

Supplemental Online Content

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This supplemental material has been provided by the authors to give readers additional information about their work.

eTable 1. Definitions and Descriptions of Variables Used in the Study

Variables	Description
Low income	based on health insurance premiums (administration data), which are indicative of income levels in Korea: Individuals receiving medical aid or within the lowest quartile of income
Smoking status	Based on self-report. Categorized in never, current, and former smokers.
Alcohol consumption	Based on self-reported intake frequency. Non-drinkers indicated a response of "0" for drinking frequency on the question "How many days a week do you drink on average?"). We defined individuals who had consumed any amount of alcohol as alcohol drinkers.
Physical activity	Self-reported. Regular physical activity defined as engaging in regular moderate-intensity exercise for at least 30 minutes on 5 or more days per week or vigorous activity for at least 20 minutes on 3 or more days per week
Obesity	defined by a body mass index (BMI) of 25kg/m ² or greater
Hypertension	claim for antihypertensive medication under the codes I10–I13 and I15 or recorded blood pressure readings (≥140/90 mmHg)
Diabetes	confirmed by at least one annual claim for antidiabetic medication under the codes E11–E14 or fasting glucose level (≥126 mg/dL).
Dyslipidemia	defined as having at least one yearly claim for lipid-lowering medication under code E78 or total cholesterol level (≥240 mg/dL).
Chronic Kidney Disease	classified based on ICD-10 codes N18, N19 or an estimated glomerular filtration rate below 60 mL/min/1.73 m ² , calculated according to the Modification of Diet in Renal Disease study equation ^a
Depression	identified by at least one claim for depressive disorders (ICD-10 codes F32, F33) within the year preceding the health examination date
Anxiety	identified by at least one claim for anxiety disorders (ICD-10 codes F40, F41) within the year preceding the health examination date
Post-traumatic stress disorder	identified by at least one claim for post-traumatic disorder (ICD-10 codes F43.1) within the year preceding the health examination date
Schizophrenia spectrum disorder	identified by at least one claim for schizophrenia spectrum disorder (ICD-10 codes F20-29) within the year preceding the health examination date
Substance use disorder	identified by at least one claim for substance use disorder (ICD-10 codes F10-19) within the year preceding the health examination date
Bipolar disorder	Identified by at least one claim with a primary diagnosis of bipolar disorders (ICD-10 codes F30, F31, F34.0) within the year preceding the health examination date.
Obsessive-compulsive disorder	identified by at least one claim for obsessive-compulsive disorder (ICD-10 codes F42) within the year preceding the health examination date
Personality disorder	identified by at least one claim for personality disorders (ICD-10 codes F60-61) within the year preceding the health examination date
Cancer	ICD-10 codes C00-C97
Cardiovascular disease	Included stroke and myocardial infarction. Myocardial infarction was defined as a record of ICD-10 codes I21 or I22 during hospitalization or these codes having been recorded at least twice. Stroke was defined as a record of ICD-10 codes I63 or I64 during hospitalization with claims for brain computed tomography or magnetic resonance imaging

^aLevey AS, Coresh J, Greene T, et al. Expressing the Modification of Diet in Renal Disease Study equation for estimating glomerular filtration rate with standardized serum creatinine values. *Clin Chem*. 2007;53(4):766-772. doi:10.1373/clinchem.2006.077180

eTable 2. Mortality, Suicide Rates, and Follow-Up Duration**A. Depression**

	TOTAL	Living Together		Living Alone		P-value
		No Depression	Depression	No Depression	Depression	
Subjects (n)	3764279	3339384	104902	312435	7558	
Total Mortality (%)	235458 (6.26)	204441 (6.12)	15619 (14.89)	14442 (4.62)	956 (12.65)	<.001
Suicide (%)	11648 (0.31)	9536 (0.29)	955 (0.91)	1065 (0.34)	92 (1.22)	<.001
Follow Up Duration (person-years)						
Mean (SD)	11.05 (1.46)	11.06 (1.44)	10.66 (2.23)	11.12 (1.25)	10.77 (2.04)	<.001
Median [Q1-Q3]	11.29 [11.10-11.56]	11.29 [11.10-11.56]	11.33 [11.06-11.62]	11.28 [11.10-11.54]	11.3 [11.07-11.58]	<.001

B. Anxiety

	TOTAL	Living Together		Living Alone		P-value
		No Anxiety	Anxiety	No Anxiety	Anxiety	
Subjects (n)	3764279	3227854	216432	304120	15873	
Total Mortality (%)	235458 (6.26)	193474 (5.99)	26586 (12.28)	13704 (4.51)	1694 (10.67)	<.001
Suicide (%)	11648 (0.31)	9289 (0.29)	1202 (0.56)	1052 (0.35)	105 (0.66)	<.0001
Follow Up Duration (person-years)						
Mean (SD)	11.05 (1.46)	11.07 (1.43)	10.80 (2.02)	11.12 (1.24)	10.87 (1.86)	<.001
Median [Q1-Q3]	11.29 [11.10-11.56]	11.29 [11.10-11.56]	11.34 [11.08-11.62]	11.28 [11.1-11.54]	11.31 [11.08-11.58]	<.001

Table displays mortality and suicide rates (%) along with follow-up duration (person-years) categorized by psychiatric disorder (A. Depression, B. Anxiety) and living arrangement. Data show total counts, percentages, and follow-up metrics, with statistical significance noted by *P* Values.

eTable 3. Interaction Analysis Between Living Arrangements and Mental Health Conditions (Depression or Anxiety) on Suicide Risk

^aIncidence per 1000 person-years.

Living arrangements	Mental Disorder	Subjects (n)	Events (n)	Follow-up duration (person-years)	Incidence rate ^a	Hazard ratio (95% Confidence interval)				
						Model 1 ^b	Model 2 ^c	Model 3 ^d	Model 4 ^e	Model 5 ^f
Living together	No Depression	3339384	9536	36938524	0.26	1(Ref.)	1(Ref.)	1(Ref.)	1(Ref.)	1(Ref.)
	Depression	104902	955	1117863	0.85	3.31 (3.10-3.53)	3.10 (2.90-3.32)	3.12 (2.92-3.34)	3.11 (2.91-3.33)	2.75 (2.56-2.95)
Living alone	No Depression	312435	1065	3473805	0.31	1(Ref.)	1(Ref.)	1(Ref.)	1(Ref.)	1(Ref.)
	Depression	7558	92	81381	1.13	3.68 (2.98-4.56)	3.28 (2.65-4.06)	3.23 (2.61-4.00)	3.22 (2.60-3.99)	2.85 (2.30-3.53)
P-value for interaction						0.342	0.621	0.756	0.758	0.756
Living together	No Anxiety	3227854	9289	35718619	0.26	1(Ref.)	1(Ref.)	1(Ref.)	1(Ref.)	1(Ref.)
	Anxiety	216432	1202	2337768	0.51	1.98 (1.86-2.10)	1.86 (1.75-1.98)	1.88 (1.77-2.00)	1.88 (1.77-2.00)	1.54 (1.45-1.64)
Living alone	No Anxiety	304120	1052	3382615	0.31	1(Ref.)	1(Ref.)	1(Ref.)	1(Ref.)	1(Ref.)
	Anxiety	15873	105	172579	0.61	1.96 (1.60-2.39)	1.75 (1.43-2.14)	1.74 (1.43-2.13)	1.74 (1.42-2.13)	1.43 (1.17-1.75)
P-value for interaction						0.932	0.566	0.472	0.477	0.488

^bModel 1 was not adjusted.

^cModel 2 was adjusted for sex and age.

^dModel 3 was adjusted for sex, age, income, smoking status, alcohol consumption, physical activity, BMI, diabetes, hypertension, dyslipidemia, and chronic kidney disease.

^eModel 4 was adjusted for sex, age, income, smoking status, alcohol consumption, physical activity, BMI, diabetes, hypertension, dyslipidemia, chronic kidney disease, and cancer.

^fModel 5 was adjusted for sex, age, income, smoking status, alcohol consumption, physical activity, BMI, diabetes, hypertension, dyslipidemia, chronic kidney disease, cancer, depression and anxiety.

eTable 4. Hazard Ratios (HRs) and 95% Confidence Intervals (CIs) for Suicide Risk by Living Arrangements, Depression, and Anxiety, Stratified by Follow-Up Duration

Living Arrangement	Depression	Anxiety	Subjects (n)	Events (n)	Follow-up duration (person-years)	Incidence rate ^a	Hazard ratio (95% Confidence interval)			
							Model 1 ^b	Model 2 ^c	Model 3 ^d	Model 4 ^e
Follow-up period: 1 year to <5 years										
Living together	No	No	3159043	3138	12545982	0.25	1(Ref.)	1(Ref.)	1(Ref.)	1(Ref.)
		Yes	180341	354	711087	0.50	1.99 (1.78-2.22)	1.86 (1.67-2.08)	1.89 (1.69-2.11)	1.89 (1.69-2.11)
	Yes	No	68811	216	270050	0.80	3.20 (2.79-3.67)	2.94 (2.56-3.38)	2.96 (2.57-3.40)	2.95 (2.57-3.39)
		Yes	36091	179	141068	1.27	5.07 (4.36-5.90)	4.58 (3.93-5.34)	4.68 (4.02-5.46)	4.67 (4.00-5.44)
Living alone	No	No	299033	366	1189867	0.31	1.23 (1.10-1.37)	1.59 (1.42-1.77)	1.46 (1.31-1.63)	1.46 (1.31-1.63)
		Yes	13402	26	52975	0.49	1.96 (1.33-2.89)	2.27 (1.54-3.34)	2.08 (1.41-3.07)	2.08 (1.41-3.07)
	Yes	No	5087	22	20041	1.10	4.39 (2.89-6.68)	5.00 (3.28-7.60)	4.52 (2.97-6.88)	4.51 (2.96-6.87)
		Yes	2471	17	9677	1.76	7.03 (4.36-11.32)	7.67 (4.76-12.35)	6.97 (4.32-11.24)	6.95 (4.31-11.20)
Follow-up period: 5 year to < 9 years										
Living together	No	No	3110879	3041	12319014	0.25	1(Ref.)	1(Ref.)	1(Ref.)	1(Ref.)
		Yes	174889	262	685513	0.38	1.55 (1.37-1.76)	1.50 (1.32-1.71)	1.52 (1.34-1.73)	1.52 (1.34-1.73)
	Yes	No	66144	216	257852	0.84	3.39 (2.96-3.90)	3.26 (2.83-3.75)	3.28 (2.85-3.77)	3.27 (2.84-3.76)
		Yes	34358	122	133391	0.91	3.71 (3.09-4.44)	3.53 (2.94-4.24)	3.60 (2.99-4.32)	3.58 (2.98-4.30)
Living alone	No	No	295685	377	1173542	0.32	1.30 (1.17-1.45)	1.69 (1.51-1.88)	1.56 (1.40-1.74)	1.57 (1.40-1.75)

	Yes	13066	20	51417	0.39	1.58 (1.02-2.45)	1.90 (1.22-2.95)	1.76 (1.13-2.74)	1.76 (1.13-2.74)
Yes	No	4934	15	19348	0.78	3.14 (1.89-5.22)	3.75 (2.26-6.23)	3.45 (2.08-5.73)	3.44 (2.07-5.71)
	Yes	2369	14	9234	1.52	6.14 (3.63-10.38)	7.06 (4.18-11.95)	6.48 (3.83-10.97)	6.46 (3.82-10.94)

^aIncidence per 1000 person-years.

^bModel 1 was not adjusted.

^cModel 2 was adjusted for sex and age.

^dModel 3 was adjusted for sex, age, income, smoking status, alcohol consumption, physical activity, BMI, diabetes, hypertension, dyslipidemia and chronic kidney disease.

^eModel 4 was adjusted for sex, age, income, smoking status, alcohol consumption, physical activity, BMI, diabetes, hypertension, dyslipidemia, chronic kidney disease, and cancer.

eTable 5. Hazard Ratios (HRs) and 95% Confidence Intervals (CIs) for Suicide Risk by Duration of Living Alone and Psychiatric Conditions: Sensitivity Analysis

Living Arrangement	Mental Disorder	Subjects (n)	Events (n)	Follow-up duration (person-years)	Incidence rate ^a	Hazard ratio (95% Confidence interval)				
						Model 1 ^b	Model 2 ^c	Model 3 ^d	Model 4 ^e	Model 5 ^f
Living together	No Depression	2749839	8113	30341380	0.27	1 (Ref.)	1(Ref.)	1(Ref.)	1(Ref.)	1(Ref.)
	Depression	93414	856	992442	0.86	3.22 (3.00-3.46)	3.11 (2.89-3.34)	3.13 (2.91-3.36)	3.12 (2.90-3.35)	2.76 (2.56-2.97)
Living alone (1 year)	No Depression	218099	536	2438984	0.22	0.82 (0.75-0.90)	1.24 (1.13-1.35)	1.13(1.04-1.24)	1.13 (1.04-1.24)	1.13 (1.037,1.24)
	Depression	4560	44	49848	0.88	3.30 (2.45-4.44)	4.14 (3.08-5.57)	3.79 (2.82-5.10)	3.79 (2.81-5.09)	3.37 (2.52-4.54)
Living alone (2-4 years)	No Depression	371446	887	4158159	0.21	0.80 (0.75-0.86)	1.22 (1.14-1.31)	1.12 (1.05-1.21)	1.12 (1.05-1.21)	1.12 (1.05-1.21)
	Depression	6928	55	75574	0.73	2.72 (2.09-3.55)	3.46 (2.66-4.52)	3.20 (2.45-4.17)	3.19 (2.44-4.16)	2.85 (2.18-3.71)
Living alone (≥5 years)	No Depression	312435	1065	3473805	0.31	1.15 (1.08-1.22)	1.59 (1.49-1.69)	1.46 (1.36-1.55)	1.46 (1.36-1.55)	1.46 (1.36-1.56)
	Depression	7558	92	81390	1.13	4.23 (3.44-5.19)	5.16 (4.20-6.34)	4.69 (3.82-5.76)	4.68 (3.81-5.75)	4.14 (3.36-5.09)
Living together	No Anxiety	2651832	7888	29271566	0.27	1(Ref.)	1(Ref.)	1(Ref.)	1(Ref.)	1(Ref.)
	Anxiety	191421	1081	2062257	0.52	1.94 (1.82-2.07)	1.88 (1.76-2.01)	1.90 (1.78-2.03)	1.90 (1.78-2.02)	1.55 (1.45-1.66)
Living alone (1 year)	No Anxiety	213040	528	2382631	0.22	0.82 (0.75-0.90)	1.25 (1.14-1.36)	1.14 (1.05-1.25)	1.14 (1.04-1.25)	1.14 (1.04-1.25)
	Anxiety	9619	52	106201	0.49	1.82 (1.38-2.39)	2.35 (1.79-3.09)	2.17 (1.65-2.85)	2.17(1.65-2.85)	1.79 (1.36-2.36)
Living alone (2-4 years)	No Anxiety	362982	873	4064423	0.21	0.80 (0.74-0.86)	1.23 (1.14-1.32)	1.13 (1.05-1.22)	1.13 (1.05-1.22)	1.13 (1.05-1.21)
	Anxiety	15392	69	169310	0.41	1.51 (1.19-1.92)	1.99 (1.57-2.52)	1.84 (1.45-2.34)	1.84 (1.45-2.33)	1.54 (1.22-1.96)
Living alone (≥5 years)	No Anxiety	304120	1052	3382615	0.31	1.15 (1.08-1.23)	1.61 (1.51-1.72)	1.47 (1.38-1.57)	1.47 (1.38-1.57)	1.47 (1.38-1.57)

Anxiety	15873	105	172579	0.61	2.26 (1.87- 2.74)	2.79 (2.30- 3.38)	2.56 (2.11- 3.10)	2.56 (2.11- 3.10)	2.1 (1.73- 2.55)
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^aIncidence per 1000 person-years.

^bModel 1 was not adjusted.

^cModel 2 was adjusted for sex and age.

^dModel 3 was adjusted for sex, age, income, smoking status, alcohol consumption, physical activity, BMI, diabetes, hypertension, dyslipidemia and chronic kidney disease.

^eModel 4 was adjusted for sex, age, income, smoking status, alcohol consumption, physical activity, BMI, diabetes, hypertension, dyslipidemia, chronic kidney disease, and cancer.

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eTable 6. Comparison of Suicide Rates and Risk Among Individuals Excluded for Missing Data and Those Living Alone: Sensitivity Analysis

	Subjects (n)	Events (n)	Follow-up duration (person-years)	Incidence rate ^a	Hazard ratio (95% Confidence interval)				
					Model 1 ^b	Model 2 ^c	Model 3 ^d	Model 4 ^e	Model 5 ^f
Excluded (Missing Data)	187119	642	2051674	0.31	1(Ref.)	1(Ref.)	1(Ref.)	1(Ref.)	1(Ref.)
Living alone	319993	1157	3555195	0.33	1.04 (0.95-1.15)	1.08 (0.98-1.18)	1.02 (0.92-1.12)	1.02 (0.93-1.13)	1.03 (0.94-1.14)

^aIncidence per 1000 person-years.

^bModel 1 was not adjusted.

^cModel 2 was adjusted for sex and age.

^dModel 3 was adjusted for sex, age, income, smoking status, alcohol consumption, physical activity, BMI, diabetes, hypertension, dyslipidemia and chronic kidney disease.

^eModel 4 was adjusted for sex, age, income, smoking status, alcohol consumption, physical activity, BMI, diabetes, hypertension, dyslipidemia, chronic kidney disease, and cancer.

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