Supplemental Online Content

Kang J, Eun Y, Jang W, et al. Rheumatoid arthritis and risk of Parkinson disease in Korea. *JAMA Neurol*. Published online May 1, 2023.
doi:10.1001/jamaneurol.2023.0932

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

eMethods. Covariates

Information on anthropometric and health behaviors was collected using an NHSP self-administered questionnaire. Measurements of height (m^2) and weight (kg) were performed by healthcare personnel during the health screening examination. Body mass index was calculated as kg/m^2, and further categorized into five groups (< 18.5, 18.5-22.9, 23.0-24.9, 25.0-29.9, and ≥ 30 kg/m^2) according to the criteria for Asian populations.[1] Because insurance payment was determined based on household income level, insurance premium was used as a proxy for income, and we defined low income as the lower 25% of insurance payers and Medicaid group. Smoking status was categorized into non-smoker, former smoker < 20 pack-years, former smoker ≥ 20 pack-years, current smoker < 20 pack-years, and current smoker ≥ 20 pack-years[2]. Alcohol consumption was categorized into non-drinker, <30 g/day, and ≥30 g/day[3]. Regular physical activity was defined as participants engaged in moderate exercise for at least 30 minutes 5 times per week or strenuous exercise for at least 20 minutes 3 times per week.

Comorbidities were defined using NHIS claim data and laboratory information from NHSP in a complementary fashion. We defined diabetes mellitus as a record of diagnosis code (E11.x–E14.x) with antidiabetic medications or a fasting plasma glucose ≥ 126 mg/dL. Hypertension was defined with ICD-10 codes (I10.x-I13.x and I15.x) or being on antihypertensive agents or blood pressure ≥ 140/90 mmHg. Dyslipidemia was defined as a combination of ICD-10 codes (E78.x) and a prescription record for lipid-lowering medications or total cholesterol ≥240 mg/dL. Chronic kidney disease (CKD) was determined using ICD-10 codes (N18.x,19.x) or eGFR calculated by the Modification of Diet in Renal Disease equation (<60 mg/dL).[4] Myocardial infarction (MI, I21.x–I22.x), depression (F32.x–I33.x), and stroke (I63.x–I64.x) were defined based on diagnosis code and claim data for brain CT and/or MRI was additionally required to validate a stroke only.

eReferences

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eTable 1. Previous Studies on the Association Between RA and Incident PD

Reference	Study population	Study design	Sample size	Follow-up	Definition of RA	Outcome definition	Covariates	Key findings	limitations
Rugbjerg, K., et al, 2009	Danish National Hospital Register	Case-control	PD =13,695 RA =519 RA&PD = 63	1986-2006	ICD8 and 10 codes	ICD-8 code 342 and ICD-10 code G20)	Presence of COPD	aOR 0.7 (95% CI 0.5–0.9)	- Smoking status was not taken into consideration - RA was solely defined using disease codes - Seropositivity on the development of PD has not been evaluated
Li, X., et al, 2012	Swedish Hospital Discharge Register	Retrospective cohort study	PD = 26,791 RA = 52,994? RA&PD =63	1964-2007	ICD codes	ICD-7: code 350, ICD-8: code 342.0, ICD-9: code 332, and ICD-10: codes G20 and G21	Gender, age, period, socioeconomic status, geographic region of residence, and comorbidities.	SIR 1.07 (95% CI0.89–1.26)	- Smoking status was not taken into consideration - RA was solely defined using disease codes - Seropositivity on the development of PD has not been evaluated
Sung, Y., et al, 2016,	Taiwan National Health Insurance Research Database	age- and sex-matched retrospective cohort	RA = 33,221 PD =2,741 RA&PD = 360	1998-2010	ICD 9 code (CM 714.0) + critical illness registration	ICD-9 (CM 332) + Registry for Catastrophic Illness Patient Database	Sex, age, and comorbidities, namely, diabetes, hypertension, hyperlipidemia, CAD, head injury, depression, stroke, and NSAID use.	aHR 0.65 (95% CI 0.58-0.73	- Smoking status was not taken into consideration - Seropositivity on the development of PD has not been evaluated - A lag period of PD incidence was not applied
Chang, C., et al 2017,	National Health Insurance Research Database (NHIRD) of Taiwan	age-, sex-, and index year matched retrospective cohort	RA =19,542 PD =2,664 RA & PD =379	2001-2012	ICD 9 code (CM 714.0) + critical illness registration	ICD 9 code (CM 332) + hospitalization/or three times outpatients visit.	Age, sex, and comorbidities	aHR1.14 (95% CI 1.03–1.2)	- Smoking status was not taken into consideration - Seropositivity on the development of PD has not been evaluated - A lag period of PD incidence was not applied
Bacelis, J., et al 2021	National patient registry of Sweden	Nested Case-Control Study	RA = 8256 PD = 21876 RA & PD =66	1997–2016	ICD 10 code (M05 or M06)	ICD 10 code (G21)	N/A	OR 0.66 (95% CI 0.51, 0.85)	- Smoking status was not taken into consideration - RA was solely defined using disease codes - Seropositivity on the development of PD has not been evaluated - All participants were first-degree relatives of a person diagnosed with diabetes mellitus or celiac disease

PD: Parkinson disease; RA: Rheumatoid arthritis; ICD: international classification of disease; COPD: chronic obstructive pulmonary disease; aOR: adjusted odds ratio; CI: confidence interval; SIR: Standardized incidence ratio; aHR: adjusted hazard ratio; OR: odds ratio; N/A: not available

eTable 2. Disease-Modifying Anti-Rheumatic Drugs Used in the Definition of Diseases.

Category	Drugs
csDMARD	Methotrexate, Hydroxychloroquine, Leflunomide, Sulfasalazine, Tacrolimus, Cyclosporine, D-penicillamine, Bucillamine, Azathioprine, Minocycline, Mizoribine
bDMARD	Adalimumab, Etanercept, Infliximab, Golimumab, Rituximab, Abatacept, Tocilizumab
tsDMARD	Tofacitinib

csDMARD, conventional synthetic disease-modifying anti-rheumatic drug; bDMARD, biologic disease-modifying anti-rheumatic drug; tsDMARD, targeted synthetic disease-modifying anti-rheumatic drug

eTable 3. List of Diseases in the Rare and Intractable (RID) Program Excluded From the Study

RID code	Disease
V111	Sarcoidosis
V133	Juvenile idiopathic arthritis
V134	Polyarteritis nodosa, Eosinophilic granulomatosis with polyangiitis, Juvenile polyarteritis
V135	Goodpasture's syndrome, Thrombotic thrombocytopenic purpura, Thrombotic microangiopathy, Granulomatosis with polyangiitis, Takayasu's arteritis
V136	Systemic lupus erythematosus
V137	Inflammatory myositis
V138	Systemic sclerosis
V139	Sjogren's syndrome, Mixed connective tissue disease, Behcet's disease, Polymyalgia rheumatic, Eosinophilc fasciitis, Multifocal fibrosclerosis, Weber-Christian disease
V140	Ankylosing spondylitis
V178	Relapsing polychondritis
V237	Psoriatic arthritis
V238	Microscopic polyangiitis
V290	Hypersensitivity vasculitis
V294	Cryoglobulinemic vasculitis
V298	Adult onset Still's disease
V900	Extremely rare diseases including IgG4-related disease, SAPHO syndrome

eTable 4. Registration Criteria for Parkinson's Disease in the Rare and Intractable (RID) Program of Korean

Registration criteria	Disease
Step 1	Diagnosis of Parkinsonism Mild or greater bradykinesia Plus at least one of the followings - Muscular rigidity - 4-6 Hz rest tremor - Postural instability not caused by primary visual, vestibular, cerebellar, or proprioceptive dysfunction
Step 2	Exclusion criteria for Parkinson's disease - History of repeated strokes with stepwise progression of parkinsonian features - History of repeated head injury - History of definite encephalitis - Oculogyric crises - Neuroleptic treatment at onset of symptoms - More than one affected relative - Sustained remission - Strictly unilateral features after 3 years - Supranuclear gaze palsy - Cerebellar signs - Early severe autonomic involvement - Early severe dementia with disturbances of memory, language, and praxis - Babinski sign - Presence of cerebral tumor or communication hydrocephalus on imaging study - Negative response to large doses of levodopa in absence of malabsorption - MPTP exposure
Step 3	Three or more following criteria is required for diagnosis of Parkinson's disease Unilateral onset - Rest tremor present - Progressive disorder - Persistent asymmetry affecting side of onset most - Excellent response (70-100%) to levodopa - Severe levodopa-induced chorea - Levodopa response for 5 years or more - Clinical course of ten years or more

eTable 5. Sensitivity Analysis Evaluating the Risk of Parkinson's Disease According to RA Status and Serologic Status Of RA With 2-Year, 3-Year, and 5-Year Lag Periods.

Lag periods	2-year lag period			3-year lag period			5-year lag period		
	N	Event(N)	HR (95% CI)	N	Event (N)	HR (95% CI)	N	Event (N)	HR (95% CI)
By RA status									
Control	271,843	664	1 (Ref.)	229,645	511	1 (Ref.)	148,374	270	1 (Ref.)
RA	53,995	221	1.63 (1.39 -1.90)	45,394	169	1.66 (1.39 - 1.98)	29,014	83	1.61 (1.25 - 2.06)
By RA status and seropositivity									
Control	271,843	664	1 (Ref.)	229,645	511	1 (Ref.)	148,374	270	1 (Ref.)
SNRA	15,526	37	0.98 (0.70 -1.36)	12,885	27	0.95 (0.64 - 1.40)	8,384	10	0.70 (0.37 - 1.31)
SPRA	38,469	184	1.87 (1.59 -2.21)	32,509	142	1.93 (1.60 - 2.33)	20,630	73	1.95 (1.50 - 2.54)
By seropositivity									
SNRA	15,526	37	1 (Ref.)	12,885	27	1 (Ref.)	8,384	10	1 (Ref.)
SPRA	38,469	184	1.95 (1.34 - 2.73)	32,509	142	2.05 (1.35 - 3.09)	20,630	73	2.83 (1.46 - 5.49)

aHR: adjusted hazard ratio; CI: confidence interval

Hazard ratio was calculated adjusting for age, sex, smoking, alcohol drinking, physical activity, low income, BMI, diabetes mellitus, hypertension, hyperlipidemia, chronic kidney disease myocardial infarction, stroke, and depression

eTable 6. Stratified Analyses of Association Between Rheumatoid Arthritis (RA) Status and Parkinson Disease (PD) Risk by Socioeconomic Characteristics, Health Behaviors, and Comorbidities

Subgroup		RA status	N	Event (N)	Duration (PY)	Incidence rate (per 1,000 Person-years)	aHR (95% CI)	*P-interaction*
Age	40–49	Control	55,505	10	259,046.2	0.04	1 (Ref.)	.424
		RA	11,101	7	51,735.4	0.14	3.26 (1.24 - 8.57)	
	50-64	Control	138,800	220	641,249.5	0.34	1 (Ref.)	
		RA	27,760	81	127,386.0	0.64	1.72 (1.33 - 2.22)	
	65-74	Control	59,510	396	263,028.7	1.51	1 (Ref.)	
		RA	11,902	133	50,748.6	2.62	1.61 (1.32 - 1.96)	
	≥75	Control	19,585	177	74,456.6	2.38	1 (Ref.)	
		RA	3,917	69	13,712.6	5.03	1.93 (1.46 - 2.56)	
Sex	Male	Control	68,670	257	296,732.7	0.87	1 (Ref.)	.343
		RA	13,734	80	57,505.8	1.39	1.57 (1.22 - 2.02)	
	Female	Control	204,730	546	941,048.4	0.58	1 (Ref.)	
		RA	40,946	210	186,076.8	1.13	1.82 (1.55 - 2.13)	
Income	Low 25% + Medicaid group	Control	64,191	165	287,507.6	0.57	1 (Ref.)	.995
		RA	12,792	55	54,948.8	1.00	1.75 (1.50 - 2.03)	
	Above 25%	Control	209,209	638	950,273.4	0.67	1 (Ref.)	
		RA	41,888	235	188,633.8	1.25	1.74 (1.28 - 2.37)	
Smoking	Never	Control	217,978	663	998,687.1	0.66	1 (Ref.)	.295
		RA	42,727	237	193,421.5	1.23	1.76 (1.51 - 2.04)	
	Ex-smoker + PY<20	Control	15,676	52	65,729.4	0.79	1 (Ref.)	
		RA	3,234	20	13,499.8	1.48	1.79 (1.07 - 3.01)	
	Ex-smoker + PY≥20	Control	10,613	46	44,832.0	1.03	1 (Ref.)	
		RA	2,685	15	10,877.5	1.38	1.27 (0.71 - 2.28)	
	Current smokers + PY<20	Control	14,633	24	63,406.9	0.38	1 (Ref.)	
		RA	2,771	5	11,778.3	0.43	1.03 (0.39 - 2.69)	

	Current + PY≥20	Control	14,500	18	65,125.7	0.28	1 (Ref.)	
		RA	3,263	13	14,005.6	0.93	3.14 (1.54 - 6.41)	
Alcohol consumption	None	Control	193,905	651	886,847.6	0.73	1 (Ref.)	.722
		RA	41,781	248	187,385.3	1.32	1.74 (1.50 - 2.02)	
	Mild (<30 g/day)	Control	69,654	136	307,439.2	0.44	1 (Ref.)	
		RA	11,422	36	49,934.0	0.72	1.66 (1.15 - 2.40)	
	Heavy (≥30 g/day)	Control	9,841	16	43,494.2	0.37	1 (Ref.)	
		RA	1,477	6	6,263.4	0.96	2.52 (0.98 - 6.43)	
Physical activity	None	Control	216,594	654	983,239.1	0.67	1 (Ref.)	.740
		RA	44,653	240	199,388.9	1.20	1.72 (1.48 - 2.00)	
	Regular	Control	56,806	149	254,542.0	0.59	1 (Ref.)	
		RA	10,027	50	44,193.8	1.13	1.83 (1.33 - 2.52)	
Body mass index	<18.5	Control	7,237	23	31,247.6	0.74	1 (Ref.)	.592
		RA	2,087	14	8,836.6	1.58	2.35 (1.21 - 4.56)	
	18.5–23	Control	104,475	282	47,4189.0	0.60	1 (Ref.)	
		RA	22,627	115	101,681.0	1.13	1.80 (1.45 - 2.24)	
	23–25	Control	69,736	202	318,861.9	0.63	1 (Ref.)	
		RA	13,340	60	60,000.2	1.00	1.47 (1.10 - 1.97)	
	25–30	Control	81,260	264	367,212.3	0.72	1 (Ref.)	
		RA	14,720	93	64,853.2	1.43	1.86 (1.47 - 2.36)	
	≥30	Control	10,692	32	46,270.2	0.69	1 (Ref.)	
		RA	1,906	8	8,211.7	0.97	1.38 (0.63 - 2.99)	
Diabetes	No	Control	236,982	622	1,08185,8.8	0.58	1 (Ref.)	.546
		RA	47,289	229	213,299.4	1.07	1.78 (1.53 - 2.07)	
	Yes	Control	36,418	181	155,922.2	1.16	1 (Ref.)	
		RA	7,391	61	30,283.2	2.01	1.61 (1.20 - 2.15)	
Hypertension	No	Control	168,051	328	766,659.6	0.43	1 (Ref.)	.976
		RA	31,684	112	143,253.1	0.78	1.74 (1.41 - 2.17)	
	Yes	Control	105,349	475	471,121.5	1.01	1 (Ref.)	
		RA	22,996	178	100,329.6	1.77	1.74 (1.46 - 2.07)	

Dyslipidemia	No	Control	182,759	469	849,357.7	0.55	1 (Ref.)	.669
		RA	35,983	160	165,130.9	0.97	1.70 (1.42 - 2.03)	
	Yes	Control	90,641	334	388,423.3	0.86	1 (Ref.)	
		RA	18,697	130	78,451.7	1.66	1.80 (1.47 - 2.21)	
Chronic kidney disease	No	Control	254,935	670	1152,241.2	0.58	1 (Ref.)	.124
		RA	49,961	248	222,982.2	1.11	1.82 (1.57 - 2.11)	
	Yes	Control	18,465	133	85,539.8	1.56	1 (Ref.)	
		RA	4,719	42	20,600.4	2.04	1.36 (0.96 - 1.92)	
Myocardial infarction	No	Control	271,910	795	1,23173,1.3	0.65	1 (Ref.)	.448
		RA	54,069	287	241,194.5	1.19	1.75 (1.53 - 2.01)	
	Yes	Control	1,490	8	6,049.7	1.32	1 (Ref.)	
		RA	611	3	2,388.1	1.26	1.04 (0.28 - 3.94)	
Stroke	No	Control	271,978	787	1,231,588.9	0.64	1 (Ref.)	.391
		RA	54,167	284	241,456.2	1.18	1.76 (1.53 - 2.02)	
	Yes	Control	1,422	16	6,192.2	2.58	1 (Ref.)	
		RA	513	6	2,126.5	2.82	1.16 (0.45 - 2.96)	
Depression	No	Control	257,289	681	1,169,252.2	0.58	1 (Ref.)	.356
		RA	46,987	214	210,992.2	1.01	1.80 (1.54 - 2.10)	
	Yes	Control	16,111	122	68,528.8	1.78	1 (Ref.)	
		RA	7,693	76	32,590.4	2.33	1.55 (1.16 - 2.06)	

PY: person-years; aHR: adjusted hazard ratio; CI: confidence interval

Hazard ratio was calculated adjusting for age, sex, smoking, alcohol drinking, physical activity, low income, BMI, diabetes mellitus, hypertension, hyperlipidemia, chronic kidney disease myocardial infarction, stroke, and depression

eTable 7. Stratified Analyses of Association Between Serologic Status of RA and Parkinson Disease (PD) Risk by Socioeconomic Characteristics, Health Behaviors, and Comorbidities

Subgroup		Serologic subtype	N	Event (N)	Duration (PY)	Incidence rate (per 1,000 PY)	aHR (95% CI)	$P_{interaction}$
Age	40–49	SNRA	3,512	3	15,573.2	0.19	1 (Ref.)	.596
		SPRA	7,589	4	36,162.2	0.11	1.52 (0.92 - 2.54)	
	50-64	SNRA	8,117	16	36,488.4	0.44	1 (Ref.)	
		SPRA	19,643	65	90,897.6	0.72	1.69(0.98 - 2.92)	
	65-74	SNRA	3,096	25	13,267.2	1.88	1 (Ref.)	
		SPRA	8,806	108	37,481.4	2.88	1.61(1.04 - 2.50)	
	≥75	SNRA	945	12	3,475.2	3.45	1 (Ref.)	
		SPRA	2,972	57	10,237.4	5.57	1.71(0.92 - 3.19)	
Sex	Male	SNRA	4,189	22	17,386.7	1.27	1 (Ref.)	.059
		SPRA	9,545	58	40,119.1	1.45	1.08 (0.66 - 1.77)	
	Female	SNRA	11,481	34	51,417.3	0.66	1 (Ref.)	
		SPRA	29,465	176	134,659.5	1.31	1.95 (1.35 - 2.82)	
Income	Low 25% + Medicaid group	SNRA	3509	8	15,165.4	0.53	1 (Ref.)	.319
		SPRA	9283	47	39,783.5	1.18	2.27 (1.07 - 4.81)	
	Above 25%	SNRA	12161	48	53,638.6	0.90	1 (Ref.)	
		SPRA	29727	187	134,995.2	1.39	1.50 (1.09 - 2.06)	
Smoking	Never	SNRA	12,198	47	54,293.9	0.87	1 (Ref.)	N/A
		SPRA	30,529	190	139,127.6	1.37	1.55 (1.13 - 2.14)	
	Ex-smoker + PY<20	SNRA	1,161	5	4,707.7	1.06	1 (Ref.)	
		SPRA	2,073	15	8,792.1	1.71	1.50 (0.54 - 4.12)	
	Ex-smoker + PY≥20	SNRA	824	4	3,440.8	1.16	1 (Ref.)	
		SPRA	1,861	11	7,436.7	1.48	1.18 (0.37 - 3.71)	
	Current smokers + PY<20	SNRA	772	0	3,268.1	0.00	N/A	
		SPRA	1,999	5	8,510.2	0.59	N/A	

	Current + PY≥20	SNRA	715	0	3,093.5	0.00	N/A	
		SPRA	2,548	13	10,912.1	1.19	N/A	
Alcohol consumption	None	SNRA	11,755	43	52,009.3	0.83	1 (Ref.)	.112
		SPRA	30,026	205	135,376.0	1.51	1.82 (1.31 - 2.54)	
	Mild (<30 g/day)	SNRA	3,454	10	14,898.1	0.67	1 (Ref.)	
		SPRA	7,968	26	35,035.8	0.74	1.05 (0.51 - 2.19)	
	Heavy (≥30 g/day)	SNRA	461	3	1,896.6	1.58	1 (Ref.)	
		SPRA	1,016	3	4,366.8	0.69	0.44 (0.09 - 2.17)	
Physical activity	None	SNRA	12,588	40	55,379.3	0.72	1 (Ref.)	.042
		SPRA	32,065	200	144,009.5	1.39	1.88 (1.34 - 2.65)	
	Regular	SNRA	3,082	16	13,424.7	1.19	1 (Ref.)	
		SPRA	6,945	34	30,769.1	1.11	0.92 (0.51 - 1.68)	
Body mass index	<18.5	SNRA	517	3	2,137.6	1.40	1 (Ref.)	.452
		SPRA	1,570	11	6,699.0	1.64	0.96 (0.27 - 3.46)	
	18.5–23	SNRA	6,145	15	27,040.9	0.56	1 (Ref.)	
		SPRA	16,482	100	74,640.0	1.34	2.36 (1.37 - 4.06)	
	23–25	SNRA	3,844	12	16,980.3	0.71	1 (Ref.)	
		SPRA	9,496	48	43,019.9	1.12	1.58 (0.84 - 2.97)	
	25–30	SNRA	4,501	24	19,773.4	1.21	1 (Ref.)	
		SPRA	10,219	69	45,079.7	1.53	1.24 (0.78 - 1.98)	
	≥30	SNRA	663	2	2,871.7	0.70	1 (Ref.)	
		SPRA	1,243	6	5,340.0	1.12	1.59 (0.32 - 7.86)	
Diabetes	No	SNRA	13,419	46	59,566.3	0.77	1 (Ref.)	.319
		SPRA	33,870	183	153,733.1	1.19	1.49 (1.08 - 2.07)	
	Yes	SNRA	2,251	10	9,237.7	1.08	1 (Ref.)	
		SPRA	5,140	51	21,045.5	2.42	2.19 (1.11 - 4.31)	
Hypertension	No	SNRA	8,686	22	38,431.9	0.57	1 (Ref.)	.508
		SPRA	22,998	90	104,821.1	0.86	1.42 (0.89 - 2.27)	
	Yes	SNRA	6,984	34	30,372.1	1.12	1 (Ref.)	

		SPRA	16,012	144	69,957.5	2.06	1.74 (1.20 - 2.53)	
Dyslipidemia	No	SNRA	9,801	28	44,175.5	0.63	1 (Ref.)	.842
		SPRA	26,182	132	120,955.4	1.09	1.57 (1.04 - 2.36)	
	Yes	SNRA	5,869	28	24,628.5	1.14	1 (Ref.)	
		SPRA	12,828	102	53,823.2	1.90	1.66 (1.09 - 2.53)	
Chronic kidney disease	No	SNRA	14,169	48	62,468.9	0.77	1 (Ref.)	.838
		SPRA	35,792	200	160,513.3	1.25	1.59 (1.16 - 2.19)	
	Yes	SNRA	1,501	8	6,335.1	1.26	1 (Ref.)	
		SPRA	3,218	34	14,265.3	2.38	1.74 (0.80 - 3.76)	
Myocardial infarction	No	SNRA	15,481	56	68,059.7	0.82	1 (Ref.)	N/A
		SPRA	38,588	231	173,134.9	1.33	1.59 (1.19 - 2.14)	
	Yes	SNRA	189	0	744.3	0.00	N/A	
		SPRA	422	3	1,643.8	1.83	N/A	
Stroke	No	SNRA	15,508	55	68,156.7	0.81	1 (Ref.)	.857
		SPRA	38,659	229	173,299.4	1.32	1.61 (1.20 - 2.16)	
	Yes	SNRA	162	1	647.3	1.55	1 (Ref.)	
		SPRA	351	5	1,479.2	3.38	1.96 (0.23 - 16.82)	
Depression	No	SNRA	13,241	37	58,354.5	0.63	1 (Ref.)	.314
		SPRA	33,746	177	152,637.8	1.16	1.78 (1.25 - 2.54)	
	Yes	SNRA	2,429	19	10,449.5	1.82	1 (Ref.)	
		SPRA	5,264	57	22,140.9	2.57	1.29 (0.77 - 2.17)	

PY: person-years; aHR: adjusted hazard ratio; CI: confidence interval

Hazard ratio was calculated adjusting for age, sex, smoking, alcohol drinking, physical activity, low income, BMI, diabetes mellitus, hypertension, hyperlipidemia, chronic kidney disease myocardial infarction, stroke, and depression

eTable 8. The Association of RA and Its Seropositivity With the Risk of Parkinson's Disease According to Female Reproductive Factors

		N	Event (N)	Duration (PY)	Incidence rate (per 1,000 PY)	aHR (95% CI)	P_{int}
By menopausal status							
No	Control	48,133	14	226,613.6	0.06	1 (Ref.)	.021
	RA	8,953	12	41,991.3	0.29	4.43 (2.05 - 9.59)	
Yes	Control	123,484	441	558,188.6	0.79	1 (Ref.)	
	RA	25,387	164	112,884.3	1.45	1.75 (1.46 - 2.10)	
No	Control	48,133	14	226,613.6	0.06	1 (Ref.)	.015
	SNRA	6,459	8	30,797.5	0.26	4.06 (1.70 -9.69)	
	SPRA	2,494	4	11,193.8	0.36	5.41 (1.78 -16.4)	
Yes	Control	123,484	441	558,188.6	0.79	1 (Ref.)	
	SNRA	18,285	138	81,573.2	1.69	2.02 (1.67 -2.46)	
	SPRA	7,102	26	31,311.1	0.83	1.02 (0.68 -1.51)	
By age at menopause							
<50	Control	35,672	133	165,059.2	0.81	1 (Ref.)	.656
	RA	8,052	56	36,275.6	1.54	1.86 (1.36 -2.54)	
≥50	Control	87,812	308	393,129.4	0.78	1 (Ref.)	
	RA	17,335	108	76,608.7	1.41	1.70 (1.37 -2.13)	
<50	Control	35,672	133	165,059.2	0.81	1 (Ref.)	.930
	SNRA	5,803	48	26,318.8	1.82	2.14 (1.53 - 2.98)	
	SPRA	2,249	8	9,956.9	0.80	1.04 (0.51 - 2.12)	
≥50	Control	87,812	308	393,129.4	0.78	1 (Ref.)	
	SNRA	12,482	90	55,254.4	1.629	1.98 (1.56 - 2.50)	
	SPRA	4,853	18	21,354.2	0.843	1.01 (0.63 -1.62)	
By hormone replacement therapy							
No	Control	105,235	378	474,007.1	0.797	1 (Ref.)	.212
	RA	20,441	140	90,291.6	1.551	1.83 (1.51 - 2.23)	
Yes	Control	18,249	63	84,181.5	0.748	1 (Ref.)	

	RA	4,946	24	22,592.7	1.062	1.33 (0.83 - 2.12)	
No	Control	105,235	378	474,007.1	0.797	1 (Ref.)	.363
	SNRA	14,981	117	66,419.8	1.762	2.07 (1.68 - 2.56)	
	SPRA	5,460	23	23,871.9	0.963	1.15 (0.75 - 1.76)	
Yes	Control	18,249	63	84,181.5	0.748	1 (Ref.)	
	SNRA	3,304	21	15,153.4	1.386	1.73 (1.06 -2.84)	
	SPRA	1,642	3	7,439.2	0.403	0.0 (0.16 -1.59)	

Hazard ratio was calculated adjusting for age, sex, smoking, alcohol drinking, physical activity, low income, BMI, diabetes mellitus, hypertension, hyperlipidemia, chronic kidney disease myocardial infarction, stroke, and depression

eTable 9. Exploratory Analysis Evaluating the Risk of Parkinson's Disease According to Exposure to Conventional Synthetic DMARDs(csDMARDs) Biologic DMARDs (bDMARDs) and Target-Specific DMARDs (tsDMARDs)

	N	Event (N)	Duration (PY)	Incidence rate (per 1,000 PY)	HR
By RA status and biologic DMARDs use					
Control	273,400	803	1237781.0	0.65	1(Ref.)
RA ,no bDMARDs use	50,756	278	224567.6	1.24	1.78 (1.55 - 2.04)
RA, bDMARDs use	3,924	12	19015.1	0.63	1.16 (0.65 - 2.05)
By RA seropositivity and biologic DMARDs use					
Control	273,400	803	1237781.0	0.65	1(Ref.)
SPRA, no bDMARDs use	35,469	223	157420.0	1.42	2.02 (1.74 - 2.35)
SPRA , bDMARDs use	3,541	11	17358.6	0.63	1.14 (0.63 - 2.10)
SNRA, no bDMARDs use	15,287	55	67147.5	0.82	1.20 (0.91 - 1.57)
SNRA, bDMARDs use	383	1	1656.5	0.60	1.43 (0.20 -10.15)
By RA status and tsDMARDs use					
Control	273,400	803	1237781.0	0.65	1(Ref.)
RA , no tsDMARDs use	54,095	286	241027.6	1.19	1.73 (1.51 - 1.98)
RA, tsDMARDs use	585	4	2555.0	1.57	3.39 (1.27 - 9.07)
By RA seropositivity and tsDMARDs use					
Control	273,400	803	1237781.0	0.65	1(Ref.)
SPRA , no tsDMARDs use	38,429	230	172241.8	1.34	1.93 (1.67 - 2.24)
SPRA , tsDMARDs use	581	4	2536.9	1.58	3.40 (1.27 - 9.10)
SNRA , no tsDMARDs use	15,666	56	68785.9	0.81	1.20 (0.91 - 1.58)
SNRA, tsDMARDs use	4	0	18.1	0	N/A

By RA status and bDMARDs and tsDMARDs use					
Control	273,400	803	1237781.0	0.65	1(Ref.)
RA, no bDMARDs or tsDMARDs use	50,462	275	223429.4	1.23	1.77 (1.54 - 2.03)
RA , bDMARDs or tsDMARDs use	4,218	15	20153.2	0.74	1.38 (0.83 -2.30)
By RA seropositivity and biologic DMARDs use					
Control	273,400	803	1237781.0	0.65	1(Ref.)
SPRA. no bDMARDs or tsDMARDs use	35,178	220	156292.4	1.41	2.00 (1.72 - 2.33)
SPRA, bDMARDs or tsDMARDs use	3,832	14	18486.2	0.76	1.38 (0.81 - 2.34)
SNRA, no bDMARDs or tsDMARDs use	15,284	55	67136.9	0.82	1.20 (0.91 - 1.57)
SNRA, bDMARDs or tsDMARDs use	386	1	1667.0	0.60	1.42 (0.12 - 10.10)

RA: Rheumatoid arthritis: SNRA: seronegative RA, SPRA: seropositive RA; PY: person-years; N/A: not available

Hazard ratio was calculated adjusting for age, sex, smoking, alcohol drinking, physical activity, low income, BMI, diabetes mellitus, hypertension, hyperlipidemia, chronic kidney disease myocardial infarction, stroke, and depression

e Table 10. Comparison of Baseline Characteristics Between Participants and Non-Participants of Health Checkup Within 2 Years From the Index Date.

	RA group				Control Group			
	Non-participants (n=55,331)	Participants (n=64,457)	*p* value	SMD	Non-participants (n=530,509)	Participants (n=677,322)	*p* value	SMD
Age, mean ± SD	52.3±17.3	56.7±12.2	<.001	0.294	51.3±16.3	56.0±12.0	<.001	0.326
40–64	41,034 (74.2)	46,873 (72.7)		0.033	412,524 (77.8)	504,198 (74.4)		0.078
≥65	14,297 (25.8)	17,584 (27.3)			117,985 (22.2)	173,124 (25.6)		
Sex			<.001	0.040			<.001	0.034
Male	13,477 (24.4)	16,823 (26.1)			124,457 (23.5)	168,721 (24.9)		
Female	41,854 (75.6)	47,634 (73.9)			406,052 (76.5)	508,601 (75.1)		
Income			<.001	0.114			<.001	0.057
Low 25% + Medicaid group	15,082 (27.3)	14,393 (22.4)			126,686 (23.9)	145,556 (21.5)		
Above 25%	40,249 (72.7)	50,064 (77.7)			403,823 (76.1)	531,766 (78.5)		
Diabetes Medication	6,192 (11.2)	6,948 (10.8)	.023	0.013	42,441 (8.0)	62,652 (9.3)	<.001	0.045
Hypertension Medication	17,539 (31.7)	21,709 (33.7)	<.001	0.042	114,431 (21.6)	188,092 (27.8)	<.001	0.144
Dyslipidemia Medication	10,486 (19.0)	15,856 (24.6)	<.001	0.137	63,290 (11.9)	135,668 (20.0)	<.001	0.222
Chronic kidney disease	1,858 (3.4)	1,457 (2.3)	<.001	0.066	4,775 (0.9)	4,335 (0.6)	<.001	0.029
Myocardial infarction	748 (1.4)	703 (1.1)	<.001	0.024	2,759 (0.5)	3,116 (0.5)	<.001	0.009
Stroke	699 (1.3)	599 (0.9)	<.001	0.032	3,236 (0.6)	3,251 (0.5)	<.001	0.018
Depression	7,301 (13.2)	8,657 (13.4)	.240	0.007	26,101 (4.9)	36,846 (5.4)	<.001	0.024

aHR: adjusted hazard ratio; CI: confidence interval; RA: rheumatoid arthritis, SMD: standardized mean difference