

1 **Classification:** Biological Sciences

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3 **Type D Personality Is Associated with Psychological Distress and Poor Self-rated Health among**
4 **the Elderly: A Population-based Study in Japan**

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25 **Abstract**

26 We investigated the association between Type D personality, psychological distress, and self-ratings of
27 poor health in elderly Japanese people. In August 2010, questionnaires were sent to all residents aged
28 ≥ 65 in three municipalities ($n = 21232$) in Okayama Prefecture, Japan, and 13929 questionnaires were
29 returned (response rate: 65.6%). To assess mental and physical health outcomes, we used the Kessler
30 Psychological Distress Scale and a single item question regarding perceived general health. We
31 analyzed 9759 questionnaires to determine odds ratios (ORs) and 95% confidence intervals (CIs) for
32 several health outcomes, adjusting for sex, age, smoking status, frequency of alcohol consumption,
33 overweight status, educational attainment, socioeconomic status, and number of cohabiters. The
34 multiple imputation method was employed for missing data regarding Type D personality. The
35 prevalence of Type D personality in our sample was 46.2%. After adjusting for covariates, we found
36 that participants with Type D personality were at 4–5 times the risk of psychological distress, and twice
37 the risk of poor self-rated health. This association was stronger in participants aged 65–74 years
38 (psychological distress; OR: 5.80, 95% CI: 4.96–6.78, poor self-rated health; OR: 2.84, 95% CI:
39 2.38–3.38) than in those aged over 75 years (psychological distress; OR: 4.54, 95% CI: 3.96–5.19, poor
40 self-rated health; OR: 2.05, 95% CI: 1.79–2.34). Type D personality is associated with adverse health
41 status among Japanese elderly people in terms of mental and physical risk; therefore, further research
42 into the implications of this personality type is warranted.

43

44 **Introduction**

45 An individual's personality is reflected in their thoughts, emotions, and behavior, which, in turn,
46 influence the health of the person [1]. In recent years, Type D personality has been linked to a wide
47 range of adverse health outcomes [2-4]. People with Type D personality tend to have negative emotions
48 towards themselves and others, known as *negative affectivity* (NA). Furthermore, these people are
49 generally afraid of being criticized and rejected by others, so they tend to experience difficulty
50 expressing themselves appropriately in social situations. This results in *social inhibition* (SI) [2,5].
51 Several studies of heart disease patients have found that people with a Type D personality have higher
52 cardiac morbidity and higher mortality rates compared with patients with other personality types [3,5].
53 This concept has been applied not only to patients with specific diseases but also to the general
54 population, suggesting that Type D personality is associated with poor physical health [4,6,7]. A
55 previous study reported that Type D personality can change after severe life events like cardiac surgery
56 [8]. However, Type D personality is considered to be a relatively stable, non-psychopathological
57 character trait, distinct from mental illnesses such as depression [9-12]. Thus, researchers have
58 investigated the relationship between Type D personality and various psychological problems, including
59 depression, anxiety, and posttraumatic stress disorder [4,11,13,14]. Type D personality is further
60 associated with work-related problems such as an increased rate of sick leave, job stress, and burnout
61 [15,16].

62 In terms of health care utilization, reports indicate that patients with Type D personality rarely
63 receive regular health check-ups [17] or treatment [18]. This could be related to the SI component of
64 Type D personality, which may inhibit these people from seeking adequate care. Then, they tend to be a
65 vulnerable social group. In Japan and other industrialized countries, the burgeoning elderly population
66 is a growing social concern, necessitating efficient and effective social and medical support for the
67 elderly. It is likely that studies on the health effects of Type D personality will be useful in planning

68 appropriate delivery of social/medical resources. However, most studies to date have focused on
69 middle-aged individuals (to our knowledge, the highest average age of the participants in previous
70 studies was 54.2 years) [4,19], which does not address the need to better understand the elderly
71 population. Further, studies of Type D personality tend to focus on specific at-risk sub-populations, and
72 not the general population. Finally, it appears that most of these studies have been conducted in
73 Western countries [4]. Since the relevant psychosocial concepts are culturally contingent, it is helpful to
74 confirm the health effects in another context. For instance, in Western studies, individuals with Type-A
75 characteristics have been found to be prone to myocardial infarction [20,21], while Japanese studies
76 have not demonstrated an increased risk of coronary heart disease in this personality type [22,23].

77 This study seeks to evaluate the health effects of Type D personality among a general
78 population of elderly people in Japan, using the construct *psychological distress* to represent mental
79 health, and *self-rated health* (SRH) to represent physical health.

80

81 **Methods**

82 *Participants*

83 Data were obtained from the Okayama Mental Health Survey of Elderly People, a
84 cross-sectional complete community survey conducted in the Okayama Prefecture, located in the
85 western part of Japan. In August 2010, the Prefectural Government conducted a postal survey of all
86 residents aged 65 and over ($n = 21232$) in the three municipalities. Participants were not given any
87 monetary compensation for their involvement, and privacy was ensured by using an anonymous survey
88 (we printed personal identifiers on each questionnaire and used personal data solely to issue a reminder
89 to non-respondents). We received 13929 responses, representing a response rate of 65.6%. We excluded
90 respondents with missing values on the measures related to Type D personality, psychological distress,
91 perceived general health, sex, or age, and 9759 participants were included in the analysis.

92 A thorough explanation of the aim of the survey was given on the cover of the questionnaire. If
93 residents did not agree to participate in this survey, they could freely choose not to respond without any
94 consequences. Therefore, we considered the receipt of a completed questionnaire to indicate informed
95 consent. The investigators obtained the data from the Okayama Prefectural Government after the
96 removal of personal identifiers. This epidemiological study was reviewed and approved by the Ethics
97 Committee of the Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical
98 Sciences.

99

100 *Measures*

101 Type D personality was assessed using the 14-item Type D Personality Scale (DS14) [5].
102 Participants were asked to rate their responses on a 5-point Likert-type scale (from 0 = *false* to 4 = *true*).
103 DS14 contains two subscales: negative affectivity (7 items; range 0–28) and social inhibition (7 items;
104 range 0–28). We defined participants with Type D personality as those with scores of greater than 10 on
105 both subscales (i.e., NA & SI) [2,24].

106 Psychological distress was evaluated using the Kessler Psychological Distress scale (K6). This
107 instrument has 6 items, and responses are given on a 5-point Likert-type scale (from 0 = *none of the*
108 *time* to 4 = *all of the time*, total score ranges from 0–24) [25]. The K6 was used to screen participants
109 for mood and anxiety disorders according to the criteria of the Diagnostic and Statistical Manual of
110 Mental Disorders, fourth edition (DSM-IV) [26]. A previous study from Japan [27] used a score of
111 more than 5 on the K6 to indicate psychological distress (sensitivity 100%, specificity 68.7%). In
112 addition to this, we used a cut-off point of >13 (sensitivity 64.7%, specificity 97.3%) [27] to assess
113 severe psychological distress [28]. In previous studies [26,27], the K6 has been found to be an effective
114 screening method for psychological distress, with results that are as reliable as those of other
115 assessments such as the K10, the Depression and Suicide Screen (DSS), the Center for Epidemiologic

116 Studies Depression Scale (CES-D), and the General Health Questionnaire-12 (GHQ-12). The K6 has
117 also been used to predict suicidal behavior during the past year [29].

118 The perceived general health of participants was evaluated via one questionnaire item, as
119 follows: “Would you say that in general your health is excellent, very good, good, fair, or poor?” From
120 this item, we created a dichotomous physical health outcome measure (we equated a response of ‘fair’
121 or ‘poor’ with poor health). Previous studies have found that a poor SRH is a strong predictor of
122 mortality [30,31].

123 We identified the following covariates which could act as confounding factors: sex, age
124 (continuous), smoking status (never/former vs. current), frequency of alcohol consumption, overweight
125 status, educational attainment, socioeconomic status, and number of cohabiters. Overweight status was
126 based on body mass index, which was calculated from the height and weight data provided in the
127 questionnaire. An overweight participant was defined as someone with 25 or more kg/m^2 , according to
128 the guidelines of the Japan Society for the Study of Obesity. Frequency of alcohol consumption was
129 divided into four categories: never, 1–3 times/month, 1–6 times/week, and every day. Educational
130 attainment was divided into three categories: junior high school, high school, and college or higher
131 (these divisions took into account historical differences in access to higher education). Socioeconomic
132 status was assessed subjectively by a visual analogue scale (1 = affluent, 9 = disadvantaged), and
133 answers were ranked as *high* (1–4), *middle* (5), *lower middle* (6–8), and *low* (9) according to the
134 distributions. Number of cohabiters was divided into four categories: 1 person (alone), 2, 3, and 4
135 persons or more.

136

137 *Statistical analyses*

138 We first tested for linear trends indicating associations between levels of the Type D subscales
139 (NA & SI) and each health outcome. We then used a logistic regression analysis to further examine

140 associations between Type D personality, psychological distress, and poor SRH, with participants
141 stratified by sex and age group (65–74 y/>75 y). A crude analysis was carried out (Crude Model), and
142 we calculated odds ratios (ORs) and 95% confidence intervals (CIs) for each health outcome. We then
143 adjusted our analysis for the following covariates: sex (only for the age-stratified analysis), age,
144 smoking status, frequency of alcohol consumption, overweight status, educational attainment,
145 socioeconomic status, and number of cohabiters (Adjusted Model). Finally, we imputed data that was
146 missing from the DS14 using the multiple imputation method (Multiple Imputation by Chained
147 Equations: MICE), created five complete datasets, analyzed each dataset, and pooled the results
148 (Imputation). In MICE, all of the covariates were used as independent variables, and each of the DS14
149 items as an ordinary dependent variable was filled up.

150 In a sensitivity analysis, we changed the cut-off for K6 scores to 13 to evaluate severe
151 psychological distress. To determine the independent effects of NA and SI, ORs for each health
152 outcome were calculated according to the following groups: NA < 10, SI ≥ 10 (i.e., SI+); NA ≥ 10, SI <
153 10 (i.e., NA+); and NA ≥ 10, SI ≥ 10 (i.e., Type D), with a reference of NA < 10 and SI < 10 (i.e.,
154 NA-SI-).

155 All statistical analyses were carried out using STATA/SE 11.1 (StataCorp, College Station, TX,
156 USA). The level of significance was set at $p < .05$ (two-sided).

157

158 **Results**

159 Demographic characteristics and the frequency of Type D personality are shown in Table 1.
160 We found 4508 participants with Type D personality (46.2%), with no substantial difference in
161 prevalence between sexes. In both sexes, we observed a significant dose-response relationship between
162 Type D personality traits and health outcome, with higher levels of NA and SI corresponding to a
163 higher proportion of psychological distress and poor SRH (Table 2).

164 In terms of the associations between Type D personality and each health outcome, ORs and
165 95% CIs are shown in Table 3. Regardless of sex or age stratification, Type D personality was
166 consistently and significantly associated with a higher risk of psychological distress and poor SRH,
167 compared with subjects without Type D. While these associations were of a similar magnitude in both
168 sexes, we found younger participants (65–74 y) to have higher ORs (Adjusted Model, psychological
169 distress; OR: 5.80, 95% CI: 4.96–6.78, poor SRH; OR: 2.84, 95% CI: 2.38–3.38) than participants over
170 75 (Adjusted Model, psychological distress; OR: 4.54, 95% CI: 3.96–5.19, poor SRH; OR: 2.05, 95%
171 CI: 1.79–2.34). These results were unchanged even when using MICE, suggesting that the ORs
172 significantly increased in all stratified groups (Imputation). (See online table for the demographic
173 characteristics for the 960 participants whose missing data was imputed).

174 The K6 cut-off value of 13 or more was used to assess severe psychological distress. In all
175 stratification groups (with one exception in Adjusted Model among men), ORs were higher than the
176 results for psychological distress (cut-off value of 5 or more) (Table 4). The magnitudes for
177 psychological distress were relatively uniform across sex and age groups (i.e., 4–5 times higher risks).
178 In contrast, for severe psychological distress younger elderly showed strong relationships (OR: 9.92,
179 95% CI: 5.74–17.12) compared with that of older elderly (OR: 4.62, 95% CI: 3.45–6.17) in Adjusted
180 Model. Further, when we separately analyzed NA and SI (Table 5), we found that NA had a stronger
181 effect on health outcomes than SI. This pattern was clearer for psychological distress than for poor
182 SRH. Notably, even among the non-Type D participants (based on conventional classification [i.e., SI+
183 or NA+]), all of ORs were significantly high for both psychological distress and poor SRH compared
184 with NA-SI- group.

185

186 **Discussion**

187 To our knowledge, the present study was based on the largest sample size among any previous

188 studies on Type D personality. Furthermore, this is the first study about Type D personality in Japanese
189 elderly population. Our findings suggest that Type D personality is associated with an adverse health
190 status among elderly Japanese people, both in terms of mental and physical outcomes. After adjusting
191 for covariates, we found that individuals with Type D personality were at 4–5 times the risk of
192 psychological distress and twice the risk of poor SRH. A stratified analysis by age showed that younger
193 elderly participants (65-74 years) were more strongly affected by Type D personality traits than older
194 elderly participants (>75 years). Multiple imputations did not change the results substantially.

195 Various studies have explored the association between Type D personality and mental illness
196 [4,14,32], and to our knowledge, all of these studies reported adverse associations between Type D
197 personality and mental health status, with ORs ranging from 2.6 to 8.6. Our findings, stratified by sex
198 and age, were comparable to these previous studies (adjusted ORs ranging from 4.5 to 5.8). Various
199 instruments have been developed to evaluate psychological distress and symptoms of depression, such
200 as the CES-D, the WHO Composite International Diagnostic Interview (CIDI), the Perceived Stress
201 Scale (PSS), the Patient Health Questionnaire (PHQ), and the K10. This study differed from previous
202 studies in that it used K6 scoring. However, the K6 is highly comparable to both the K10 and the
203 CES-D for assessing mood and anxiety disorders [27], so this difference is unlikely to produce any
204 difficulties in comparing findings between studies. Although the SRH is one of the most widely used
205 health status assessments globally [33-35], we know of no previous studies that investigated the
206 association between Type D personality and the SRH. In the present study, individuals with Type D
207 personality showed significantly higher ORs of poor SRH than individuals with non-Type D,
208 suggesting that Type D personality has a negative influence on physical health status, regardless of the
209 methodology (i.e., subjective exposure and outcome).

210 In this study, participants aged 65-74 years demonstrated consistently higher ORs for
211 psychological distress and poor SRH compared with participants who were over 75 years of age. The

212 most striking finding was the extremely high OR score for severe psychological distress in individuals
213 with Type D personality who were between 65 and 74. This may be due to the influence of various
214 psychosocial changes that accompany the early stages of aging (approximately age 65): decline in
215 physiological function, the death of friends and peers, retirement and loss of professional identity, the
216 independence of one's children, and the loss of previous social roles. Individuals above 75 years of age
217 may have had more time to acquire and familiarize themselves with coping mechanisms for dealing
218 with these psychosocial changes, resulting in a lower OR. Nevertheless, most of the resources are
219 usually designated to deliver much more for older elderly people rather than younger people in many
220 developed countries including Japan. Although further study is necessary, our findings may provide a
221 new perspective about how to efficiently distribute public services.

222 In previous European studies [4,7,12,36], the percentage of the general population with Type
223 D personality was between 13% and 38.5% (Mean age range: 10.3–54.2). In contrast, the prevalence of
224 Type D personality in the present study was 46.3%, which is much higher than in previous studies.
225 Indeed, this difference may be mainly due to differences in age groups. Furthermore, differences
226 related to race and cultural background is likely to have an influence. For example, Japanese respondents
227 tend to under-report positively phrased items (they are reverse-coded on our one-dimensional scale)
228 compared with Europeans and Americans, causing a bias towards higher scores in Japanese samples
229 [37]. It is possible that a similar tendency affected the responses to the DS14 questionnaire used in the
230 present study. Notably, in the previous studies from Korea and China [38,39], the proportions of Type
231 D personality among healthy controls were 31.2% and 31.9%, respectively, which are comparable to
232 the European studies. In the Korean study by Lin et al.[38], however, some SI items in the original
233 version were unfamiliar to Koreans, therefore two original items were replaced with other items. A
234 larger and prospective future study may be necessary to show that DS14 is applicable to the Japanese
235 setting with good validity and reliability.

236 Recent studies might have a possibility of misunderstanding as to the structure of Type D
237 personality, with the categories of Type D and non-Type D made based on selective criteria [40].
238 Furthermore, several consecutive studies have reported null findings regarding the association of Type
239 D personality with mortality [41-43] and other health outcome [44]. We considered these findings when
240 planning the current study, and thus chose to separate the components of NA and SI in our analysis. As
241 a result, NA has a relatively stronger effect on health than SI, particularly in terms of psychological
242 distress. Our findings are in agreement with the classification of the basic characteristics of personality,
243 namely the five-factor model [45-47], which shows strong correlations between neuroticism and types
244 of psychological distress, such as depression. In addition, we need to pay attention that there might be
245 considerable risks even in a non-Type D categories according to conventional classifications. It may
246 also suggest that the separate evaluation of NA and SI could reveal additional risks among vulnerable
247 groups.

248 Our study has several limitations. First, there is a possibility of common-method bias.
249 Although previous studies have repeatedly shown associations between Type D personality and
250 depression or psychological distress [4,11,13,14], the influence of similar items, including those
251 addressed in the DS14 and the K6 questionnaire has to be discussed. We can evaluate this influence in a
252 partial way because, while the NA subscale shared some with items with the K6, there is no overlap in
253 SI subscales. Furthermore, the SRH does not share items with the DS14. Hence, the consistency of our
254 findings across exposures and outcomes would have some validity. Although some elements of Type D
255 personality and depression do overlap, previous studies using factor analysis have found that the Type
256 D personality scale and measures of depressive symptoms are different and distinct [9,32]. A second
257 limitation of our study is related to the assessment of mental health, and we should be aware of the
258 possibility that participants with mental illness/cognitive deterioration did not complete the
259 questionnaire accurately. Although information about the depression/cognitive function of our

260 participants was unavailable, future studies are warranted by assessing comorbidity, focusing on
261 depression and dementia, rather than psychological distress. Third, because of the cross-sectional
262 design of our study, we cannot rule out the possibility of reverse causation. Thus, careful interpretation
263 is necessary. The DS14 evaluates personality based on questions that measure stable long-term
264 characteristics. The K6, on the other hand, specifies a concrete time period (the previous 30 days) and
265 the SRH asks the present status of general health. Thus, the temporal relationship between exposure
266 (DS14) and self-reported mental/physical outcomes was determined. A fourth limitation is selection
267 bias, whereby participants with Type D personality and poor health outcomes may have opted not to
268 participate in the study. This could lead to an underestimation of the present findings.

269 In conclusion, the present study shows that Japanese elderly people with Type D personality
270 have an enhanced risk of psychological distress as well as poor SRH. The effect of personality on
271 health is likely to be culturally contingent, and this is the first study to examine the health effects of
272 Type D personality in a Japanese elderly population. In addition, this is the first study to demonstrate
273 the validity of previous findings for this specific group. As developed countries face an increasingly
274 elderly population, and consequently, an increasing need for various types of healthcare, the present
275 findings may aid the development of efficient social services. To this end, an enhanced understanding
276 of connections between the mental and physical health of the elderly is essential.

277 **Competing interest**

278 The authors have no conflict of interest to declare.

279

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404

405 Table 1. Demographic characteristics of participants, Japan, 2010

	Men (<i>n</i> = 4000)	Women (<i>n</i> = 5759)
Characteristics	Number (%)	Number (%)
Age: mean [SD]	75.9 [6.9]	76.8 [7.5]
Smoking status		
Never/Former	3147 (78.7)	5240 (91.0)
Current	716 (17.9)	99 (1.7)
Information missing	137 (3.4)	420 (7.3)
Frequency of alcohol consumption		
Never	1307 (32.7)	4138 (71.9)
1–3 times/month	445 (11.1)	675 (11.7)
1–6 times/week	880 (22.0)	528 (9.2)
Every day	1344 (33.6)	177 (3.1)
Information missing	24 (0.6)	241 (4.2)
Body mass index (kg/m ²)		
Normal (<25)	3203 (80.1)	4529 (78.6)
Overweight (≥25)	686 (17.2)	965 (16.8)
Information missing	111 (2.8)	265 (4.6)
Educational attainment		
Junior high school	1811 (45.3)	2416 (42.0)
High school	1619 (40.5)	2541 (44.1)
College or more	440 (11.0)	492 (8.5)
Information missing	130 (3.3)	310 (5.4)
Socioeconomic status		

High	468 (11.7)	528 (9.2)
Middle	1849 (46.2)	2755 (47.8)
Lower middle	1139 (28.5)	1569 (27.2)
Low	339 (8.5)	549 (9.5)
Information missing	205 (5.1)	358 (6.2)
Number of cohabiters		
1 person (alone)	450 (11.3)	1232 (21.4)
2 persons	1717 (42.9)	1882 (32.7)
3 persons	625 (15.6)	933 (16.2)
4 persons or more	1079 (27.0)	1462 (25.4)
Information missing	129 (3.2)	250 (4.3)
Non-Type D personality	2159 (54.0)	3092 (53.7)
Type D personality	1841 (46.0)	2667 (46.3)

406 SD: standard deviation

407

408 Table 2. Distribution of psychological distress^a and poor self-rated health^b by levels of Type D subscales, Japan, 2010

	Men			Women		
		Psychological	Poor self-rated		Psychological	Poor self-rated
	Total	distress (%)	health (%)	Total	distress (%)	health (%)
	4000	1463 (36.6)	1133 (28.3)	5759	2485 (43.2)	1614 (28.0)
Negative affectivity ^c						
0/0	341	8 (2.4)	44 (12.9)	378	20 (5.3)	43 (11.4)
1/1–2	105	8 (7.6)	12 (11.4)	388	45 (11.6)	57 (14.7)
2–3/3–5	321	23 (7.2)	54 (16.8)	719	131 (18.2)	121 (16.8)
4–6/6–8	544	94 (17.3)	114 (21.0)	827	250 (30.2)	163 (19.7)
7–10/9–12	773	226 (29.2)	187 (24.2)	1226	557 (45.4)	328 (26.8)
11–16/13–18	1453	728 (50.1)	473 (32.6)	1794	1118 (62.3)	659 (36.7)
17–28/19–28	463	376 (81.2)	249 (53.8)	427	364 (85.3)	243 (56.9)
P for trend		<.001	<.001		<.001	<.001
Social inhibition						
0	118	11 (9.3)	12 (10.2)	157	19 (12.1)	20 (12.7)
1–3	340	35 (10.3)	51 (15.0)	458	82 (17.9)	7.3 (15.9)

4–7	599	105 (17.5)	94 (15.7)	915	241 (26.3)	152 (16.6)
8–11	870	264 (30.3)	214 (24.6)	1302	483 (37.1)	308 (23.7)
12–15	1163	501 (43.1)	342 (29.4)	1727	875 (50.7)	521 (30.2)
16–21	755	427 (56.6)	335 (44.4)	993	628 (63.2)	428 (43.1)
22–28	155	120 (77.4)	85 (54.8)	207	157 (75.9)	112 (54.1)
P for trend		<.001	<.001		<.001	<.001

409 ^a Psychological distress denotes K6 score of 5 or higher.

410 ^b Poor self-rated health denotes that participant answered either "Fair" or "Poor."

411 ^c Cut-off for categories are different between men and women.

412

413 Table 3: Odds ratios for psychological distress and poor self-rated health associated with Type D personality, Japan, 2010

	Psychological distress ^a			Poor self-rated health ^b		
	Crude Model	Adjusted Model ^c	Imputation ^c	Crude Model	Adjusted Model ^c	Imputation ^c
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
<i>Men</i>						
Non-type D	reference	reference	reference	reference	reference	reference
Type D	5.58 (4.85–6.43)	5.55 (4.74–6.50)	5.43 (4.66–6.34)	2.55 (2.21–2.94)	2.25 (1.91–2.64)	2.26 (1.94–2.64)
<i>Women</i>						
Non-type D	reference	reference	reference	reference	reference	reference
Type D	4.93 (4.40–5.52)	4.71 (4.12–5.38)	4.54 (4.00–5.16)	2.68 (2.38–3.02)	2.36 (2.05–2.72)	2.32 (2.03–2.67)
<i>65-74y</i>						
Non-type D	reference	reference	reference	reference	reference	reference
Type D	6.14 (5.34–7.07)	5.80 (4.96–6.78)	5.73 (4.93–6.68)	3.07 (2.62–3.59)	2.84 (2.38–3.38)	2.83 (2.39–3.36)
<i>75y+</i>						
Non-type D	reference	reference	reference	reference	reference	reference
Type D	4.56 (4.08–5.12)	4.54 (3.96–5.19)	4.34 (3.82–4.94)	2.40 (2.14–2.69)	2.05 (1.79–2.34)	2.04 (1.79–2.32)

414 CI: confidence interval, OR: odds ratio

415 ^a Psychological distress denotes K6 score of 5 or higher.416 ^b Poor self-rated health denotes that participant answered either "Fair" or "Poor."

417 ^c Adjusted for age, sex, smoking status, frequency of alcohol consumption, overweight status, educational attainment, socioeconomic status,

418 and number of cohabiters

419

420 Table 4: Odds ratios for severe psychological distress^a associated with Type D personality, Japan, 2010

	Crude Model	Adjusted Model ^b	Imputation ^b
	OR (95% CI)	OR (95% CI)	OR (95% CI)
<i>Men</i>			
Non-type D	reference	reference	reference
Type D	6.51 (4.46–9.51)	5.16 (3.41–7.81)	5.68 (3.80–8.51)
<i>Women</i>			
Non-type D	reference	reference	reference
Type D	6.18 (4.75–8.02)	6.09 (4.42–8.40)	5.77 (4.26–7.82)
<i>65-74y</i>			
Non-type D	reference	reference	reference
Type D	9.64 (6.14–15.13)	9.92 (5.74–17.12)	10.39 (6.05–17.83)
<i>75y+</i>			
Non-type D	reference	reference	reference
Type D	5.26 (4.11–6.73)	4.62 (3.45–6.17)	4.62 (3.51–6.08)

421 CI: confidence interval, OR: odds ratio

422 ^a Severe psychological distress denotes a K6 score of 13 or higher.423 ^b Adjusted for age, sex, smoking status, frequency of alcohol consumption, overweight status, educational attainment, socioeconomic status,

424 and number of cohabiters

425 Table 5: Odds ratios for psychological distress and poor self-rated health associated with each component of Type D personality, Japan, 2010

	Psychological distress ^a			Poor self-rated health ^b		
	Crude Model	Adjusted Model ^c	Imputation ^c	Crude Model	Adjusted Model ^c	Imputation ^c
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
NA-,SI-	reference	reference	reference	reference	reference	reference
SI+	2.05 (1.76–2.39)	2.02 (1.69–2.40)	1.96 (1.66–2.32)	1.78 (1.52–2.08)	1.71 (1.43–2.04)	1.66 (1.40–1.97)
NA+	5.49 (4.62–6.53)	5.90 (4.84–7.20)	5.86 (4.84–7.08)	2.16 (1.80–2.61)	2.18 (1.76–2.70)	2.08 (1.69–2.55)
Type D	9.22 (8.17–10.41)	9.21 (8.00–10.60)	8.92 (7.79–10.22)	3.67 (3.25–4.14)	3.21 (2.79–3.70)	3.14 (2.75–3.60)

426 NA: negative affectivity, SI: social inhibition, CI: confidence interval, OR: odds ratio

427 ^a Psychological distress denotes a K6 score of 5 or higher.428 ^b Poor self-rated health denotes that participant answered either "Fair" or "Poor."429 ^c Adjusted for age, sex, smoking status, frequency of alcohol consumption, overweight status, educational attainment, socioeconomic status,
430 and number of cohabiters

431