient number in the DPC database [2].

Considering these limitations, whether publically accessible DPC data is worth analyzing has yet to be determined, although its enormity, its accessibility, and its expected further development are attractive. The purpose of this paper was to examine the adequacy of utilizing publically accessible DPC data in epidemiological fields.

MATERIALS AND METHODS

This study required no institutional review board approval, or informed consent, since only publically accessible data on government homepages obtained through the Internet were used.

Prefectural consistency in spontaneous intracerebral hemorrhage mortality

Prior to examining the adequacy of prefectural sICH incidence in the DPC database, whether sICH occurs with a constant tendency in each prefecture should be examined, since randomly fluctuating medical events are inappropriate for epidemiological analysis. Although there has been no comparable prefectural sICH incidence measurement so far, as a related index, the number of deaths due to sICH was utilized for this purpose. The Japanese government has successively reported the total annual number of deaths categorized by cause. This number is obtained from all of the death certificates physicians produced, which are then regrouped by cause of death according to the International Classificstion of Diseas, 10th revision by the government. Although mortality and incidence are different indices, it can be assumed that there are correlations, and as a preliminary analysis, the prefectural consistency concerning sICH was confirmed utilizing this officially reported mortality. Every five years, the government reported the rate of age-adjusted cause of death for each prefecture by sex (Appendix 1A). If death due to sICH is affected by surrounding conditions specific to each prefecture, the rank of this rate must be highly constant and the tendencies must be close between sexes. We statistically analyzed the prefectural consistency of sICH mortality between 1990 and 2010 and the correlation between the tendencies in both sexes was evaluated for each year.

Obtaining spontaneous intracerebral hemorrhage incidence in the Diagnosis Procedure Combination database

From publically accessible DPC data, the number of hospitalized patients due to sICH in DPC hospitals can be obtained. The corresponding codes indicating sICH are those beginning with 010040, and in this article, the number of patients with those codes divided by the population of the corresponding year was defined as the sICH incidence in the DPC database. However, this number was contaminated by two inevitable biases: one is that patients who died within the first day were excluded from the publically accessible DPC data, and the other is that intracerebral hemorrhages (ICH) due to arteriovenous malformation rupture were counted as sICH, although ICH due to aneurysm rupture, tumor, cerebral infarction, or trauma with different corresponding codes were ruled out. As for the prefectural sICH incidence, hospitals were grouped according to the prefecture in which they were located, then the sICH patient number for each prefecture was summed up. This number divided by the prefectural population is defined as the prefectural sICH incidence; however, this number is further contaminated by the "masked rate" [5]. This occurs because patient numbers treated in hospitals with fewer than 10 patients in a year were not reported, thus the patient numbers obtained as the prefectural sICH incidence resulted in smaller numbers than those captured by the DPC database. This "masked rate," the percentage of unreported numbers in Excel files giving the patient numbers of each hospital, was obtained by a $100 \times$ summation / total number. All calculated sICH incidences were expressed as the number per 100,000 people. The files used for the calculation are shown in Appendix 1B and 1C.

Evaluation of prefectural spontaneous intracerebral hemorrhage incidence in the Diagnosis Procedure Combination database

In order to evaluate the adequacy of the prefectural sICH incidence in the DPC database, obtained with the abovementioned method, as an epidemiologically applicable index, analyses were performed concerning two factors: its consistency over a number of years and its correlation with other factors that might have an effect. The consistency of the prefectural sICH incidence in the DPC database between 2011 and 2014 was analyzed according to the same manner used in the consistency analysis for prefectural mortality. Then, the correlations with three possibly affecting factors were assessed for each year. The first possibly affecting factor is the prefectural rate of elderly population

aged 75 and over, each year of which was obtained from the files shown in Appendix 1C. A large elderly population will increase the sICH incidence, and without a correlation with this factor, the adequacy of the obtained prefectural sICH would be doubtful. As a second factor, the correlation with the prefectural crude mortality due to sICH was evaluated, since mortality due to sICH is a major outcome. The crude prefectural sICH mortality was calculated by dividing total reported deaths due to sICH in each prefecture, with the files shown in Appendix 1D, by the total prefectural population in each corresponding year (Appendix 1C). The third factor is a major, considerable bias: the rate of non-DPC beds in each prefecture. As mentioned above, the prefectural sICH incidence may be contaminated by several biases, and the most significant bias would be the unknown number of sICH patients treated at non-DPC hospitals. If prefectures with a larger number of non-DPC general beds tend to have smaller sICH incidences, the effect of this bias may contaminate the analysis, thus the prefectural sICH incidence obtained with this method should be considered unreliable. The numbers of DPC beds in each hospital were obtained from the files shown in Appendix 1E, and the total number of general hospital beds in each prefecture from the files shown in Appendix 1F, for the calculation of the prefectural rate of non-DPC general beds.

Comparison model between prefectural sICH incidences in the DPC database

Although the purpose of this article is to evaluate the adequacy of prefectural sICH incidence in the DPC database as an epidemiological index, it is also important to understand how this can be utilized in further analysis. In order to demonstrate a comparison model as an example, the latest prefectural sICH incidence in the DPC database in 2014 was analyzed with several factors specific to each prefecture. The factors used for analysis were 1) population per 1 km^2 of inhabitable area, 2) yearly temperature average, 3) yearly hours of sunshine, 4) yearly precipitation, 5) prefectural income per person, and 6) prefectural alcohol consumption per adult person. These factors were obtained from the government database indicated in Appendix 1G and 1H.

Statistical analysis

The analysis for the time-course consistency of prefectures was performed by calculating Kendall's coefficient of concordance [9,10]. For the correlation, the nonparametric Spearman's correlation coefficient was used for the univariate analysis, and multiple forward stepwise regression analysis was employed for the multivariate analysis. The results were considered statistically significant at $p < 0.05$, and all p-values were two-sided.

RESULTS

Prefectural consistency for spontaneous intracerebral hemorrhage mortality

The age-adjusted mortality due to sICH throughout Japan decreased from 26.1 (per 100,000 people) in 1990 to 17.1 in 2010 for males, and from 15.7 to 7.6 for females. There was a large difference among prefectures; for males from 11.1 to 24.6 in 2010, and for females from 4.8 to 12.1. During these 20 years, five prefectures were continuously ranked among the lowest 10 prefectures for males; Nara (ranked 5-2-1-2-1), Kagawa (ranked 2-9-4-5-1), Shiga (ranked 7-5-8-3-3), Osaka (ranked 10-8-9-7-8), and Fukui (ranked 1-3-2-10-10), and for females, two prefectures were ranked; Kagawa (ranked 2-1-7-5-1) and Osaka (ranked 6-5-5-6-3). As for the highest 10 prefectures, five prefectures were continuously ranked for males, Iwate (ranked 2-1-2-1-1), Aomori (ranked 4-6-1-4-3), Akita (ranked 8-3-7-6-4), Kagoshima (ranked 6-5-5-2-5), and Tochigi (ranked 1-2-8-8-7), but none for females. In Kendall's coefficient of concordance analysis, both males (W-value = 0.75, p < 0.001) and females (W-value = 0.70, p < 0.001) showed a high consistency of prefectural sICH mortality. There are strong correlations between sexes, Rs = 0.68, p < 0.001 in 1990, Rs = 0.52, p < 0.001 in 1995, Rs = 0.69, p < 0.001 in 2000, Rs = 0.77, p < 0.001 in 2005, and Rs = 0.77, p < 0.001 in 2010. These consistencies over time and between sexes revealed that there should exist a prefectural tendency in mortality due to sICH. All data are shown in Appendix 2.

Overview of spontaneous intracerebral hemorrhage incidence in the Diagnosis Procedure Combination database

Table 1 presents an overview of sICH incidence in the DPC database. The crude sICH incidence in the DPC database increases from 43.6 to 47.3 in these four years, which must result from the increasing number of hospitals using DPC systems. The "masked rate" of summed-up sICH patients for each prefecture is around 10%; thus the prefectural sICH number in the DPC database obtained with the above mentioned method captured approximately 90% of patients from the total sICH number in the DPC database.

Consistency of prefectural spontaneous intracerebral hemorrhage in the Diagnosis Procedure Combination database

During these four years, four prefectures were continuously ranked among the lowest 10 prefectures; Yamanashi (ranked 1-1-1-1), Miyagi (ranked 2-3-2-3), Oita (ranked 3-2-4-9), and Saitama (ranked 6-4-3-2). As for the highest 10 prefectures, eight prefectures were continuously ranked, Okinawa (ranked

Table 1. Annual change in the DPC database related to sICH

Year (report date)	No. of hospitals in DPC database	Rate of DPC beds (DPC beds/ all general beds, %)	Total sICH	sICH DPC database[1]	Summed-up incidence in sICH	Masked rate[2] (%) prefectural
2011 (21/08/2012)	1,634	54.6 (491, 282/899, 385)	55,766	43.6	49,941	10.4
2012 (09/30/2013)	1,774	57.2 (513, 449/898, 166)	55,889	43.8	50,195	10.2
2013 (09/05/2014)	1,804	57.6 (516, 551/897, 380)	56,486	44.4	50,747	10.2
2014 (11/16/2015)	2,942	65.1 (582, 367/894, 216)	60,144	47.3	53,817	10.5

DPC, Diagnosis Procedure Combination; sICH, spontaneous intracerebral hemorrhage.
[1]Numbers represent patients per 100,000 Japanese people.
[2]Masked rate results from unreported patients treated at hospitals with fewer than 10 patients per year.

Table 2. Correlation coefficient of analyzed factors with prefectural sICH incidence in the DPC database

Year	Analyzed factor		
	Rate of the elderly aged 75 and over	Crude mortality due to sICH	Rate of non-DPC beds
2011	0.35 (0.02)	0.25 (0.10)	-0.24 (0.11)
2012	0.36 (0.01)	0.28 (0.06)	-0.21 (0.17)
2013	0.37 (0.01)	0.27 (0.07)	-0.24 (0.11)
2014	0.39 (0.007)	0.22 (0.14)	-0.04 (0.79)

The number in the parenthesis represents p-value.
sICH, spontaneous intracerebral hemorrhage; DPC, Diagnosis Procedure Combination.

1-1-1-1), Iwate (ranked 2-3-2-2), Wakayama (ranked 3-4-5-4), Kumamoto (ranked 4-5-6-8), Yamagata (ranked 5-2-3-7), Tottori (ranked 6-10-8-3), Kochi (ranked 7-6-7-5), and Aomori (ranked 10-9-9-9). The Kendall's coefficient of concordance analysis revealed quite a high consistency of prefectural sICH incidence in the DPC database for these four years (W-value = 0.95, p < 0.001). All data were shown in Appendix 3.

Factors affecting prefectural spontaneous intracerebral hemorrhage incidence in the DPC database

Table 2 indicates the Spearman's correlation coefficient of three examined factors in each year, and Figure 2 indicates the relations between sICH incidence and these factors in 2014. Among examined factors, only the rate of the elderly aged 75 and over showed a significant positive correlation continuously for these four years. The crude mortality due to sICH showed positive correlation and the rate of non-DPC beds showed negative correlation, but they were non-significant. With a multiple regression analysis, no factor significantly affected the prefectural sICH in the DPC database in 2011 and in 2012; however, in 2013, the crude mortality due to sICH had a significant correlation ($\beta = 0.37$, p = 0.01), and in 2014, the rate of elderly persons had a significant correlation ($\beta = 0.30$, p < 0.05). All data from the three examined factors are shown in Appendices 4-6.

Comparison model between prefectural s spontaneous intracerebral hemorrhage incidences in the Diagnosis Procedure Combination database
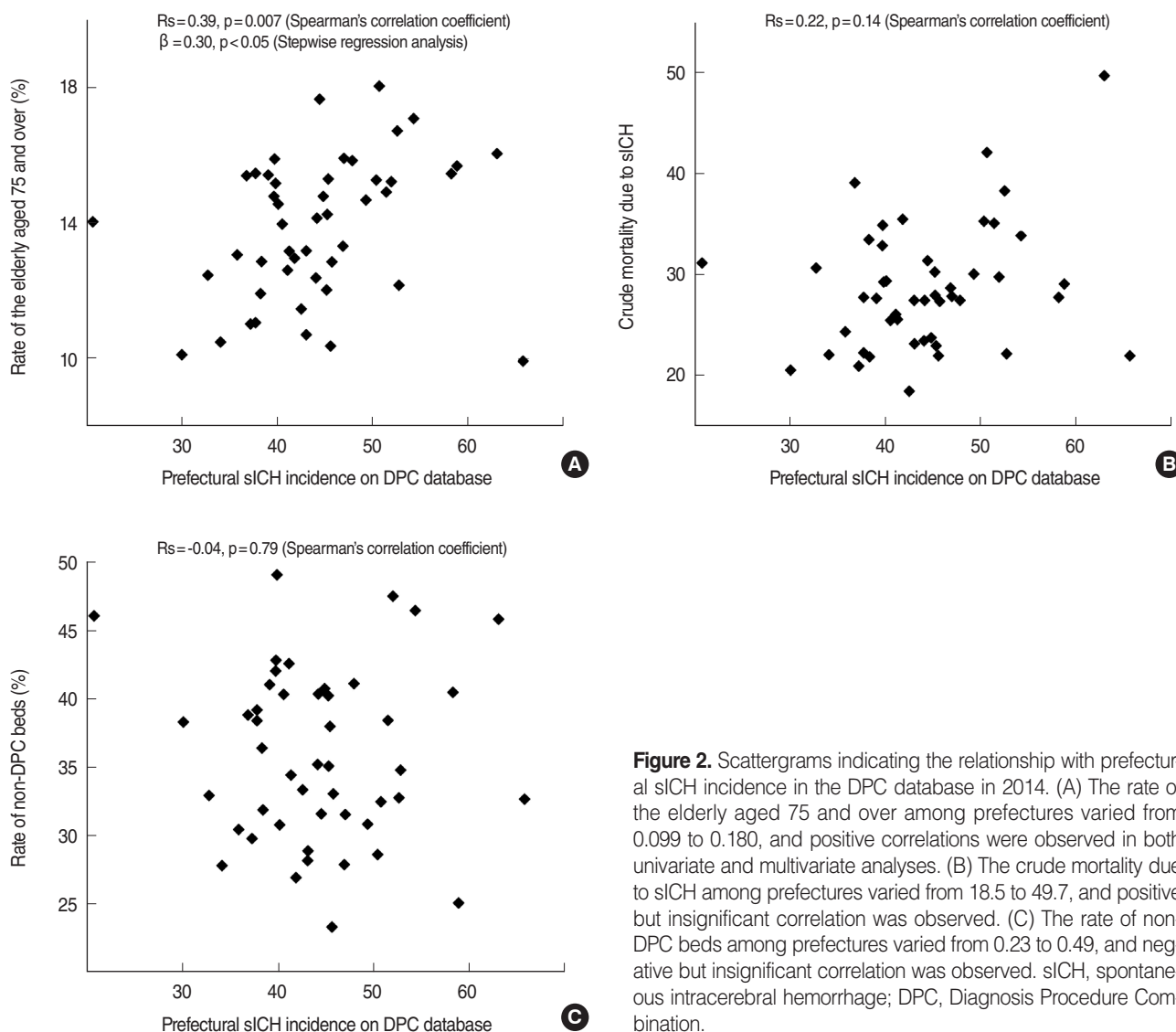
Among six factors examined, only the prefectural income per person negatively correlated with prefectural sICH incidence according to the non-parametric Spearman's correlation coefficient (Rs = -0.32, p < 0.05). With multivariate analysis, the prefectural alcohol consumption per adult person independently affected prefectural sICH incidence ($\beta = 0.32$, p < 0.05). Other factors did not reveal any significant relation in both analyses. Figure 3 indicates the relations between sICH incidence and these significant factors. All data are shown in Appendix 7.

DISCUSSION

The reliability of a large medical database has been difficult to determine. Ordinarily, comparison with a "gold standard" database is desirable for novel database evaluation. However, there is no "gold standard" database regarding sICH incidence [2]. Among medical indices relating to sICH, the standard one is mortality due to sICH, which can be extracted from the vital statistics survey reported annually by the JMHLW, and these data have been used for international comparison by the World Health Organization [11]. In our preliminary analysis, mortality due to sICH in Japan revealed a constant tendency among prefectures. However, our study also revealed only partial positive tendencies between the prefectural mortality and prefectural sICH incidence in the DPC database. This does not necessarily mean that the sICH incidence in the DPC database is unreliable, since the mortality is a different parameter from the incidence, as shown in Figure 1. The mortality due to sICH was reported to be lower in Japan than in any other region [1], and this might result from an intensive medical intervention attitude even for comatose patients with sICH [12]. Further, we should be skeptical about the accuracy of the reported mortality number, since this also definitely contains errors due to misdiagnosis [13,14].

Several population-based studies for sICH incidence in Japan

Rs=0.39, p=0.007 (Spearman's correlation coefficient)
β=0.30, p<0.05 (Stepwise regression analysis)

Figure 2. Scattergrams indicating the relationship with prefectural sICH incidence in the DPC database in 2014. (A) The rate of the elderly aged 75 and over among prefectures varied from 0.099 to 0.180, and positive correlations were observed in both univariate and multivariate analyses. (B) The crude mortality due to sICH among prefectures varied from 18.5 to 49.7, and positive but insignificant correlation was observed. (C) The rate of non-DPC beds among prefectures varied from 0.23 to 0.49, and negative but insignificant correlation was observed. sICH, spontaneous intracerebral hemorrhage; DPC, Diagnosis Procedure Combination.

have been reported, all of which were from regional communities [3,15-17]. The Japanese government holds a National Database (NDB) composed of all health insurance claims (HIC) for payment, which covers the entire nation, including non-DPC hospitals [18]. Although NDB has been refined with more computerized HIC submissions [19], NDB is not equally adequate to the DPC database for analysis due to the lack of detailed patient profiles or uncoded diagnoses [18,19]. We showed constant positive correlations for prefectural sICH incidence in the DPC database with the elderly population rate for each prefecture, indicating a rational tendency: a more aged population will have more sICHs [1]. No significant correlation was obtained with the rate of non-DPC beds in each prefecture, which is a considerable bias. These positive and negative results, and some correlations with mortality due to sICH, may suggest some

potential for the sICH incidence obtained by this method. When considering the reliability of the database, its extensive coverage of all concerned patients is a necessary factor to take into account. Due to the severity of the symptoms, it is very rare for patients with sICH to be treated without hospitalization [20]. Thus, analysis of hospitalized patient data is effective for sICH research [20], and was actually not so different from analysis with a population-based study [21]. As a hospital patient database, the DPC database has been expanding and enhancing its coverage. In addition, the credibility of the gathered data is important for the reliability of the database. We believe the quality of the recorded data is high due to its relation to reimbursement under government supervision.

Although there are attractive features to the DPC database, we should be careful regarding limitations when utilizing the
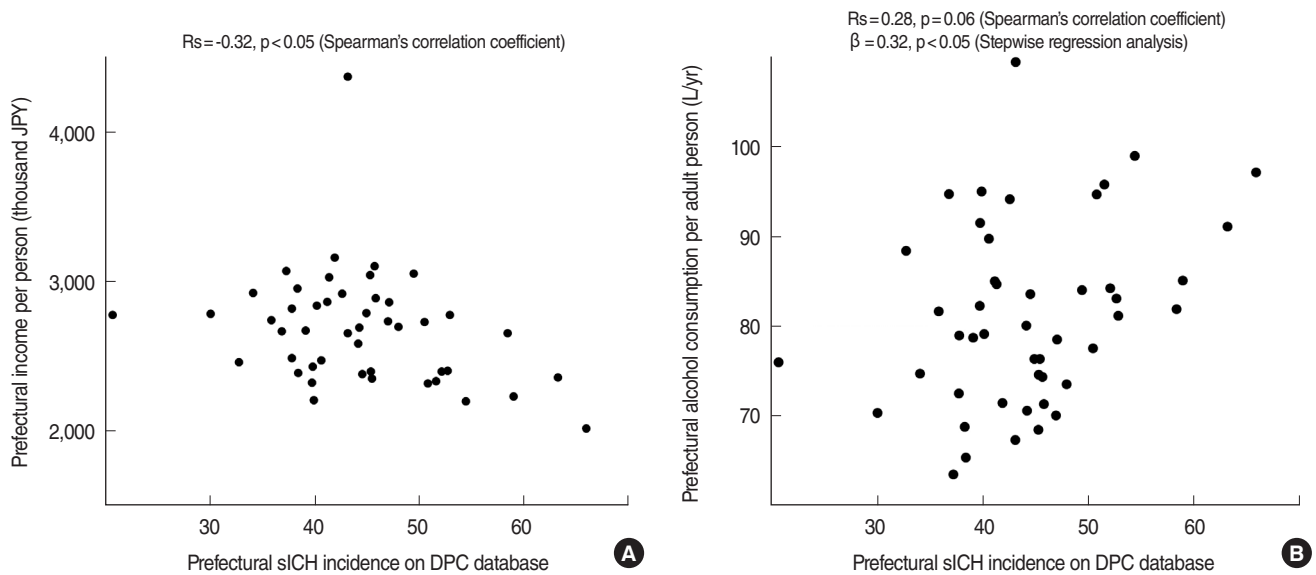
Figure 3. Scattergrams indicating the relationship with prefectural incidence in the DPC database in 2014 as the comparison model. Among examined factors, those with a significant correlation are shown. (A) Prefectural income per person varied from 2,018 thousand to 4,373 thousand JPY, and negative correlation was observed in univariate analysis. (B) Prefectural alcohol consumption per adult person varied from 63.5 to 109.4 L/yr, and positive correlation was observed in multivariate analysis. sICH, spontaneous intracerebral hemorrhage; DPC, Diagnosis Procedure Combination; JPY, Japanese yen (100 JPY=1 dollar).

DPC database. The major limitation is that the number of patients treated at non-DPC hospitals is decreasing as the medical reimbursement for hospitalization using the DPC system expands. However, when utilizing publically accessible DPC data, as in this article, other specific limitations occur. The limitations inherent to the publically accessible DPC data are significant and this may account for the paucity of articles utilizing these data [5,22]. Analyses with the whole body of the DPC database are able to utilize more detailed information for each patient. In order to avoid the limitations inherent to publically accessible DPC data, it is preferable that the whole body of the DPC database to be made accessible to any qualified researcher with a medically meaningful research proposal.

Since determining the causative factors influencing sICH incidence is not the purpose of this article, we performed only correlation analysis with a limited number of factors, in order to introduce a comparison model between prefectures using the latest publically accessible DPC data. Among the factors examined in this model, the prefectural income per person negatively correlated with the prefectural sICH incidence, and prefectural alcohol consumption was a factor with a positive effect. The risk of alcohol consumption has been proven in Japan [17], and considering the correlation of sICH incidence with low income, some social behaviors relating to drinking habits may influence sICH onset [23]. Other meteorological factors did not reveal any significant relation with sICH incidence, although several

reports indicate meteorological [15] or seasonal effects [24,25] on sICH onset. Further analyses with reliable data representing the characteristics of each prefecture may show causative factors with this comparison model.

Although careful attention due to its limitations is required, further evaluation of publically accessible DPC data in Japan as a tool for epidemiological analyses is warranted.

CONFLICT OF INTEREST

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

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REFERENCES

1. van Asch CJ, Luitse MJ, Rinkel GJ, van der Tweel I, Algra A, Klijn CJ. Incidence, case fatality, and functional outcome of intracerebral haemorrhage over time, according to age, sex, and ethnic origin: a

systematic review and meta-analysis. Lancet Neurol 2010;9:167-176.

2. Gattellari M, Goumas C, Worthington J. Declining rates of fatal and nonfatal intracerebral hemorrhage: epidemiological trends in Australia. J Am Heart Assoc 2014;3:e001161.

3. Nagura J, Suzuki K, Hayashi M, Sakamoto T, Shindo K, Oishi H, et al. Stroke subtypes and lesion sites in Akita, Japan. J Stroke Cerebrovasc Dis 2005;14:1-7.

4. Ola O, Sedig K. The challenge of big data in public health: an opportunity for visual analytics. Online J Public Health Inform 2014;5:223.

5. Fukuhara T. Geographical analysis of aneurysmal subarachnoid hemorrhage in Japan utilizing publically-accessible DPC database. PLoS One 2015;10:e0122467.

6. Kubo T, Fujino Y, Murata A, Ichimiya Y, Kuwabara K, Fujimori K, et al. Prevalence of type 2 diabetes among acute inpatients and its impact on length of hospital stay in Japan. Intern Med 2011;50:405-411.

7. Murata A, Okamoto K, Matsuda S, Kuwabara K, Ichimiya Y, Matsuda Y, et al. Multivariate analysis of factors influencing length of hospitalization and medical costs of cholecystectomy for acute cholecystitis in Japan: a national database analysis. Keio J Med 2013;62:83-94.

8. Tagami T, Matsui H, Fushimi K, Yasunaga H. Low-dose corticosteroid treatment and mortality in refractory abdominal septic shock after emergency laparotomy. Ann Intensive Care 2015;5:32.

9. Gisev N, Bell JS, Chen TF. Interrater agreement and interrater reliability: key concepts, approaches, and applications. Res Social Adm Pharm 2013;9:330-338.

10. Gerylovová A, Holčík J. Use of nonparametric methods in medicine. VII. Kendall's coefficient of concordance in several sequences. Vnitr Lek 1991;37:186-191 (Czech).

11. World Health Organization. Global status report on noncommunicable diseases 2014 [cited 2015 Dec 12]. Available from: http://apps.who.int/iris/bitstream/10665/148114/1/9789241564854_eng.pdf?ua=1.

12. Fukuhara T, Aoi M, Namba Y. Mechanical ventilation for comatose patients with inoperative acute intracerebral hemorrhage: possible futility of treatment. PLoS One 2014;9:e103531.

13. Ohtsu T, Kokaze A, Shimada N, Kaneita Y, Shirasawa T, Ochiai H, et al. Usage of the .9 codes of the ICD-10 for Japanese mortality statistics. Acta Med Okayama 2009;63:281-286.

14. Özdemir R, Rao C, Öcek Z, Dinç Horasan G. Reliable mortality statistics for Turkey: are we there yet? BMC Public Health 2015;15:545.

15. Matsumoto M, Ishikawa S, Kajii E. Cumulative effects of weather on stroke incidence: a multi-community cohort study in Japan. J Epidemiol 2010;20:136-142.

16. Omama S, Yoshida Y, Ogasawara K, Ogawa A, Ishibashi Y, Ohsawa M, et al. Incidence rate of cerebrovascular diseases in northern Japan determined from the Iwate Stroke Registry with an inventory survey system. J Stroke Cerebrovasc Dis 2013;22:e317-e322.

17. Gotoh S, Hata J, Ninomiya T, Hirakawa Y, Nagata M, Mukai N, et al. Trends in the incidence and survival of intracerebral hemorrhage by its location in a Japanese community. Circ J 2014;78:403-409.

18. Fujimori K. Practical use of E-claim data for regional healthcare planning. Nihon Eiseigaku Zasshi 2012;67:56-61 (Japanese).

19. Tanihara S. Assessment of text documentation accompanying uncoded diagnoses in computerized health insurance claims in Japan. J Epidemiol 2015;25:181-188.

20. Kleindorfer D. The bad news: stroke incidence is stable. Lancet Neurol 2007;6:470-471.

21. Cordonnier C, Rutgers MP, Dumont F, Pasquini M, Lejeune JP, Garrigue D, et al. Intra-cerebral haemorrhages: are there any differences in baseline characteristics and intra-hospital mortality between hospitaland population-based registries? J Neurol 2009;256:198-202.

22. Sakai H, Muramatsu K, Matsuda S. DPC data based situation analysis of regional core hospital: an application of the GIS methodology for regional health care plans. J UOEH 2013;35:39-49 (Japanese).

23. Nakaguchi H, Teraoka A. Relationship between the occurrence of spontaneous intracerebral hemorrhage and holidays and traditionally unlucky days in Fukuyama City, Hiroshima Prefecture, Japan. J Stroke Cerebrovasc Dis 2007;16:194-198.

24. Spengos K, Vemmos KN, Tsivgoulis G, Synetos A, Zakopoulos N, Zis VP, et al. Seasonal variation of hospital admissions caused by acute stroke in Athens, Greece. J Stroke Cerebrovasc Dis 2003;12:93-96.

25. Raj K, Bhatia R, Prasad K, Srivastava MV, Vishnubhatla S, Singh MB. Seasonal differences and circadian variation in stroke occurrence and stroke subtypes. J Stroke Cerebrovasc Dis 2015;24:10-16.

Appendix 1. The details of publically accessible data on government homepages obtained through the Internet

A. The age-adjusted numbers of death due to sICH per each prefecture in 1990, 1995, 2000, 2005 and 2010 were obtained from the CSV files on e-Stat (Japanese government statistics portal site), indicated as Table 2-31 at, https://www.e-stat.go.jp/SG1/estat/GL08020103.do?_toGL08020103_&listID=000001101037&requestSender=search. Accessed December 12, 2015.

B. The numbers of sICH on the DPC database were obtained from the Excel files on one of JMHLW home pages, reporting the conference series evaluating the DPC system at, http://www.mhlw.go.jp/stf/shingi/shingi-chuo.html?tid=128164. The total numbers of sICH in Japan were obtained from the Excel files, indicated as Reference 2-(9), in which the hospitals were grouped by the year of participation in the DPC system at, http://www.mhlw.go.jp/stf/shingi/2r9852000002hs9l-att/2r9852000002hsv2.xls for 2011 (reported on August 21, 2012), http://www.mhlw.go.jp/file/05-Shingikai-12404000-Hokenkyoku-Iryouka/0000034285.xls for 2012 (reported on September 20, 2013), http://www.mhlw.go.jp/file/05-Shingikai-12404000-Hokenkyoku-Iryouka/0000056548.xls for 2013 (reported on September 5, 2014) and http://www.mhlw.go.jp/file/05-Shingikai-12404000-Hokenkyoku-Iryouka/0000104212.xls for 2014 (reported on November 16, 2015). The prefectural numbers of sICH were obtained from the Excel files, indicated as Reference 2-(9) MDC01 at, http://www.mhlw.go.jp/stf/shingi/2r9852000002hs9l-att/2r9852000002hsv9.xls for 2011, http://www.mhlw.go.jp/file/05-Shingikai-12404000-Hokenkyoku-Iryouka/0000023588.xls for 2012, http://www.mhlw.go.jp/file/05-Shingikai-12404000-Hokenkyoku-Iryouka/0000056549.xls for 2013 and http://www.mhlw.go.jp/file/05-Shingikai-12404000-Hokenkyoku-Iryouka/0000104214.xls for 2014. All accessed December 12, 2015.

C. The population in Japan in each prefecture and the numbers of people aged 75 and over were obtained from the Excel file on e-Stat, indicated as Table 11 at, http://www.e-stat.go.jp/SG1/estat/List.do?lid=000001088119 for 2011, http://www.e-stat.go.jp/SG1/estat/List.do?lid=000001109855 for 2012, http://www.e-stat.go.jp/SG1/estat/List.do?lid=000001118081 for 2013 and http://www.e-stat.go.jp/SG1/estat/List.do?lid=000001132435 for 2014. All accessed December 12, 2015.

D. The crude numbers of deaths due to sICH per each prefecture were obtained from the CSV files on e-Stat, indicated as Table 5-19 at, http://www.e-stat.go.jp/SG1/estat/List.do?lid=000001101884 for 2011, http://www.e-stat.go.jp/SG1/estat/List.do?lid=000001108739 for 2012, http://www.e-stat.go.jp/SG1/estat/List.do?lid=000001108740 for 2013 and http://www.e-stat.go.jp/SG1/estat/List.do?lid=000001137965 for 2014. All accessed December 12, 2015.

E. The bed numbers of each prefecture on the DPC system were obtained from the Excel files on one of the JMHLW homepages, reporting the conference series evaluating the DPC system at, http://www.mhlw.go.jp/stf/shingi/shingi-chuo.html?tid=128164. The files were indicated as "the overview of participating hospitals" at, http://www.mhlw.go.jp/stf/shingi/2r9852000002hs9l-att/2r9852000002i3fr.xls for 2011, http://www.mhlw.go.jp/file/05-Shingikai-12404000-Hokenkyoku-Iryouka/0000023535.xls for 2012, http://www.mhlw.go.jp/file/05-Shingikai-12404000-Hokenkyoku-Iryouka/0000056493.xls for 2013 and http://www.mhlw.go.jp/file/05-Shingikai-12404000-Hokenkyoku-Iryouka/0000104287.xls for 2014. All accessed December 12, 2015.

F. The numbers of general beds per each prefecture were obtained from the CVS files on e-Stat, indicated as G10 at, http://www.e-stat.go.jp/SG1/estat/List.do?lid=000001102729 for 2011, indicated as G9 at, http://www.e-stat.go.jp/SG1/estat/List.do?lid=000001112557 for 2012 http://www.e-stat.go.jp/SG1/estat/List.do?lid=000001126654 for 2013 and http://www.e-stat.go.jp/SG1/estat/List.do?lid=000001141081 for 2014. All accessed December 12, 2015.

G. The statistical indices of Japanese social life were annually reported by the Ministry of Internal Affairs and Communications and the latest one was reported on February 19, 2015 at, http://www.e-stat.go.jp/SG1/estat/GL08020103.do?_toGL08020103_&tclassID=000001056523&cycleCode=0&requestSender=estat. The population per 1 km2 of inhabitable area was obtained from the Excel file, indicated as "Table A-Population and Households" at, http://www.e-stat.go.jp/SG1/estat/images/xls.gif;jsessionid=NwYfWkzW3TXpT544Slm9p3tnjktbcFKXJ4f2nlTH2RqwL1m3Dq9K!-352016752!1540013709 (2013 as the latest data), yearly average of temperature, yearly sunshine hours and yearly precipitation were obtained from the Excel file, indicated as "Table B-Natural Environment" at, http://www.e-stat.go.jp/SG1/estat/images/xls.gif;jsessionid=NwYfWkzW3TXpT544Slm9p3tnjktbcFKXJ4f2nlTH2RqwL1m3Dq9K!-352016752!1540013709 (2013 as the latest data) and prefectural income per person was obtained from the Excel file, indicated as "Table C-Economic Base" at, http://www.e-stat.go.jp/SG1/estat/images/xls.gif;jsessionid=NwYfWkzW3TXpT544Slm9p3tnjktbcFKXJ4f2nlTH2RqwL1m3Dq9K!-352016752!1540013709 (2011 as the latest data). All accessed December 12, 2015.

H. The total amount of alcohol consumption was obtained from the Excel file on the homepage of the National Tax Agency at https://www.nta.go.jp/kohyo/tokei/kokuzeicho/jikeiretsu/xls/13.xls. (2013 as the latest data). Each prefectural amount of alcohol consumption was divided by the number of people aged 20 and over in each prefecture, obtained from the Excel file, indicated as Table 10 at, http://www.e-stat.go.jp/SG1/estat/List.do?lid=000001118081. All accessed December 12, 2015.

Appendix 2. Age-adjusted prefectural mortality due to sICH between 1990 and 2010 (per 100,000 people)

Year	1990	1995	2000	2005	2010	Year	1990	1995	2000	2005	2010
Male						Female					
National average	26.1	25.0	20.3	19.0	17.1	National average	15.7	14.3	10.8	9.3	7.6
Name of Prefecture						Name of Prefecture					
Hokkaido	20.5	22.6	19.2	19.3	15.7	Hokkaido	12.4	12.1	10.2	9.9	7.4
Aomori	33.6	28.6	28.8	24.1	23.0	Aomori	17.2	16.8	11.6	10.8	9.2
Iwate	34.0	32.5	26.8	25.7	24.6	Iwate	16.6	16.5	13.7	11.9	12.1
Miyagi	26.3	26.5	20.7	23.4	23.3	Miyagi	15.2	16.4	11.3	9.3	9.7
Akita	30.0	29.8	24.1	22.8	22.9	Akita	15.6	13.8	12.7	10.9	9.0
Yamagata	24.5	25.5	19.6	18.8	19.5	Yamagata	14.6	12.0	9.9	9.0	7.7
Fukushima	30.4	29.3	19.7	22.1	17.9	Fukushima	18.6	15.0	12.7	10.7	7.8
Ibaraki	31.6	27.0	22.6	21.9	20.0	Ibaraki	16.6	16.4	11.8	12.1	9.8
Tochigi	34.7	30.0	23.8	22.5	20.7	Tochigi	20.4	17.1	13.4	12.1	9.2
Gumma	29.1	23.7	21.4	18.9	17.2	Gumma	17.0	16.2	13.8	10.9	6.7
Saitama	27.9	27.8	21.4	19.2	16.2	Saitama	16.2	17.2	12.3	9.4	7.8
Chiba	25.9	25.1	20.9	19.3	15.8	Chiba	17.2	14.9	10.7	10.1	7.4
Tokyo	28.5	25.5	20.2	18.9	18.4	Tokyo	17.0	15.5	10.6	9.2	8.3
Kanagawa	27.4	24.8	21.9	20.1	17.4	Kanagawa	16.8	15.8	11.7	9.0	8.1
Niigata	22.7	25.9	19.9	20.4	19.8	Niigata	15.1	13.0	11.1	9.5	10.1
Toyama	21.0	19.5	15.5	16.1	16.1	Toyama	11.6	11.6	9.3	9.3	6.9
Ishikawa	21.6	15.5	15.2	16.2	12.5	Ishikawa	13.5	12.6	8.1	6.4	5.9
Fukui	18.6	17.3	14.1	16.1	14.5	Fukui	13.1	12.0	6.6	8.6	8.1
Yamanashi	25.1	26.2	14.8	15.5	15.9	Yamanashi	16.8	10.5	9.3	7.9	6.7
Nagano	29.1	28.6	24.2	20.7	17.2	Nagano	16.2	15.2	13.3	10.3	7.4
Gifu	24.8	24.1	20.3	18.2	16.3	Gifu	19.5	14.1	11.0	9.3	8.1
Shizuoka	26.4	23.8	22.9	22.7	19.9	Shizuoka	15.3	15.3	11.1	12.0	9.7
Aichi	23.6	25.5	21.6	19.4	17.0	Aichi	17.6	14.8	12.3	10.7	8
Mie	26.4	24.5	18.3	17.8	15.8	Mie	18.5	14.5	9.9	8.4	7.5
Shiga	22.0	20.2	16.0	13.4	12.3	Shiga	15.1	12.2	10.1	6.8	7.4
Kyoto	25.6	25.8	19.3	21.0	14.7	Kyoto	17.0	15.7	11.3	9.1	6.9
Osaka	22.5	21.3	16.9	15.7	14.1	Osaka	12.6	11.7	8.6	7.2	5.4
Hyogo	24.2	23.0	17.5	15.7	16.0	Hyogo	15.5	13.8	10.2	7.6	6.5
Nara	21.4	16.9	13.5	12.4	11.1	Nara	11.1	13.3	8.5	4.5	5.4
Wakayama	25.4	22.0	17.7	12.2	13.1	Wakayama	12.3	11.1	9.7	7.0	6.5
Tottori	33.8	26.8	20.7	22.0	16.4	Tottori	17.7	13.9	12.0	9.4	11.3
Shimane	25.5	21.2	18.9	14.4	15.7	Shimane	14.4	14.8	9.6	7.2	5.1
Okayama	24.4	20.5	16.9	17.3	18.3	Okayama	14.1	13.4	9.8	8.3	6.7
Hiroshima	23.0	26.5	20.3	17.3	16.4	Hiroshima	15.3	14.9	10.0	9.4	6.7
Yamaguchi	24.9	23.4	22.1	18.9	14.7	Yamaguchi	14.1	14.9	9.6	10.6	7.2
Tokushima	22.4	28.0	22.3	16.1	13.0	Tokushima	16	12.6	10.9	9.0	6.6
Kagawa	20.2	21.6	15.1	14.7	11.1	Kagawa	11.4	10.5	9.2	7.1	4.8
Ehime	22.2	22.8	19.2	19.0	14.2	Ehime	15.4	12.6	8.4	8.0	7.0
Kochi	29.5	27.1	25.5	24.2	20.3	Kochi	17.2	16.2	12.4	11.1	8.3
Fukuoka	25.7	25.5	20.7	17.3	14.9	Fukuoka	14.2	12.8	9.4	7.4	6.3
Saga	28.7	28.2	15.8	19.6	12.8	Saga	18.6	15.6	10.5	8.5	6.2
Nagasaki	26.1	25.1	18.4	17.4	16.9	Nagasaki	13.7	13.2	9.6	8.4	6.6
Kumamoto	28.1	27.9	17.8	18.2	17.9	Kumamoto	15.1	12.4	9.8	9.2	8.2
Oita	27.0	26.0	20.6	16.0	15.1	Oita	16.1	12.2	10.5	10.2	5.9
Miyazaki	27.5	26.7	19.8	19.4	18.5	Miyazaki	15.3	13.1	12.5	10.4	7.8
Kagoshima	30.9	28.9	25.3	24.7	22.4	Kagoshima	16.8	18.9	11.9	12.5	9.9
Okinawa	23.0	28.4	26.2	21.3	21.9	Okinawa	14.6	12.6	8.8	8.1	7.4

(continued)

sICH, spontaneous intracerebral hemorrhage.

Appendix 3. Prefectural sICH incidence on the DPC database (per 100,000 people)

Year	2011	2012	2013	2014
Name of Prefecture				
Hokkaido	31.63	30.26	34.19	40.56
Aomori	49.82	48.81	52.43	51.48
Iwate	61.34	58.40	61.47	63.08
Miyagi	27.42	27.83	27.06	32.73
Akita	46.79	47.60	55.33	50.72
Yamagata	52.80	59.20	56.70	52.61
Fukushima	38.64	39.30	37.46	39.69
Ibaraki	37.32	36.32	39.75	45.22
Tochigi	38.85	34.99	38.32	38.28
Gumma	41.93	44.88	44.41	45.75
Saitama	29.68	28.20	30.20	30.03
Chiba	31.01	33.38	34.25	37.74
Tokyo	40.34	39.47	40.02	43.08
Kanagawa	30.79	33.09	32.50	34.07
Niigata	33.57	35.41	34.68	36.79
Toyama	51.38	48.98	43.03	49.35
Ishikawa	31.99	30.87	33.65	35.81
Fukui	41.22	39.67	35.85	40.13
Yamanashi	18.44	21.83	20.90	20.69
Nagano	50.19	47.37	48.11	50.40
Gifu	42.78	42.94	42.22	43.07
Shizuoka	44.68	44.02	42.06	41.84
Aichi	41.05	43.91	43.21	45.62
Mie	46.45	46.03	41.41	46.90
Shiga	35.36	35.27	33.55	37.22
Kyoto	29.07	38.74	38.14	41.11
Osaka	37.94	38.05	39.44	42.54
Hyogo	41.42	42.94	42.35	44.09
Nara	29.08	31.87	34.49	38.37
Wakayama	60.60	55.47	53.63	58.29
Tottori	51.62	48.80	52.60	58.89
Shimane	37.50	42.15	45.87	44.48
Okayama	40.60	39.72	41.76	44.18
Hiroshima	42.03	39.15	38.63	41.30
Yamaguchi	49.51	47.66	51.90	47.02
Tokushima	47.44	49.61	48.05	47.91
Kagawa	37.60	32.76	37.16	44.85
Ehime	30.08	31.45	32.03	39.07
Kochi	51.45	51.86	52.62	54.34
Fukuoka	49.10	48.36	50.79	52.80
Saga	42.38	39.50	38.93	45.27
Nagasaki	43.97	46.66	43.09	45.38
Kumamoto	53.50	55.01	53.14	52.01
Oita	28.46	25.82	30.81	37.75
Miyazaki	31.74	32.59	31.16	39.86
Kagoshima	37.79	37.46	36.85	39.75
Okinawa	70.09	67.64	64.24	65.80

sICH, spontaneous intracerebral hemorrhage; DPC, Diagnosis Procedure Combination.

Appendix 4. Rate of the elderly aged 75 and over

Year	2011	2012	2013	2014
Name of Prefecture				
Hokkaido	0.127	0.132	0.136	0.140
Aomori	0.136	0.141	0.147	0.149
Iwate	0.149	0.153	0.158	0.160
Miyagi	0.116	0.120	0.122	0.125
Akita	0.167	0.173	0.178	0.180
Yamagata	0.158	0.162	0.166	0.167
Fukushima	0.140	0.144	0.147	0.148
Ibaraki	0.110	0.114	0.117	0.120
Tochigi	0.112	0.114	0.117	0.119
Gumma	0.120	0.123	0.127	0.129
Saitama	0.087	0.092	0.097	0.101
Chiba	0.096	0.101	0.106	0.111
Tokyo	0.098	0.102	0.105	0.107
Kanagawa	0.093	0.097	0.101	0.105
Niigata	0.146	0.149	0.152	0.154
Toyama	0.140	0.143	0.145	0.147
Ishikawa	0.124	0.127	0.129	0.131
Fukui	0.139	0.143	0.145	0.146
Yamanashi	0.132	0.135	0.138	0.140
Nagano	0.145	0.148	0.151	0.153
Gifu	0.122	0.126	0.129	0.132
Shizuoka	0.119	0.123	0.127	0.130
Aichi	0.093	0.097	0.101	0.104
Mie	0.125	0.128	0.131	0.133
Shiga	0.104	0.107	0.109	0.110
Kyoto	0.116	0.120	0.123	0.126
Osaka	0.101	0.106	0.111	0.115
Hyogo	0.113	0.117	0.121	0.124
Nara	0.116	0.121	0.125	0.129
Wakayama	0.145	0.150	0.152	0.154
Tottori	0.150	0.153	0.156	0.157
Shimane	0.170	0.174	0.177	0.176
Okayama	0.133	0.137	0.139	0.141
Hiroshima	0.123	0.127	0.130	0.132
Yamaguchi	0.150	0.154	0.157	0.159
Tokushima	0.151	0.155	0.157	0.158
Kagawa	0.141	0.145	0.146	0.148
Ehime	0.145	0.149	0.152	0.154
Kochi	0.162	0.166	0.169	0.171
Fukuoka	0.113	0.117	0.119	0.122
Saga	0.137	0.140	0.142	0.143
Nagasaki	0.144	0.148	0.151	0.153
Kumamoto	0.145	0.148	0.150	0.152
Oita	0.146	0.149	0.153	0.155
Miyazaki	0.142	0.147	0.150	0.152
Kagoshima	0.151	0.155	0.157	0.159
Okinawa	0.091	0.094	0.097	0.099

Appendix 5. Crude mortality due to sICH (per 100,000 people)

Year	2011	2012	2013	2014
Name of Prefecture				
Hokkaido	27.3	25.2	24.5	25.5
Aomori	38.8	37.9	36.7	35.1
Iwate	50.8	48.9	48.0	49.7
Miyagi	34.3	32.4	31.5	30.7
Akita	46.8	45.7	46.3	42.1
Yamagata	41.8	36.1	34.7	38.3
Fukushima	32.8	32.1	32.7	32.9
Ibaraki	30.1	31.0	31.6	30.3
Tochigi	34.1	34.8	30.6	33.5
Gumma	27.8	30.4	29.7	27.4
Saitama	22.0	20.8	20.6	20.6
Chiba	21.7	24.7	21.5	22.3
Tokyo	25.0	24.0	23.9	23.2
Kanagawa	23.0	22.2	24.2	22.1
Niigata	39.2	35.1	36.6	39.1
Toyama	32.9	32.1	30.0	30.1
Ishikawa	25.5	25.9	26.9	24.4
Fukui	24.2	30.2	23.2	29.4
Yamanashi	32.3	28.9	27.6	31.2
Nagano	32.7	35.3	36.8	35.3
Gifu	29.6	26.7	25.4	27.5
Shizuoka	32.7	35.4	34.1	35.5
Aichi	23.6	23.1	22.6	22.0
Mie	30.6	28.9	28.2	28.7
Shiga	22.1	22.6	19.3	21.0
Kyoto	23.8	26.4	24.1	26.1
Osaka	19.5	19.6	18.9	18.5
Hyogo	22.9	23.8	24.3	23.5
Nara	20.0	19.1	22.1	21.9
Wakayama	23.8	26.4	25.5	27.8
Tottori	32.8	29.6	31.2	29.1
Shimane	33.9	34.6	34.3	31.4
Okayama	30.0	26.6	30.7	27.5
Hiroshima	26.9	26.6	27.3	25.6
Yamaguchi	29.2	29.5	29.8	27.9
Tokushima	28.2	28.1	26.0	27.5
Kagawa	26.7	25.2	26.1	23.8
Ehime	33.1	28.8	27.9	27.7
Kochi	35.9	37.0	36.4	33.9
Fukuoka	23.4	22.7	21.3	22.2
Saga	26.3	30.1	26.1	28.0
Nagasaki	26.6	27.5	27.2	23.0
Kumamoto	31.1	30.1	26.7	29.8
Oita	27.9	31.0	30.4	27.8
Miyazaki	31.1	33.2	31.6	29.3
Kagoshima	39.3	37.8	36.1	34.9
Okinawa	22.0	21.8	22.3	22.0

sICH, spontaneous intracerebral hemorrhage.

Appendix 6. Rate of non-DPC beds

Year	2011	2012	2013	2014
Name of Prefecture				
Hokkaido	0.531	0.495	0.486	0.403
Aomori	0.57	0.538	0.532	0.384
Iwate	0.521	0.472	0.479	0.458
Miyagi	0.474	0.465	0.469	0.330
Akita	0.405	0.369	0.361	0.325
Yamagata	0.369	0.363	0.370	0.328
Fukushima	0.503	0.468	0.464	0.421
Ibaraki	0.497	0.506	0.512	0.402
Tochigi	0.456	0.421	0.428	0.364
Gumma	0.591	0.514	0.504	0.331
Saitama	0.480	0.445	0.443	0.383
Chiba	0.479	0.465	0.463	0.384
Tokyo	0.377	0.354	0.353	0.289
Kanagawa	0.374	0.353	0.341	0.278
Niigata	0.542	0.470	0.460	0.388
Toyama	0.320	0.319	0.303	0.309
Ishikawa	0.369	0.354	0.354	0.305
Fukui	0.430	0.431	0.421	0.308
Yamanashi	0.546	0.530	0.538	0.461
Nagano	0.407	0.364	0.348	0.286
Gifu	0.347	0.349	0.348	0.282
Shizuoka	0.325	0.319	0.278	0.270
Aichi	0.400	0.344	0.335	0.233
Mie	0.386	0.371	0.377	0.279
Shiga	0.426	0.403	0.398	0.298
Kyoto	0.496	0.480	0.479	0.426
Osaka	0.434	0.398	0.399	0.334
Hyogo	0.429	0.406	0.403	0.352
Nara	0.387	0.375	0.382	0.319
Wakayama	0.469	0.438	0.426	0.405
Tottori	0.354	0.327	0.327	0.251
Shimane	0.506	0.461	0.375	0.316
Okayama	0.542	0.518	0.513	0.404
Hiroshima	0.462	0.448	0.456	0.344
Yamaguchi	0.485	0.426	0.428	0.316
Tokushima	0.542	0.495	0.501	0.411
Kagawa	0.429	0.441	0.412	0.408
Ehime	0.569	0.546	0.547	0.410
Kochi	0.553	0.537	0.534	0.465
Fukuoka	0.430	0.424	0.423	0.348
Saga	0.530	0.515	0.516	0.351
Nagasaki	0.468	0.467	0.469	0.380
Kumamoto	0.567	0.556	0.558	0.475
Oita	0.587	0.536	0.543	0.392
Miyazaki	0.600	0.576	0.573	0.491
Kagoshima	0.524	0.514	0.519	0.428
Okinawa	0.371	0.369	0.374	0.327

DPC, Diagnosis Procedure Combination.

Appendix 7. Prefectural data of examined factors in comparison model with prefectural sICH incidence on the DPC database in 2014, shown in Appendix 3

Name of Prefecture	Population per 1 km² of inhabitable area	Yearly average of temperature	Yearly sunshine hours	Name of Prefecture	Yearly precipitation	Prefectural income per person	Prefectural alcohol consumption per adult person
Hokkaido	244.6	9.2	1,648	Hokkaido	1,347	2,475	89.73
Aomori	412.9	10.5	1,516	Aomori	1,664	2,333	95.75
Iwate	350.6	10.6	1,671	Iwate	1,643	2,359	91.06
Miyagi	740.2	12.7	1,880	Miyagi	1,112	2,461	88.36
Akita	328.7	11.9	1,469	Akita	2,373	2,319	94.65
Yamagata	399.6	11.9	1,696	Yamagata	1,347	2,403	83.07
Fukushima	460.2	13.4	1,844	Fukushima	1,202	2,324	82.28
Ibaraki	736.1	14.3	2,259	Ibaraki	1,338	3,044	68.49
Tochigi	666.1	14.4	2,128	Tochigi	1,505	2,955	68.83
Gumma	862.2	15.2	2,366	Gumma	999	2,890	71.35
Saitama	2,805.7	15.6	2,336	Saitama	1,251	2,785	70.37
Chiba	1,753.2	16.6	2,135	Chiba	1,447	2,820	72.52
Tokyo	9,553.6	17.1	2,131	Tokyo	1,614	4,373	109.37
Kanagawa	6,187.3	16.6	2,257	Kanagawa	1,517	2,926	74.73
Niigata	517.3	13.8	1,662	Niigata	2,327	2,668	94.68
Toyama	580.8	14.5	1,786	Toyama	2,863	3,055	84.00
Ishikawa	834.4	15.0	1,868	Ishikawa	3,318	2,744	81.66
Fukui	740.2	14.9	1,740	Fukui	2,726	2,841	79.14
Yamanashi	889.4	15.4	2,462	Yamanashi	939	2,779	75.97
Nagano	640.4	12.3	2,130	Nagano	1,138	2,730	77.53
Gifu	932.2	16.3	2,316	Gifu	1,876	2,657	67.35
Shizuoka	1,352.1	17.2	2,298	Shizuoka	1,822	3,162	71.48
Aichi	2,501.5	16.4	2,355	Aichi	1,464	3,105	74.35
Mie	896.7	16.5	2,366	Mie	1,394	2,735	70.09
Shiga	1,092.1	15.1	2,073	Shiga	1,492	3,072	63.52
Kyoto	2,222.8	16.2	1,940	Kyoto	1,451	2,865	84.98
Osaka	6,701.4	17.1	2,300	Osaka	1,418	2,920	94.12
Hyogo	2,002.5	17.0	2,255	Hyogo	1,298	2,585	80.05
Nara	1,624.3	15.3	2,004	Nara	1,506	2,388	65.41
Wakayama	893.3	17.0	2,282	Wakayama	1,370	2,655	81.88
Tottori	634.6	15.5	1,842	Tottori	2,048	2,232	85.08
Shimane	545.0	15.4	1,843	Shimane	2,035	2,382	83.56
Okayama	866.5	16.4	2,214	Okayama	1,341	2,693	70.60
Hiroshima	1,239.8	16.6	2,249	Hiroshima	1,821	3,030	84.64
Yamaguchi	827.4	15.8	2,041	Yamaguchi	2,267	2,864	78.50
Tokushima	751.8	16.8	2,327	Tokushima	1,949	2,698	73.55
Kagawa	982.1	16.8	2,288	Kagawa	1,537	2,790	76.36
Ehime	842.7	16.8	2,208	Ehime	1,623	2,673	78.70
Kochi	641.9	17.3	2,373	Kochi	2,327	2,199	98.91
Fukuoka	1,833.7	17.7	2,059	Fukuoka	1,802	2,778	81.16
Saga	630.2	17.1	2,113	Saga	2,012	2,399	74.60
Nagasaki	854.7	17.5	2,018	Nagasaki	1,684	2,351	76.36
Kumamoto	659.2	17.2	2,197	Kumamoto	1,975	2,399	84.23
Oita	674.7	16.9	2,186	Oita	1,506	2,488	78.95
Miyazaki	606.8	17.9	2,411	Miyazaki	2,080	2,208	94.96
Kagoshima	513.7	18.9	2,183	Kagoshima	1,778	2,431	91.48
Okinawa	1,211.4	23.3	1,809	Okinawa	2,071	2,018	97.10

(continued)

sICH, spontaneous intracerebral hemorrhage; DPC, Diagnosis Procedure Combination.