An age-period-cohort analysis for prevalence of common psychiatric disorders in Japan, 1999-2017

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1   **Title :**

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8   **Running title:**

9   Japan Common Psychiatric Disorders Prevalence

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25   **Abstract**

26   **Purpose:** This study aimed to analyze the prevalence of common psychiatric disorders in Japan via an age-

27   period-cohort (APC) analysis.

28   **Methods:** Data were used on the prevalence of schizophrenia and schizotypal and delusional disorders, mood

29   [affective] disorders (mood disorders, hereafter), and neurotic, stress-related, and somatoform disorders from

30   the 1999–2017 Patient Survey in Japan. The age group was defined as 20–89 years with five-year increments;

31   the cohort was assigned for each age group of each year with a one-year shift. A Bayesian APC analysis was

32   used to decompose changes in prevalence into three effects: age, period, and cohort.

33   **Results:** The APC analysis revealed that the peaks of age effect varied among sexes and diseases. The period

34   effects for all the diseases showed increasing trends over the analyzed years. Although the cohort effect for

35   prevalence of schizophrenia and schizotypal and delusional disorders increased until the 1960s, it decreased

36   afterwards. On the other hand, the cohort effects for prevalence of mood disorders and neurotic, stress-related,

37   and somatoform disorders increased from around the 1950s, and it indicates the prevalence increased

38   particularly in young ages over the years. Also, the trends of each effect were relatively similar between mood

39   disorders and neurotic, stress-related, and somatoform disorders.

40   **Conclusion:** Increase in public awareness and psychological stress associated with change in social

41   environment is thought to affect the period and cohort effects on prevalence of mood disorders and neurotic,

42   stress-related, and somatoform disorders.

43   **Keywords:** Age-period-cohort analysis, the Patient Survey in Japan, Psychiatric Disorders, Japan, Prevalence

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1. Introduction

The number of patients with psychiatric disorders has increased over the years in Japan. According to the Patient Survey in Japan [1], the estimated number of patients with mental and behavioral disorders increased from 1.82 million in 1999 to 3.48 million in 2017. Specifically, patients with mood [affective] disorders increased from 0.44 million in 1999 to 1.28 million in 2017, and patients with neurotic, stress-related, and somatoform disorders increased from 0.42 million in 1999 to 0.83 million in 2017. Accordingly, the national medical expenses of mental and behavioral disorders amounted to 1.91 trillion yen in 2017 [2]. If diseases of the nervous system, such as Alzheimer's, are taken into account as psychiatric disorders, the number of patients and/or national medical expenses would become even larger. Furthermore, it is important to not only consider the direct costs of the diseases but also the indirect costs such as the decrease of labor productivity or unemployment, and social cost associated with the psychiatric disorders as well [3].

However, epidemiological studies that have previously investigated the trend of psychiatric disorders are few in number when compared to other major diseases such as cancer or cardiovascular diseases in Japan [4,25]. Although some epidemiological studies have investigated the prevalence of common psychiatric disorders in Japan [5,6], a study using nationwide and/or time series data has not yet been conducted. It is interesting to note that even data from the Patient Survey that routinely investigates the number of patients with psychiatric disorders across Japan, information on the trend of prevalence over various age groups and over the cohorts have not been analyzed. The age-period-cohort analysis (APC) is an analytical method often used for investigating the trend of a disease [7], and it decomposes the statistics of various age groups over the years into age, period, and cohort effects. The APC analysis is commonly used in the public health domain to analyze trends in the incidence or mortality of a disease, particularly for cancer or cardiovascular diseases in Japan [8,9]. Although there are some studies that have used APC analysis for analyzing the trend of mental illnesses in other countries [10,11,12], an APC analysis for psychiatric disorders has not yet been conducted in Japan. By analyzing the Patient Survey data in Japan using the APC model, the effects of age groups and/or birth cohorts on the prevalence of psychiatric disorders can, thereby, be estimated.

75 This study analyzed the trends surrounding the prevalence of common psychiatric disorders using the APC

76 analysis of data collected by the Patient Survey in Japan.

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78 **2. Methods**

79 Data from the Patient Survey in Japan [1] were used. The Patient Survey tallies the number of patients who

80 visit a hospital or clinic at sites throughout Japan.

81 The hospitals and clinics that are surveyed are randomly chosen because the number of medical institutes is

82 huge in Japan, whereas hospitals having >500 beds are totally surveyed. Medical institutes across all of Japan

83 are stratified based on factors, such as the region and type of the institute, and stratified random sampling is

84 used to select the medical institutes surveyed [13]. Hospitals are stratified based on regions, type of hospitals,

85 and bed size, whereas clinics are stratified based on prefectures, departments, and with or without bed [13].

86 The Patient Survey is conducted once every 3 years. The estimated total number of patients was calculated on

87 the basis of the number of outpatients and hospitalized patients in the Survey, and open to the public. The data

88 for the estimated total number of patients from the seven Patient Surveys conducted from 1999 to 2017 were

89 used for analysis.

90 The estimated number of patients in the survey included those with schizophrenia and schizotypal and

91 delusional disorders, mood [affective] disorders (mood disorders, hereafter), and neurotic, stress-related, and

92 somatoform disorders. The ICD10 code for schizophrenia and schizotypal and delusional disorders was F20–

93 F29; for mood disorders, it was F30–F39; and for neurotic, stress-related, and somatoform disorders, it was

94 F40–F48. The population statistics data of sex and age group were obtained from the Vital Statistics [14], and

95 used as the denominator in the calculation of prevalence for each sex, age group, year, and disease.

96 The statistical analysis portion of this study included calculations for the prevalence of disorders in the

97 patients by sex. Additionally, age-adjusted prevalence was calculated by sex for each type of disease. The age-

98 adjusted prevalence of each disease was calculated for each combination of sex and period using the 1999

99 population of men as the standard population. The Bayesian APC model whose outcome value follows Poisson

100   distribution was used for the analysis [7]. The estimated number of patients in each age group of each year was

101   used as the outcome value, and the corresponding number of total population was used as the offset term for

102   the APC model. For the Bayesian prior distribution of each age, period, and cohort effect, random walk of the

103   first order was used to identify the parameters. Age groups were defined in the data as five-year units from 20–

104   24 years to 85–89 years. The cohort used for the APC analysis was assigned by one-year shifts; that is, the

105   generation aged 85–89 years in 1999 was grouped into the first cohort. The most recent born cohort covered

106   the generation aged 20–24 years in 2017. Statistically significance difference between two time points in

107   each age, period, cohort effect was examined based on whether 95% Bayesian credible intervals overlap

108   between the two time points. If the 95% Bayesian credible intervals of two time points of an effect do not

109   overlap, it indicates a statistically significant difference between the two time points. To estimate the

110   parameters, we used the Hamiltonian Monte Carlo method [15]. All statistical analyses were conducted using

111   R software version 3.5.1 [16].

112

113   **Results**

114   Table 1 shows the estimated number of patients with schizophrenia and schizotypal and delusional disorders,

115   mood disorders, and neurotic, stress-related, and somatoform disorders by age group in men and women.

116   Table 2 shows the number of patients with diagnoses schizophrenia and schizotypal and delusional disorders,

117   mood disorders, and neurotic, stress-related, and somatoform disorders by age group per 1,000 persons in men

118   and women. For men, although the prevalence of patients with schizophrenia and schizotypal and delusional

119   disorders both increased and decreased in all age groups over the analyzed periods, the prevalence specifically

120   increased from 1999 to 2017 in the age group consisting of those aged 40 years or older. The prevalence of

121   patients with mood disorders increased in all age groups over the analyzed periods. Prevalence of patients with

122   neurotic, stress-related, and somatoform disorders also increased in most of the age groups over the analyzed

123   periods. For women, the prevalence of patients with schizophrenia and schizotypal and delusional disorders

124   increased from 1999 to 2017 in the age group consisting of those aged 50 years old or older. The prevalence of

125   patients with mood disorders and neurotic, stress-related, and somatoform disorders increased in all age groups

126   over the analyzed periods. It is noted that the prevalence of patients with schizophrenia and schizotypal and

127   delusional disorders is highly affected by the cohort. The prevalence of patients with mood disorders displayed

128   an increase in trends over the cohorts but particularly in the younger age groups. Similar results were observed

129   in patients with mood disorders and neurotic, stress-related, and somatoform disorders.

130   Table 3 shows the age-adjusted number of patients with schizophrenia and schizotypal and delusional

131   disorders, mood disorders, and neurotic, stress-related, and somatoform disorders in men and women per 1,000

132   persons. The age-adjusted prevalence of patients with schizophrenia and schizotypal and delusional disorders

133   increased from 1999 to 2017 in both men and women. The age-adjusted prevalence of patients with mood

134   disorders and neurotic, stress-related, and somatoform disorders also increased over the analyzed periods, and

135   the degree of increase was higher than that of schizophrenia and schizotypal and delusional disorders. The age-

136   adjusted prevalence of patients with neurotic, stress-related, and somatoform disorders increased particularly in

137   women.

138   Table 4 shows the results of APC analysis for each disease in men. We presented the result of birth cohorts

139   from cohorts born in 1911-1915 to those in 1991-1995 by 5-year increments for visibility of the results. The

140   age effect for schizophrenia and schizotypal and delusional disorders significantly increased from age groups

141   of 20-24 to 45–49 years, and then decreased thereafter. There was a significant difference in the age effect

142   between 45–49 years and 85–89 years. The period effect highlighted a slightly increasing trend, but there was

143   not statistically significant difference among the effects. The cohort effect displayed a significant increasing

144   trend from cohorts born in 1911-1915 to cohorts born in 1961-1965, and the estimate decreased in cohorts born

145   in thereafter. Age effect for mood disorders significantly increased from the age group of 20–24 to the age

146   group of 55–59 and also decreased thereafter. The period effect showed an increase approximately three times

147   from 1999 to 2017, and there was a statistically significant difference between 1999 and 2017. The cohort

148   effect decreased from cohort born in 1921–1925 to 1946–1950, and showed an increasing trend afterwards.

149   The results of patients with diagnoses neurotic, stress-related, and somatoform disorders were relatively similar

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150   to those of mood disorders.

151   Table 5 shows the results of APC analysis for each disease in women. The age effect for schizophrenia and

152   schizotypal and delusional disorders significantly increased from age group of 20–24 to the group aged 55–59,

153   and the age effects for older ages were significantly lower than the age group of 55–59. Although there was a

154   sudden decline in 2011, the period effect showed an overall increasing trend over the analyzed period. The

155   cohort effect significantly increased from cohort born in 1911–1915 to 1961–1965, and it decreased thereafter.

156   The age effect for mood disorders significantly increased from the age group of 20–24 to the age group of 65–

157   69, and decreased afterwards. Also, the period effect significantly increased from 1999 to 2017. The cohort

158   effect significantly decreased from cohort born in 1921–1925 to 1951–1955, and started increasing after that.

159   Although the results of patients with neurotic, stress-related, and somatoform disorders were relatively similar

160   to those of mood disorders, the degree of increase for the cohort effect was larger for neurotic, stress-related,

161   and somatoform disorders, and there was a statistically significance difference between cohorts born in 1951–

162   1955 and 1991–1995.

163

164   **Discussion**

165   We analyzed the data of the Patient Survey for revealing the trends of age, period, and cohort effects for

166   prevalence of each disease. As a result of APC analysis, a significant increase of prevalence in the middle ages

167   and a significant decrease of the prevalence in older ages were observed in all the diseases. However, the peak

168   for age effects of mood disorders and neurotic, stress-related, and somatoform disorders were seen to be later

169   for women compared to men. Also, the significant increase of the period effects was observed for mood

170   disorders and neurotic, stress-related, and somatoform disorders during the analyzed periods. Although a

171   significant increase of the cohort effects until the middle of the analyzed cohorts and a decrease of the effects

172   afterwards was observed for schizophrenia and schizotypal and delusional disorders, a reverse phenomenon

173   was observed for mood disorders and neurotic, stress-related, and somatoform disorders. The trend for each

174   effect in mood disorders and neurotic, stress-related, and somatoform disorders were relatively similar.

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175   Regarding age effect for schizophrenia and schizotypal and delusional disorders, it has been reported that

176   patients with schizophrenia are more likely to have type 2 diabetes or cardiovascular diseases [17,18], and the

177   life expectancy of patients with schizophrenia is shorter than that of the general population [19,20]. Therefore,

178   there is a possibility that the rapid decline of age effects signify that the mortality rate for schizophrenia in the

179   older age groups is relatively high. The peaks for age effect were also seen to be different among the sexes, and

180   this is considered to be in relation to the sex difference for the onset age of schizophrenia, as the onset is

181   generally earlier for men [21,22]. Regarding mood disorders, the life expectancy of patients with unipolar

182   depression or bipolar affective disorder is also known to be generally shorter than in the general population

183   [20,23] and is reflected as such in this analysis. The peak of age effect for mood disorders and neurotic, stress-

184   related, and somatoform disorders was considered to be near the 40s for men, which may be due to the fact that

185   social stress in these age groups is considered to be relatively high because social stress is a major risk factor

186   for depression [24]. The peak age of onset for depression in women is considered to be during the perinatal

187   period and during menopause [25], and onset after menopause is considered to affect the result of the later peak

188   age for women.

189   Regarding period effects, a significant increase of the prevalence with mood disorders and neurotic, stress-

190   related, and somatoform disorders may be related to an increase over the past few years in public awareness for

191   these disorders. It is interesting to note that words like "stress" and "depressive" have come to be frequently

192   used in daily conversation in Japan. According to a previous study [26], the increase in diseases over the years

193   may be due to the increase in mental health service usage. However, there is a possibility that the prevalence of

194   patients with mood disorders and neurotic, stress-related, and somatoform disorders are actually increasing

195   particularly in young ages because as described below, the trends of the cohort effects were relatively

196   consistent with that of suicide. Also, depression was shown to be associated with lifestyle-related diseases such

197   as diabetes and obesity [27,28], and the consultation rate of lifestyle-related diseases is also currently on the

198   rise in Japan [1]. Regarding the similarity of mood disorders and neurotic, stress-related, and somatoform

199   disorders, the risk factors for these diseases are relatively common [29,30]. It is already shown that

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200   comorbidity of major depression and anxiety disorder is high [31], and that there is an overlap of these

201   disorders in patients.

202   Regarding the cohort effect for prevalence of schizophrenia and schizotypal and delusional disorders, the

203   decrease of the prevalence in the younger age groups as shown in Table 1 and 2 is considered to have caused

204   the decrease in cohort effect. One possible reason for the decrease of the cohort effect is the discharge of

205   patients with psychiatric disorders as is currently ongoing in Japan, which has led to a decrease in patients who

206   are hospitalized with psychiatric disorders [1]. According to the Patient Survey [1], the mean length of stay for

207   patients with schizophrenia and schizotypal and delusional disorders is much longer than patients with other

208   diseases, and the number of hospitalized patients with schizophrenia and schizotypal and delusional disorders

209   is also declining. This may be due to the trend of the cohort effect. There is also a possibility that the incidence

210   of schizophrenia is actually decreasing in more recent born cohorts as reported in recent reports citing a

211   decrease in incidences of schizophrenia from the 1960s in other countries [32]. It is also possible that the

212   recovery rate for young patients with schizophrenia may be increasing owing to the development of psychiatric

213   drugs.

214   Regarding the cohort effect for prevalence of patients with mood disorders and neurotic, stress-related, and

215   somatoform disorders, the increase of prevalence in the younger age groups is relatively high, and this is

216   considered to have affected the trend of the cohort effect. According to a study that conducted an APC analysis

217   for suicide rate in Japanese individuals [33], the cohort effect for suicide rates also tended to increase from

218   approximately 1950 for women and that from approximately 1960 for men. Therefore, the trend of cohort

219   effect for patients with mood disorders and neurotic, stress-related, and somatoform disorders is considered to

220   have an effect on the trend of suicide. Social insecurity may be a possible reason for the increase in cohort

221   effect for the suicide rate [33], and it was pointed out that the younger cohorts in Japan are in relative poverty

222   among developed countries in contrast with cohorts born in approximately 1951 [33,34]. Stagnation of

223   Japanese economy and an increase in precarious jobs from the late 20th Century are pointed out to be related to

224   this phenomenon [33]. Socioeconomic status was shown to be related to depression in a previous study [35],

225 and there are reports indicating the association between precarious job and psychological distress in Japan

226 [36,37]. Therefore, social insecurity in the younger age group may be a factor affecting the trend of cohort

227 effects for mood disorders and neurotic, stress-related, and somatoform disorders. Additionally, the

228 employment rate in women was seen as rapidly increasing over the cohorts, and this may have affected

229 variability of the cohort effect in women. Another factor for the increase of the cohort effect may be due to the

230 Mental Health Act which was enacted in 1950 as it required each prefecture to establish a public psychiatric

231 hospital. This may have led to an increase in the consultation rates of patients with depression and/or anxiety

232 disorder over the cohorts.

233 The study is not without its limitations. As mentioned in the Methods section, the Patient Survey displays the

234 estimated total number of patients in increments of 1000; therefore, it does not present the actual number of

235 patients. In addition, the number of patients reflects the consultation rate rather than the prevalence of a

236 disease. An epidemiological study needs to be conducted in the future to assess the true prevalence of the

237 diseases. Moreover, a validity of estimated number of patients in the Patient Survey has not been confirmed,

238 and the validity of the calculation method of the estimated total number of patients needs to be examined

239 immediately. Also, only the data of patients who were treated in a disease in the date of the Survey are counted

240 in the calculation of the estimated number of patients [38]. Therefore, a patient with a psychiatric disease who

241 consulted a hospital for a disease, such as cancer and cardiovascular diseases is not counted in the number of

242 patients with the psychiatric disease. Also, patients with 2 or more psychiatric disorders can be treated as a

243 patient with either disease. Therefore, the decrease of the age effects for each disease possibly means that

244 prevalence of the psychiatric patients with other diseases increases with age. Furthermore, this study

245 specifically focused on the number of patients with schizophrenia and schizotypal and delusional disorders,

246 mood disorders and neurotic, stress-related, and somatoform disorders, and was not able to focus on particular

247 types of disease such as schizophrenia or depression, which would also be worthwhile to explore. On the other

248 hand, the strength of the Patient Survey is that more than 10,000 medical institutes are examined every survey

249 year in the survey [38], and the coverage of the survey is larger than any other survey for psychiatric disease in

250   Japan.

251

252   **Conclusions**

253   As a result of the APC analysis, the peaks of age effect were different among sexes and diseases. The period

254   effects for all the diseases showed an increase in trends over the analyzed years. Although the cohort effect for

255   schizophrenia and schizotypal and delusional disorders started to decrease from approximately the 1960s, the

256   cohort effects for mood disorders and neurotic, stress-related, and somatoform disorders started to increase

257   from around the 1950s. The tuning points of the cohort effects for these diseases were relatively similar to that

258   of suicide mortality rate in Japan. In addition, an increase in social insecurity in younger cohorts had been

259   pointed out as a factor for the increase of the cohort effect of suicide mortality rate in a previous study.

260   Therefore, there is a possibility that an increase in psychological stress associated with change in social

261   environment and public awareness of the diseases affected the trends of the period and cohort effects for mood

262   disorders and neurotic, stress-related, and somatoform disorders.

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270   **Conflicts of Interest**

271   There are no potential conflicts of interest to declare.

272

273   **Availability of data and material**

274   The data used in this study can be downloaded from the website of Japan's government statistics.

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Code availability

277   The software code of APC analysis used in this study can be shared upon request.

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Ethics approval

280   Not applicable because we used data that are publicly available.

281

Consent to participate

283   Not applicable

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Consent for publication

286   Not applicable

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Authors' contributions

289 Conceptualization: TO. Data curation: TO. Formal analysis: TO. Methodology: TO. Funding acquisition: None.

290 Writing- original draft: TO. Writing - review & editing: TO.

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428   Table 1. Estimated number of patients with schizophrenia and schizotypal and delusional disorders, mood

429   disorders, and neurotic, stress-related, and somatoform disorders by age groups（Unit: thousand persons）.

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	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85–89
Male schizophrenia, schizotypal and delusional disorders														
1999	12	26	29	35	33	46	47	32	26	22	10	4	2	1
2002	15	28	41	38	38	41	48	35	29	20	14	5	3	1
2005	11	26	38	41	37	36	42	41	30	24	15	8	3	1
2008	13	18	33	42	40	43	41	51	39	26	17	11	5	1
2011	14	17	27	41	43	41	33	37	40	23	16	11	5	2
2014	8	16	26	37	41	44	38	37	39	30	18	13	6	2
2017	9	12	22	31	46	50	40	42	38	39	23	14	6	3
Male mood [affective] disorders														
1999	4	8	13	12	15	16	15	16	15	21	12	7	2	1
2002	4	17	18	22	24	22	28	22	21	21	20	14	5	1
2005	9	22	34	34	40	32	32	31	28	21	22	15	7	1
2008	11	14	35	44	43	41	37	34	32	27	26	20	12	3
2011	11	19	26	41	45	40	38	38	32	20	24	21	10	3
2014	8	24	26	36	52	50	38	43	36	40	22	22	9	7
2017	12	19	32	41	53	56	63	48	35	41	32	25	20	6
Male neurotic, stress-related and somatoform disorders														
1999	9	13	15	16	13	15	18	12	12	14	11	7	3	1
2002	7	15	20	22	12	14	14	15	10	12	13	9	3	2
2005	9	14	24	24	14	18	17	22	14	11	12	8	4	1
2008	8	14	19	22	20	17	19	17	16	12	13	11	6	3
2011	15	16	17	18	26	19	16	16	14	16	13	10	3	3
2014	9	19	18	32	23	27	20	17	24	17	16	12	9	3
2017	14	15	26	22	33	30	30	18	14	27	10	14	11	4
Female schizophrenia, schizotypal and delusional disorders														
1999	12	21	30	28	25	40	42	44	30	25	18	10	4	2
2002	17	25	32	33	25	35	52	39	37	33	20	12	5	3
2005	12	21	32	38	38	35	44	42	42	36	22	16	8	3
2008	15	22	29	32	37	35	39	48	43	35	32	18	10	5
2011	9	17	24	34	33	31	31	35	41	31	28	21	10	7
2014	11	14	22	32	44	40	39	41	41	41	36	20	17	7
2017	6	13	23	26	39	38	40	42	42	53	30	26	15	9
Female mood [affective] disorders														
1999	7	11	17	14	22	18	24	28	26	38	32	24	10	4
2002	14	19	38	32	29	33	38	47	47	47	48	39	20	7
2005	23	34	49	45	47	39	35	53	49	50	57	52	30	11
2008	25	35	47	55	53	52	42	55	58	62	62	56	28	12
2011	16	33	36	60	57	43	41	39	54	45	44	49	38	18
2014	17	31	40	63	78	60	57	45	56	68	60	47	39	19
2017	24	33	44	47	78	82	70	58	62	75	64	62	46	21
Female neurotic, stress-related and somatoform disorders														
1999	9	19	19	19	17	18	22	21	26	29	24	15	6	4
2002	11	22	31	25	24	23	28	27	25	31	25	20	8	4
2005	20	25	35	44	29	21	26	36	28	25	36	20	14	4
2008	13	24	27	40	38	28	25	29	31	31	31	24	16	5
2011	17	28	34	34	37	30	27	19	26	21	24	23	14	7
2014	17	26	30	40	49	46	37	36	35	35	38	23	22	9
2017	19	30	42	53	61	61	54	34	35	42	33	27	21	12

431 Table 2. Number of patients with schizophrenia and schizotypal and delusional disorders, mood disorders, and

432 neurotic, stress-related, and somatoform disorders by age groups per 1,000 persons.

	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85–89
Male schizophrenia, schizotypal and delusional disorders														
1999	2.7	5.3	6.7	8.9	8.4	9.8	9.6	7.4	7.1	6.7	3.9	2.7	2.3	2.2
2002	3.7	6.0	8.7	9.3	9.8	10.1	9.1	8.3	7.4	5.7	5.0	2.6	3.1	2.0
2005	3.0	6.3	7.8	9.4	9.2	9.4	9.6	8.1	7.2	6.8	4.9	3.5	2.5	1.8
2008	3.7	4.8	7.4	8.8	9.6	11.2	10.6	10.6	9.0	6.8	5.3	4.5	3.2	1.6
2011	4.4	4.8	6.7	8.4	9.3	10.4	8.7	9.0	7.7	6.2	4.8	4.1	2.8	2.4
2014	2.6	4.8	7.0	8.5	8.4	10.3	9.8	9.8	8.9	6.8	4.9	4.7	3.1	1.9
2017	3.0	3.9	6.3	7.9	9.8	10.6	9.9	11.2	10.0	8.2	6.4	4.7	2.8	2.6
Male mood [affective] disorders														
1999	0.9	1.6	3.0	3.1	3.8	3.4	3.1	3.7	4.1	6.4	4.7	4.7	2.3	2.2
2002	1.0	3.6	3.8	5.4	6.2	5.4	5.3	5.2	5.4	6.0	7.1	7.3	5.1	2.0
2005	2.4	5.3	7.0	7.8	9.9	8.3	7.3	6.1	6.7	5.9	7.2	6.6	5.7	1.8
2008	3.1	3.7	7.8	9.2	10.3	10.6	9.6	7.0	7.4	7.1	8.1	8.1	7.7	4.7
2011	3.5	5.3	6.5	8.4	9.7	10.1	10.1	9.3	6.2	5.4	7.2	7.9	5.7	3.6
2014	2.6	7.3	7.0	8.3	10.6	11.7	9.8	11.4	8.2	9.1	6.0	8.0	4.6	6.8
2017	3.9	6.2	9.1	10.5	11.2	11.9	15.6	12.8	9.2	8.6	8.9	8.3	9.3	5.1
Male neurotic, stress-related and somatoform disorders														
1999	2.0	2.6	3.5	4.1	3.3	3.2	3.7	2.8	3.3	4.3	4.3	4.7	3.5	2.2
2002	1.7	3.2	4.2	5.4	3.1	3.5	2.7	3.5	2.6	3.4	4.6	4.7	3.1	3.9
2005	2.4	3.4	4.9	5.5	3.5	4.7	3.9	4.3	3.4	3.1	3.9	3.5	3.3	1.8
2008	2.3	3.7	4.3	4.6	4.8	4.4	4.9	3.5	3.7	3.1	4.1	4.5	3.8	4.7
2011	4.7	4.5	4.2	3.7	5.6	4.8	4.2	3.9	2.7	4.3	3.9	3.7	1.7	3.6
2014	2.9	5.8	4.9	7.4	4.7	6.3	5.2	4.5	5.5	3.9	4.4	4.4	4.6	2.9
2017	4.6	4.9	7.4	5.6	7.0	6.4	7.4	4.8	3.7	5.7	2.8	4.7	5.1	3.4
Female schizophrenia, schizotypal and delusional disorders														
1999	2.8	4.4	7.2	7.3	6.4	8.5	8.5	9.8	7.6	6.8	5.7	4.1	2.5	2.0
2002	4.5	5.5	7.0	8.2	6.6	8.7	9.8	8.9	8.9	8.5	5.9	4.4	2.7	2.6
2005	3.4	5.3	6.8	8.9	9.6	9.2	10.0	8.1	9.6	9.3	6.1	5.3	3.7	2.3
2008	4.5	6.1	6.7	6.9	9.1	9.2	10.1	9.7	9.4	8.4	8.6	5.6	4.0	3.3
2011	3.0	4.9	6.2	7.2	7.3	8.0	8.2	8.4	7.6	7.6	7.3	6.1	3.7	3.9
2014	3.8	4.4	6.2	7.6	9.3	9.5	10.2	10.8	9.0	8.7	8.5	5.7	5.8	3.5
2017	2.1	4.4	6.8	6.9	8.5	8.3	10.0	11.2	10.7	10.4	7.3	7.0	4.8	4.1
Female mood [affective] disorders														
1999	1.6	2.3	4.1	3.6	5.7	3.8	4.9	6.2	6.6	10.4	10.1	9.9	6.3	4.0
2002	3.7	4.2	8.3	8.0	7.6	8.2	7.2	10.8	11.3	12.2	14.2	14.3	10.7	6.1
2005	6.6	8.5	10.4	10.6	11.9	10.2	8.0	10.3	11.2	12.9	15.9	17.3	13.7	8.5
2008	7.5	9.7	10.9	11.8	13.0	13.7	10.9	11.1	12.7	14.9	16.6	17.4	11.3	7.9
2011	5.3	9.6	9.3	12.8	12.6	11.1	10.9	9.4	10.0	11.0	11.5	14.2	14.0	10.0
2014	5.8	9.8	11.2	15.1	16.4	14.3	14.9	11.8	12.3	14.4	14.2	13.5	13.4	9.4
2017	8.3	11.2	13.0	12.4	17.1	17.9	17.6	15.4	15.8	14.7	15.6	16.7	14.7	9.5
Female neurotic, stress-related and somatoform disorders														
1999	2.1	4.0	4.5	4.9	4.4	3.8	4.5	4.7	6.6	7.9	7.6	6.2	3.8	4.0
2002	2.9	4.8	6.8	6.2	6.3	5.7	5.3	6.2	6.0	8.0	7.4	7.3	4.3	3.5
2005	5.7	6.3	7.4	10.4	7.3	5.5	5.9	7.0	6.4	6.4	10.0	6.7	6.4	3.1
2008	3.9	6.6	6.2	8.6	9.3	7.4	6.5	5.9	6.8	7.4	8.3	7.5	6.4	3.3
2011	5.7	8.2	8.8	7.2	8.2	7.7	7.2	4.6	4.8	5.1	6.3	6.7	5.1	3.9
2014	5.8	8.2	8.4	9.6	10.3	11.0	9.7	9.4	7.7	7.4	9.0	6.6	7.5	4.4
2017	6.6	10.2	12.4	14.0	13.4	13.3	13.6	9.1	8.9	8.2	8.0	7.3	6.7	5.4

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436   Table 3. Age-adjusted number of patients with diagnoses schizophrenia and schizotypal and delusional

437   disorders, mood disorders, and neurotic, stress-related, and somatoform disorders per 1,000 persons.

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Diseases types, sex and periods	Schizophrenia, schizotypal and delusional disorders		Mood [affective] disorders		Neurotic, stress-related and somatoform disorders	
	Men	Women	Men	Women	Men	Women
1999	6.80	6.64	3.29	5.18	3.33	4.80
2002	7.38	7.30	4.86	8.48	3.42	5.82
2005	7.26	7.62	6.63	10.49	3.89	6.91
2008	7.80	7.82	7.57	11.89	3.97	6.86
2011	7.17	6.72	7.42	10.39	4.20	6.73
2014	7.31	7.77	8.34	12.59	5.02	8.67
2017	7.65	7.66	9.78	14.43	5.55	10.64

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Table 4. The result of APC analysis for each disease for men.

	Estimate of each effect (95% credible interval)		
	Schizophrenia, schizotypal and delusional disorders	Mood [affective] disorders	Neurotic, stress-related and somatoform disorders
Age effect			
20–24	0.562 (0.453, 0.710)	0.327 (0.176, 0.528)	0.655 (0.440, 0.911)
25–29	0.818 (0.675, 1.006)	0.642 (0.381, 0.974)	0.872 (0.629, 1.156)
30–34	1.111 (0.939, 1.326)	0.933 (0.609, 1.325)	1.069 (0.818, 1.371)
35–39	1.306 (1.131, 1.519)	1.152 (0.825, 1.531)	1.183 (0.947, 1.474)
40–44	1.350 (1.191, 1.533)	1.371 (1.059, 1.721)	1.123 (0.929, 1.353)
45–49	1.495 (1.342, 1.671)	1.428 (1.181, 1.706)	1.179 (1.009, 1.387)
50–54	1.450 (1.319, 1.596)	1.478 (1.267, 1.720)	1.172 (1.007, 1.370)
55–59	1.433 (1.305, 1.576)	1.477 (1.254, 1.734)	1.094 (0.934, 1.281)
60–64	1.348 (1.215, 1.493)	1.352 (1.114, 1.660)	1.016 (0.857, 1.214)
65–69	1.188 (1.051, 1.340)	1.329 (1.054, 1.750)	1.077 (0.894, 1.322)
70–74	0.954 (0.822, 1.102)	1.212 (0.909, 1.699)	1.069 (0.866, 1.356)
75–79	0.774 (0.645, 0.921)	1.120 (0.789, 1.688)	1.053 (0.816, 1.386)
80–84	0.625 (0.505, 0.764)	0.813 (0.536, 1.344)	0.861 (0.630, 1.151)
85–89	0.484 (0.379, 0.609)	0.522 (0.325, 0.924)	0.768 (0.544, 1.060)
Period effect			
1999	0.975 (0.897, 1.029)	0.530 (0.455, 0.635)	0.856 (0.756, 0.964)
2002	1.000 (0.952, 1.051)	0.762 (0.676, 0.869)	0.884 (0.797, 0.973)
2005	1.001 (0.960, 1.041)	0.997 (0.906, 1.101)	0.923 (0.845, 1.004)
2008	1.017 (0.988, 1.068)	1.184 (1.087, 1.290)	0.992 (0.916, 1.076)
2011	1.002 (0.964, 1.043)	1.130 (1.026, 1.242)	1.009 (0.921, 1.098)
2014	0.996 (0.945, 1.044)	1.262 (1.104, 1.425)	1.155 (1.045, 1.284)
2017	1.010 (0.952, 1.086)	1.471 (1.234, 1.715)	1.240 (1.091, 1.413)
Birth cohort effect			
1911–1915	0.749 (0.566, 1.000)	1.033 (0.514, 1.862)	1.035 (0.688, 1.579)
1916–1920	0.710 (0.550, 0.927)	0.937 (0.467, 1.574)	1.030 (0.709, 1.495)
1921–1925	0.725 (0.577, 0.922)	1.171 (0.677, 1.864)	1.067 (0.787, 1.523)
1926–1930	0.815 (0.671, 0.995)	1.156 (0.718, 1.727)	0.975 (0.723, 1.283)
1931–1935	0.918 (0.780, 1.085)	1.037 (0.694, 1.444)	0.971 (0.758, 1.233)
1936–1940	0.971 (0.844, 1.120)	0.871 (0.617, 1.149)	0.888 (0.697, 1.074)
1941–1945	0.994 (0.875, 1.124)	0.763 (0.582, 0.962)	0.851 (0.685, 1.014)
1946–1950	1.089 (0.975, 1.215)	0.743 (0.594, 0.906)	0.859 (0.708, 1.009)
1951–1955	1.180 (1.062, 1.319)	0.812 (0.679, 0.964)	0.884 (0.741, 1.025)
1956–1960	1.193 (1.072, 1.336)	0.939 (0.786, 1.129)	0.925 (0.780, 1.074)
1961–1965	1.229 (1.085, 1.398)	1.019 (0.827, 1.291)	0.986 (0.821, 1.170)
1966–1970	1.227 (1.062, 1.415)	1.040 (0.804, 1.407)	1.063 (0.880, 1.320)
1971–1975	1.193 (1.010, 1.403)	1.045 (0.764, 1.540)	1.033 (0.819, 1.309)
1976–1980	1.139 (0.938, 1.376)	1.040 (0.714, 1.686)	1.040 (0.796, 1.371)
1981–1985	1.050 (0.843, 1.291)	1.104 (0.709, 1.944)	1.091 (0.810, 1.536)
1986–1990	1.051 (0.817, 1.342)	1.269 (0.762, 2.532)	1.188 (0.856, 1.813)
1991–1995	0.948 (0.716, 1.227)	1.222 (0.681, 2.563)	1.195 (0.823, 1.892)

461 Table 5. The result of APC analysis for each disease for women.

	Estimate of each effect (95% credible interval)		
	Schizophrenia, schizotypal and delusional disorders	Mood [affective] disorders	Neurotic, stress-related and somatoform disorders
Age effect			
20–24	0.600 (0.437, 0.841)	0.414 (0.276, 0.614)	0.448 (0.276, 0.701)
25–29	0.793 (0.601, 1.061)	0.605 (0.428, 0.849)	0.724 (0.479, 1.065)
30–34	0.994 (0.784, 1.273)	0.833 (0.623, 1.108)	0.899 (0.640, 1.238)
35–39	1.090 (0.901, 1.331)	0.991 (0.789, 1.249)	1.118 (0.857, 1.444)
40–44	1.138 (0.979, 1.330)	1.225 (1.024, 1.472)	1.209 (0.988, 1.470)
45–49	1.225 (1.089, 1.379)	1.223 (1.065, 1.409)	1.237 (1.074, 1.423)
50–54	1.337 (1.217, 1.469)	1.246 (1.107, 1.401)	1.365 (1.228, 1.516)
55–59	1.360 (1.237, 1.495)	1.344 (1.194, 1.512)	1.344 (1.206, 1.493)
60–64	1.285 (1.143, 1.444)	1.396 (1.206, 1.618)	1.376 (1.189, 1.601)
65–69	1.238 (1.061, 1.438)	1.446 (1.207, 1.738)	1.339 (1.098, 1.647)
70–74	1.084 (0.889, 1.311)	1.369 (1.090, 1.730)	1.332 (1.031, 1.747)
75–79	0.907 (0.709, 1.146)	1.265 (0.951, 1.692)	1.037 (0.756, 1.446)
80–84	0.729 (0.543, 0.966)	0.927 (0.654, 1.291)	0.804 (0.549, 1.201)
85–89	0.670 (0.476, 0.930)	0.594 (0.399, 0.872)	0.547 (0.352, 0.868)
Period effect			
1999	0.908 (0.817, 1.004)	0.505 (0.445, 0.571)	0.745 (0.651, 0.855)
2002	0.979 (0.908, 1.053)	0.842 (0.767, 0.923)	0.881 (0.797, 0.975)
2005	1.013 (0.958, 1.071)	1.078 (1.004, 1.159)	1.016 (0.945, 1.093)
2008	1.046 (0.995, 1.104)	1.179 (1.105, 1.258)	0.997 (0.940, 1.058)
2011	0.964 (0.905, 1.021)	1.068 (0.994, 1.148)	0.941 (0.876, 1.010)
2014	1.052 (0.976, 1.143)	1.237 (1.126, 1.363)	1.183 (1.068, 1.309)
2017	1.046 (0.953, 1.159)	1.401 (1.242, 1.581)	1.352 (1.176, 1.549)
Birth cohort effect			
1911–1915	0.600 (0.392, 0.928)	1.248 (0.774, 2.048)	1.183 (0.659, 2.087)
1916–1920	0.638 (0.439, 0.937)	1.267 (0.829, 1.957)	0.909 (0.531, 1.488)
1921–1925	0.827 (0.605, 1.154)	1.309 (0.905, 1.931)	1.088 (0.697, 1.676)
1926–1930	0.921 (0.703, 1.220)	1.227 (0.893, 1.700)	1.007 (0.680, 1.455)
1931–1935	1.046 (0.832, 1.323)	1.078 (0.823, 1.413)	1.041 (0.760, 1.412)
1936–1940	1.152 (0.954, 1.404)	0.869 (0.692, 1.084)	0.775 (0.589, 1.000)
1941–1945	1.174 (1.006, 1.375)	0.786 (0.649, 0.942)	0.694 (0.559, 0.849)
1946–1950	1.104 (0.965, 1.259)	0.712 (0.610, 0.829)	0.670 (0.573, 0.783)
1951–1955	1.188 (1.055, 1.341)	0.664 (0.571, 0.767)	0.635 (0.550, 0.732)
1956–1960	1.169 (1.032, 1.328)	0.763 (0.660, 0.876)	0.733 (0.630, 0.851)
1961–1965	1.238 (1.062, 1.449)	0.849 (0.712, 1.003)	0.902 (0.749, 1.089)
1966–1970	1.225 (1.013, 1.479)	0.939 (0.758, 1.161)	1.142 (0.903, 1.468)
1971–1975	1.126 (0.897, 1.409)	0.993 (0.766, 1.290)	1.110 (0.827, 1.511)
1976–1980	1.071 (0.816, 1.388)	1.049 (0.772, 1.435)	1.189 (0.832, 1.741)
1981–1985	1.027 (0.744, 1.393)	1.219 (0.846, 1.783)	1.514 (0.986, 2.404)
1986–1990	0.933 (0.644, 1.331)	1.238 (0.812, 1.908)	1.562 (0.955, 2.648)
1991–1995	0.797 (0.521, 1.183)	1.235 (0.769, 2.012)	1.597 (0.915, 2.903)

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