Supplementary file

Mortality in patients with psoriatic arthritis in Sweden – a nationwide, population-based cohort study

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Supplementary Table S1. ICD-codes used to define arthritic diseases, comorbidities and causes of death

	ICD-8 1968-1986	ICD-9 1987-1996	ICD-10 1997-2018
Arthritic diseases			
Psoriatic arthritis	696.00	696A	L40.5; M07.0; M07.1; M07.2; M07.3
Juvenile arthritis	712.00	714D	M08.0; M08.1; M08.2; M08.3; M08.4; M08.8; M08.9; M09.0; M09.1; M09.2; M09.8
Ankylosing spondylitis	712.40	720A	M45.9
Spondyloarthritis	713.10; 713.11; 713.12; 713.19; 726.99	720B; 720C; 720W; 720X	M46.0; M46.1; M46.8; M46.9
Inflammatory bowel disease related arthritis	Not applicable	713B	M07.4; M07.5; M07.6
Reactive arthritis	136.03; 714.90	099D; 711B; 711D; 711X	M02.1; M02.3; M02.8; M02.9; M03.2; M03.6
Rheumatoid arthritis	712.10; 712.20; 712.38; 712.39	714A; 714B; 714C; 714W; 719D	M05.0; M05.1; M05.2; M05.3; M05.8; M05.9; M06.0; M06.2; M06.3; M06.8; M06.9; M12.3
Undifferentiated arthritis	711.00; 711.01; 711.02; 711.03; 711.04; 711.05; 711.06; 711.07; 711.08; 711.09; 714.93; 714.98; 715.99	714X; 716F; 716G; 716W; 716X	M06.4; M13.0; M13.1; M13.8; M13.9
General comorbidities			
Hypertension[a]	400-404	401-405	I10-I15
Ischaemic heart disease[a]	410-414	410-414	I20-I25
Congestive heart disease[a]	425; 427,00; 427,10; 428,99	425; 428	I11.0; I13.0; I13.2; I42; I43; I50
Thromboembolic venous disease[a]	321; 450,01; 450,03; 451,00; 451,98; 451,99; 452,99; 453,09; 671,01; 671,02; 671,08; 671,09; 673,98; 673,99	325; 415B; 437G; 451B; 451C; 451W; 451X; 452; 453A; 453C; 453D; 453W; 453X; 527B; 671D; 671E; 671F; 673C	G08; I26; I63.6; I67.6; I80.1-I80.9; I81; I82.0; I82.2-I82.9; K75.1; O22.3; O22.5; O87.1; O87.3; O88.2
Cerebrovascular disease[a]	430; 431; 433-438	430-432; 434-438	G45; G46; I60-I64; I66-I69
Other atherosclerotic disease[a]	432; 440-442; 443,10; 443,90; 443,99; 444; 445,00	433; 440-442; 443B; 443X; 444; 447B; 557	I65; I70-I72; I73.1; I73.9; I74; K55.0-K55.1
Diabetes mellitus	250	250; 648A	E10-E14; O24
Infections	000-134; 136,01; 136,02; 136,04; 136,08; 136,09; 245,01; 289,40; 320,00; 320,10; 320,80; 320,99; 322; 324; 360,00; 360,08; 360,09; 362; 363,98; 363,99; 366,00;	001-134; 136A; 136C; 136D; 136E; 136F; 136W; 136X; 137-139; 245A; 254B; 320; 321; 323D; 323E; 323G; 324; 326; 360A; 370B; 370D; 370E; 370F; 372A;	A00-B99; D73.3; D76.2; E06.0; E32.1; G00; G04.1; G04.2; G06; H00.0; H44.0; H60.0; H60.1; H60.2; H60.3; H65.0; H66; H70; I30.1; I33.0; I40.0; J00; J01;

	367,00; 368,00; 368,03; 369,00; 369,01; 380,00; 380,01; 381; 382; 383; 420; 421,00; 460,99; 461; 462; 463; 464; 465,99; 466,99; 470; 471; 472; 473; 474; 480,99; 481,99; 482; 483,99; 484,99; 485,02; 485,09; 486; 490,99; 501,99; 503; 508,00; 508,01; 508,02; 508,03; 510; 511,10; 513,99; 522,50; 527,30; 528,30; 562,02; 562,11; 566; 567,00; 567,01; 567,02; 569,00; 572,99; 590; 592,04; 592,05; 595,00; 595,01; 597,00; 597,01; 597,08; 599,02; 601,00; 604,00; 604,01; 607,30; 607,40; 607,50; 611,00; 611,01; 612; 614,99; 616,00; 616,01; 616,02; 616,03; 620; 622,00; 622,08; 622,09; 622,10; 622,11; 622,18; 622,19; 629,40; 630; 635; 645,90; 645,91; 670; 678,00; 678,01; 678,02; 680; 681; 682; 683; 684,08; 684,09; 686,00; 686,90; 686,91; 686,98; 710; 720; 732,99; 910,10; 911,10; 912,10; 913,10; 914,10; 915,10; 916,10; 917,10; 918,10; 918,11; 998,50; 999,20; 999,30	373B; 380B; 381A; 382; 383A; 383B; 420; 421A; 460; 461; 462; 463; 464; 465; 466; 473; 475; 480; 481; 482; 483; 484; 485; 486; 487; 490; 496; 510; 511B; 513; 522E; 522F; 522H; 527D; 528D; 562A; 562B; 566; 567B; 567C; 569F; 572A; 572B; 590A; 590B; 590C; 590D; 590W; 590X; 595A; 597A; 597W; 598A; 599A; 601A; 601C; 601D; 603B; 604A; 604X; 607B; 607C; 608A; 608E; 611A; 614A; 614C; 614D; 614E; 614X; 615A; 615X; 616A; 616B; 616D; 616E; 616X; 634A; 635A; 636A; 637A; 638A; 639A; 646G; 658E; 659D; 670; 675A; 675B; 675C; 675W; 675X; 680; 681; 682; 683; 684; 685; 686A; 686W; 686X; 711A; 711E; 711F; 711G; 711H; 711W; 711X; 728A; 730; 790H; 790W; 958D; 996G; 998F; 999D	J02; J03; J04; J05; J06; J09; J10; J11; J12; J13; J14; J15; J16; J18; J20; J21; J22; J32; J34.0; J36; J39.0; J39.1; J44.0; J85; J86; J98.7; K04.4; K04.6; K04.7; K11.3; K12.2; K57.0; K57.2; K57.4; K57.8; K61; K63.0; K75.0; L00; L01; L02; L03; L04; L05; L08; L30.3; M00; M46.2; M46.3; M46.4; M46.5; M60.0; M65.0; M65.1; M71.0; M71.1; M72.6; M86; N10; N11.0; N11.1; N13.6; N15.1; N15.9; N30.0; N30.8; N34.0; N39.0; N41.0; N41.2; N41.3; N43.1; N45.0; N45.9; N48.2; N49.9; N61; N70.0; N71.0; N72; N73.0; N73.1; N73.2; N75.1; N76.4; N98.0; O03.0; O03.5; O04.0; O04.5; O05.0; O05.5 O06.0; O06.5; O07.0; O07.5; O08.0; O23; O41.1; O75.3; O85; O86; O91; R57.2; R65.0; R65.1; T79.3; T80.2; T81.4; T82.6; T82.7; T83.5; T83.6; T84.5; T84.6; T84.7; T85.7; T87.4; T88.0; Y95; U04 **Or any of the following with an auxiliary code from A00-B99:** F02.4; G01; G02; G05.0; G05.1; G05.2; G07; G53.1; G63.0; G73.4; G94.0; H03; H06.1; H13.0; H13.1; H19.1; H19.2; H22.0; H32.0; H45.1; H62.0; H62.1; H62.2; H62.3; H67.0; H67.1; H75.0; H94.0; I32.0; I32.1; I41.0; I41.1; I41.2; I43.0; I52.0; I52.1; I68.1; I79.0 I79.1; I98.0;

			I98.1; J17.0; J17.1; J17.2; J17.3; K23.0; K23.1; K67; K77.0; K87.1; K93.0; K93.1; L99.8; M01.0; M01.1; M01.2; M01.3; M01.4; M01.5; M01.6; M01.8; M03.0; M03.1; M49.0; M49.1; M49.2; M49.3; M63.0; M63.1; M63.2; M68.0; M73.0; M73.1; M90.0; M90.1; M90.2; N08.0; N08.8; N16.0; N22.0; N29.0; N29.1; N33.0; N33.8; N37.0; N51; N74.0; N74.1; N74.2; N74.3; N74.4; N77.0; N77.1
Chronic pulmonary disease	491-493; 517; 518,99	491-494; 496; 515; 516D; 516W; 516X; 517	J41-J44; J45-J47; J84.1; J84.8; J84.9; J99
Chronic kidney disease	582,00; 582,09	585	N18
Malignancy	140-201; 202,00; 202,19; 202,28; 202,98; 203-207	140-208	C00-C97
Anxiety or depression	296,00; 296,20; 298,00; 300,00; 300,20; 300,30; 300,40; 300,88; 300,99; 790,20	296B; 296D; 298A; 300A; 300C; 300D; 300E; 300W; 300X; 308; 309; 311	F31.3-F31.5; F32-F34; F40-F43; F53.0
Suicide[b]	Not relevant	Not relevant	X60-X84; Y10-Y34
PsA related extra-musculoskeletal manifestations			
Anterior uveitis	364,00; 364,02; 364,09	364A; 364B; 364C; 364D	H20; H22.1
Posterior uveitis	365,00; 365,01; 365,02; 365,03; 365,04; 365,08; 365,09	363A; 363B; 363C	H30; H32.8
Inflammatory bowel disease	563,00; 563,10; 563,98; 563,99; 569,02	555-556	K50-K51

[a] Combined for the assessment of cardiovascular disease. [b] Only used for the cause of death assessment. ICD, international classification of diseases.

Supplementary Table S2. Procedure-codes used to define comorbidities

	1964-1996	1997-2017
Hip replacement surgery	8410; 8413; 8414; 8415; 8419	NFB; NFC
Knee replacement surgery	8423; 8424; 8425; 8426; 8427; 8428	NGB; NGC
Other joint surgery	8390; 8392; 8393; 8399; 8420; 8421; 8422; 8429; 8430; 8431; 8432; 8433; 8434; 8436; 8437; 8438; 8450; 8642	NBB; NBC; NCB; NCC; NDB; NDC; NDE; NDF; NDG; NHB; NHC; NHE; NHF; NHG

Supplementary Table S3. ATC-codes for anti-rheumatic treatments and used to define comorbidities

	ATC codes
Anti-rheumatic treatments	
NSAIDs	M01AA01-M01AX04
Oral glucocorticosteroids	H02AB06
csDMARDs	L01BA01; L04AX03; A07EC01; L04AA13; L04AD01; L04AX01; M01CB01; M01CB03; P01BA01; P01BA02
Anti-IL12/23 therapy	L04AC05
Anti-IL17 therapy	L04AC10; L04AC13
Anti-Phosphodiesterase 4 therapy	L04AA32
Anti-TNF therapy	L04AB01; L04AB02; L04AB4; L04AB05; L04AB06
JAK inhibition therapy	L04AA29
T-cell modulation therapy	L04AA24
General comorbidities	
Cardiovascular disease	B01AA; B01AB; B01AC02-B01AC07; B01AC13-B01AC18; B01AC22-B01AC26; B01AC30-B01AC56; B01AE; B01AF; B01AX05; C01A; C01D; C01EB17; C01EB18; C02AC05; C02C; C02DB; C02LC05; C02LE; C02LF; C02LG02; C03A-C03E; C07AA01-C07AA06; C07AA12-C07AA14; C07AA16-C07AA27; C07AB02-C07AB08; C07AB10-C07AB13; C07AB52; C07AG; C07B-C07F; C08; C09; C10
Diabetes mellitus	A10
Anxiety or depression medications excluding benzodiazepines	N06A
Benzodiazepines	N05BA

ATC, anatomical therapeutic chemical classification; csDMARD, conventional, synthetic, disease-modifying, anti-rheumatic drug; IL, interleukin; JAK, Janus kinase; NSAID, non-steroidal anti-inflammatory drug; TNF, tumor necrosis factor.

Supplementary Table S4. Demographics and disease characteristics of the psoriatic arthritis and comparator-subject cohorts at start of follow-up, stratified for sex

	Males		Females	
	PsA cases (n=15 004)	**Population comparator-subjects (n=73 060)**	**PsA cases (n=18 022)**	**Population comparator-subjects (n=88 034)**
Demographics				
Age at inclusion criteria fulfillment[a], yrs, mean (SD)	51 (14)	NA	52 (15)	NA
Age at the start of follow-up, yrs, mean (SD)	52 (14)	52 (14)	53 (15)	53 (15)
Duration between inclusion criteria fulfillment[a] and the start of follow-up, yrs, mean (SD)	1.2 (1.9)	NA	1.3 (2.0)	NA
Foreign origin, n (%)	1 391 (9.3%)	11 273 (15%)	1 810 (10%)	14 499 (17%)
Level of education >12 years, n (%)	3 806 (26%)	21 239 (30%)	5 265 (30%)	30 478 (35%)
Longer duration since PsA diagnosis[b], n (%)	5 592 (37%)	NA	6 976 (39%)	NA
General comorbidities				
Cardiovascular disease[f]	5 759 (38%)	21 587 (30%)	7 740 (43%)	27 788 (32%)
Hypertension[c]	2 256 (15%)	6 838 (9.4%)	2 562 (14%)	7 438 (8.4%)
Ischaemic heart disease[c]	1 180 (7.9%)	4 426 (6.1%)	863 (4.8%)	2 857 (3.2%)
Congestive heart disease[c]	439 (2.9%)	1 454 (2.0%)	336 (1.9%)	1 091 (1.2%)
Thromboembolic venous disease[c]	348 (2.3%)	1 225 (1.7%)	550 (3.1%)	1 545 (1.8%)
Cerebrovascular disease[c]	563 (3.8%)	2 548 (3.5%)	599 (3.3%)	2 401 (2.7%)
Other atherosclerotic disease[c]	314 (2.1%)	1 140 (1.6%)	308 (1.7%)	948 (1.1%)
Cardiovascular medication[e]	5 499 (37%)	20 551 (28%)	7 423 (41%)	26 588 (30%)
Diabetes mellitus[f]	1 326 (8.8%)	4 940 (6.8%)	1 510 (8.4%)	4 511 (5.1%)
Diabetes mellitus[c]	1 008 (6.7%)	3 532 (4.8%)	1 183 (6.6%)	3 289 (3.7%)
Diabetes medication[e]	1 166 (7.8%)	4 532 (6.2%)	1 256 (7.0%)	3 820 (4.3%)
Infection, any[c]	6 284 (42%)	21 717 (30%)	9 391 (52%)	32 218 (37%)
Infection requiring inpatient care[d]	3 914 (26%)	13 717 (19%)	5 871 (33%)	19 219 (22%)
Chronic pulmonary disease[c]	772 (5.1%)	2 527 (3.5%)	1 476 (8.2%)	3 940 (4.5%)
Chronic kidney disease[c]	153 (1.0%)	404 (0.6%)	111 (0.6%)	302 (0.3%)
Malignancy[c]	964 (6.4%)	4 090 (5.6%)	1 463 (8.1%)	6 483 (7.4%)
Anxiety and depression[f]	3 078 (21%)	11 725 (16%)	6 515 (36%)	22 979 (26%)
Anxiety or depression[c]	1 159 (7.7%)	4 959 (6.8%)	2 376 (13%)	8 566 (9.7%)
Anxiety or depression medication excluding benzodiazepines[e]	2 276 (15%)	8 239 (11%)	5 213 (29%)	17 504 (20%)
Benzodiazepine medication[e]	1 099 (7.3%)	4 248 (5.8%)	2 350 (13%)	8 547 (9.7%)
PsA related extra-musculoskeletal manifestations				
Anterior uveitis[c]	362 (2.4%)	543 (0.7%)	354 (2.0%)	586 (0.7%)
Posterior uveitis[c]	17 (0.1%)	54 (0.1%)	23 (0.1%)	64 (0.1%)
Inflammatory bowel disease[c]	267 (1.8%)	834 (1.1%)	483 (2.7%)	998 (1.1%)
Joint surgery				
Hip replacement surgery[g]	376 (2.5%)	1 004 (1.4%)	523 (2.9%)	1 533 (1.7%)
Knee replacement surgery[g]	291 (1.9%)	558 (0.8%)	522 (2.9%)	982 (1.1%)
Other joint surgery[g]	832 (5.5%)	1 417 (1.9%)	1 233 (6.8%)	1 870 (2.1%)
Number of prior hospitalisations[h], median (IQR)	2 (1-5)	1 (0-3)	5 (2-8)	3 (1-5)
Pharmacological treatment[i]				
NSAIDs	9 267 (62%)	10 375 (14%)	10 977 (61%)	16 069 (18%)
Oral glucocorticosteroids	2 685 (18%)	1 346 (1.8%)	3 733 (21%)	2 261 (2.6%)
csDMARDs	4 845 (32%)	487 (0.7%)	5 806 (32%)	765 (0.9%)
tsDMARDs or bDMARDs	1 025 (6.8%)	25 (<0.1%)	1 158 (6.4%)	48 (0.1%)
Anti-IL12/23 therapy	19 (0.1%)	0 (0%)	21 (0.1%)	0 (0%)
Anti-IL17 therapy	18 (0.1%)	0 (0%)	8 (<0.1%)	0 (0%)

Anti-Phosphodiesterase 4 therapy	23 (0.2%)	1 (<0.1%)	26 (0.1%)	0 (0%)
Anti-TNF therapy	977 (6.5%)	23 (<0.1%)	1 105 (6.1%)	48 (0.1%)
JAK inhibition therapy	0 (0%)	0 (0%)	0 (0%)	0 (0%)
T-cell modulation therapy	4 (<0.1%)	2 (<0.1%)	13 (0.1%)	0 (0%)

N (%) if not otherwise stated. [a] Having received ≥1 ICD-code for PsA as main diagnosis from an outpatient visit to a rheumatology or internal medicine department registered in NPR at age ≥18 years 2001-2017. [b] Patients with a first ICD diagnosis of PsA (as main diagnosis from an outpatient department of rheumatology or internal medicine at age ≥18 years) registered prior to start of the study assessment period on January 1, 2007. [c] Frequencies of individual comorbidities and extra-musculoskeletal manifestations are based on ≥1 ICD code from either an outpatient visit to a physician or an inpatient care episode in NPR (as main or secondary diagnosis and from any department) prior to start of the individual´s follow-up (ICD codes from inpatient care available since 1968 and from outpatient care since 2001). [d] Based on ≥1 ICD code for infection as main diagnosis from an inpatient care episode in NPR prior to the individual´s start of follow-up. [e] Based on ≥1 dispensation of pharmacological agents suggesting such comorbidity in the PDR prior to the individual´s start of follow-up (available since 2005). [f] Based on ≥1 ICD code for such diagnoses or ≥1 drug dispensations suggesting such comorbidity prior to the individual´s start of follow-up. [g] Based on procedure codes in NPR prior to the start of the individual´s follow-up. [h] Based on inpatient care episodes registered in NPR prior to the individual's start of follow-up. [i] Based on ≥1 dispensation in the PDR during one year prior to the individual´s start of follow-up (of for intravenously administered infliximab and abatacept ongoing treatment at the individual´s start of follow-up as registered in the SRQ). bDMARD, biologic disease-modifying anti-rheumatic drug; csDMARD, conventional synthetic disease-modifying anti-rheumatic drug (including azathioprine, auranofin, chloroquine, cyclosporine, hydroxychloroquine, leflunomide, methotrexate, sodium aurothiomalate, sulfasalazine); IL, interleukin; IQR, inter-quartile range; JAK, Janus kinase; NA, not applicable; NPR, National Patient Register; NSAID, non-steroidal anti-inflammatory drug; PDR, Prescribed Drugs Register; PsA, psoriatic arthritis; SD, standard deviation; SRQ, Swedish Rheumatology Quality Register; TNF, tumor necrosis factor; tsDMARD, targeted synthetic disease-modifying anti-rheumatic drug. Missing data, n male PsA cases/male comparator-subjects/female PsA cases/female comparator-subjects: Foreign origin 0/5/1/1; Education level 175/1 476/187/1 463.

Supplementary Table S5. Anti-rheumatic treatment during follow-up for the psoriatic arthritis and comparator-subject cohorts

Pharmacological treatment during follow-up[a]	PsA cases (n=33 026)	Population comparator-subjects (n=161 094)
NSAIDs	27 139 (82%)	79 348 (49%)
Oral glucocorticosteroids	16 035 (49%)	20 000 (12%)
csDMARDs	21 776 (66%)	3 762 (2.3%)
tsDMARDs or bDMARDs	9 362 (28%)	675 (0.4%)
Anti-IL12/23 therapy	569 (1.7%)	19 (<0.1%)
Anti-IL17 therapy	1 071 (3.2%)	24 (<0.1%)
Anti-Phosphodiesterase 4 therapy	1 050 (3.2%)	39 (<0.1%)
Anti-TNF therapy	8 700 (26%)	623 (0.4%)
JAK inhibition therapy	96 (0.3%)	5 (<0.1%)
T-cell modulation therapy	321 (1.0%)	43 (<0.1%)

Figures presented are n (%). [a] Based on ≥1 dispensation in the PDR from the individual´s start of follow-up until Dec 31, 2018, death or censoring (of for intravenously administered infliximab and abatacept treatment during this period as registered in the SRQ). bDMARD, biologic disease-modifying anti-rheumatic drug; csDMARD, conventional synthetic disease-modifying anti-rheumatic drug (including azathioprine, auranofin, chloroquine, cyclosporine, hydroxychloroquine, leflunomide, methotrexate, sodium aurothiomalate, sulfasalazine); IL, interleukin; JAK, Janus kinase; NSAID, non-steroidal anti-inflammatory drug; PDR, Prescribed Drugs Register; SRQ, Swedish Rheumatology Quality Register; TNF, tumor necrosis factor; tsDMARD, targeted synthetic disease-modifying anti-rheumatic drug.

Supplementary Table S6. Predictors at start of follow-up of mortality among PsA cases and comparator-subjects, respectively, according to multivariate Cox proportional hazard regression models

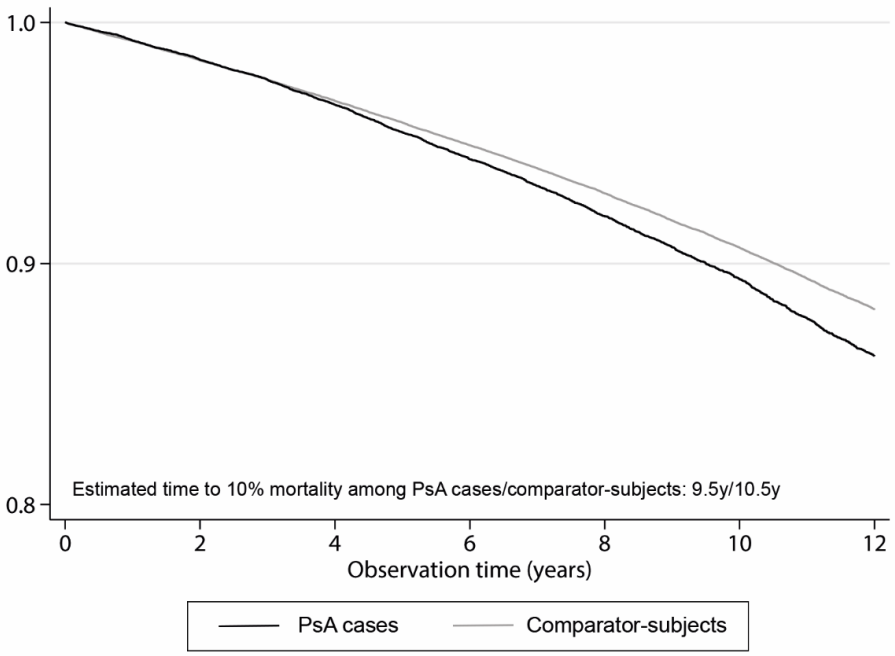
	Proportion at start of follow-up, PsA cases /comparator-subjects	PsA cases HR (95%CI)[a]	Population comparator-subjects HR (95%CI)[a]
Male sex	45/45%	1.36 (1.26-1.47)*	1.59 (1.54-1.65)
Higher age (per year)	NA	1.10 (1.09-1.10)*	1.10 (1.10-1.11)
Higher education (>12y vs ≤12y)	28/32%	0.68 (0.61-0.75)	0.67 (0.64-0.71)
Cardiovascular disease[b]	41/31%	1.44 (1.31-1.58)	1.33 (1.28-1.39)
Diabetes[b]	8.6/5.9%	1.48 (1.35-1.63)	1.56 (1.48-1.64)
Infection[c]	48/34%	1.28 (1.19-1.38)	1.33 (1.28-1.38)
Chronic pulmonary disease[c]	6.8/4.0%	1.68 (1.51-1.87)	1.68 (1.58-1.79)
Chronic kidney disease[c]	0.8/0.4%	3.42 (2.82-4.15)	2.64 (2.33-2.99)
Malignancy[c]	7.3/6.6%	1.48 (1.34-1.62)	1.55 (1.48-1.63)
Anxiety/depression[b]	29/22%	1.38 (1.27-1.49)*	1.59 (1.53-1.66)
Hip and/or knee replacement surgery[c]	4.7/2.4%	1.23 (1.10-1.37)*	1.02 (0.95-1.10)
Other joint surgery (small or large joints)[c]	6.3/2.0%	1.17 (1.03-1.31)	1.03 (0.93-1.15)

[a] Multivariate models in PsA cases and population comparator-subjects, respectively. [b] ≥1 relevant ICD-code in the NPR and/or ≥1 relevant drug dispensation in the PDR prior to start of follow-up. [b] ≥1 relevant ICD/procedure-code in NPR prior to start of follow-up. * In the entire material, the interaction terms between the PsA case/comparator-subject status and these predictors were significant (sex p<0.001; age p=0.010; anxiety/depression p<0.001; hip/knee replacement surgery p=0.006), indicating a difference of the predictive ability in the two groups. NA, not applicable; NPR, National Patient Register; PDR, Prescribed Drugs Register; PsA, psoriatic arthritis; y, years.

Sensitivity analyses for the primary outcome (i.e. all-cause mortality) assessment

For the primary outcome (comparison of all-cause mortality between psoriatic arthritis [PsA] cases and comparator-subjects) a number of different sensitivity analyses were conducted.

A. To account for potential misclassification of PsA diagnoses among the cases:
In a prior validation of our ICD-code based PsA case definition, 86% of 400 assessed cases were found to fulfil established PsA classification criteria.[1] Thus, to account for potential misclassification of PsA diagnoses among cases in the current all-cause mortality assessment, a sensitivity analysis was performed by randomly replacing 20% (i.e. slightly more than the 14% found to be misclassified in the validation study) of the PsA cases with one of their own comparator-subjects. Both the 20% of PsA cases to be replaced and which of their individual comparator-subjects to use for the replacement were chosen at random. Results of this sensitivity analysis (**Supplementary Figure S1)** remained similar to those of the main analysis.

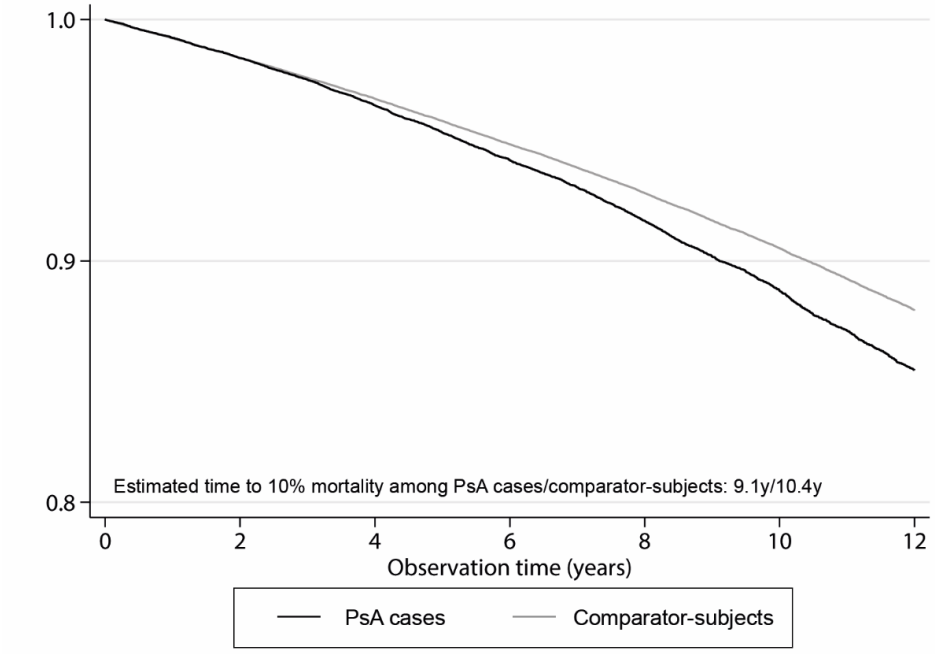


Supplementary Figure S1. Sensitivity analysis to account for potential misclassification of psoriatic arthritis diagnoses among the cases. Kaplan-Meier survival curves, comparing all-cause mortality between PsA cases (n=33 026) and general population comparator-subjects, matched for sex, age and county (n=161 094), in Sweden 2007-2018, after random replacement of 20% of the PsA cases (n=6 605) with one of their own matched comparator-subjects. HR:1.09 (95%CI:1.05-1.14) by matched Cox proportional hazard regression. CI, confidence interval; HR, hazard ratio; PsA, psoriatic arthritis; y, years.

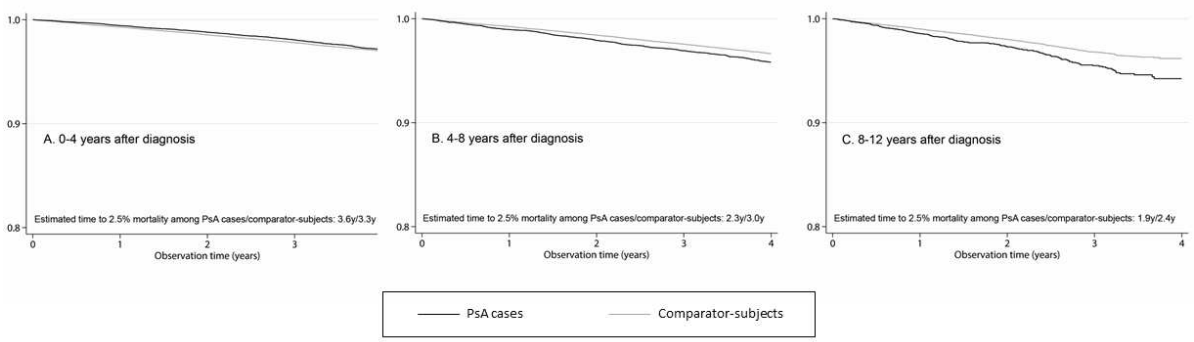
B. To account for the fact that an increase in mortality may be expected during the first months after diagnosis of a disease (since diagnoses are sometimes made during diagnostic work-up for symptoms driven by other and potentially more acutely dangerous conditions):

To assess whether the excess deaths in the PsA cohort of our main analysis was driven by an increase in mortality during the time-period just subsequent to the PsA diagnoses being made, in a sensitivity analysis we applied a delayed start of the follow-up until 6 months after the first diagnostic event for PsA cases diagnosed between July 1, 2006, and December 31, 2017 (and with corresponding delay also for their respective comparator-subjects). Furthermore, for PsA cases diagnosed during the study period (2007-2017 [i.e. the "newly diagnosed cases" subset]; and their respective matched comparator-subjects), we also performed analyses splitting the follow-up time (per case/comparator-subject) into three consecutive 4-year periods.

Delaying the start of the follow-up until 6 months after a diagnostic event did not change the results of our analysis (**Supplementary Figure S2**). When splitting the follow-up time for newly diagnosed cases into three consecutive periods, the mortality among PsA cases was actually seen to be decreased during the first 4 years after diagnosis, but becoming significantly increased during the subsequent periods 4-8 and 8-12 years after diagnosis (**Supplementary Figure S3**) – results thus well in line with our finding of an increased mortality mainly among PsA patients with longer duration since PsA diagnosis (**Figure 3** of the main Manuscript).



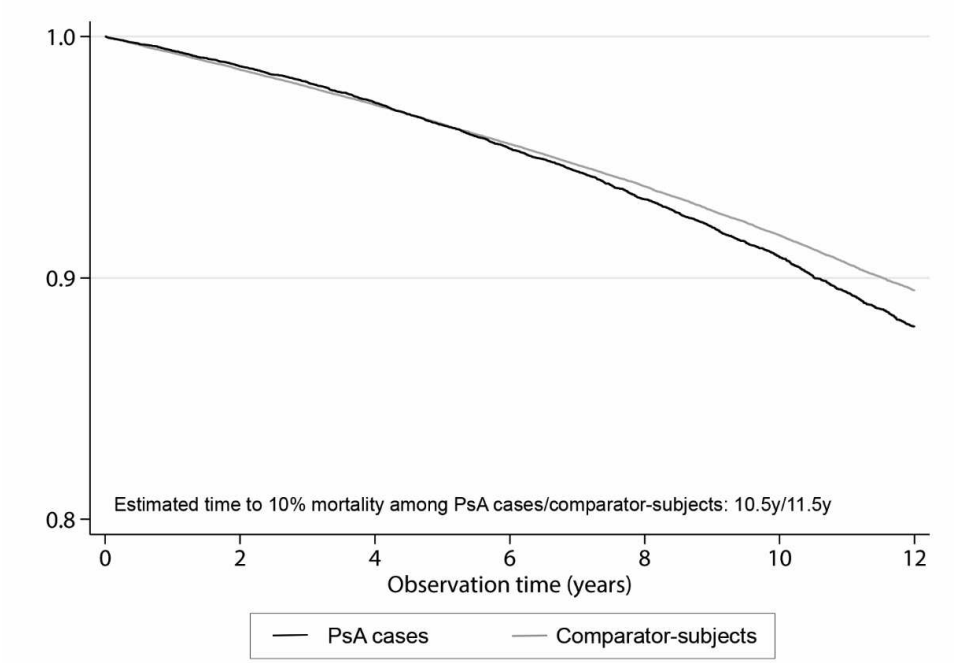
Supplementary Figure S2. Sensitivity analysis to account for a potential increase in mortality during the first months after diagnosis. Kaplan-Meier survival curves, comparing all-cause mortality between PsA cases (n=32 953) and general population comparator-subjects, matched for sex, age and county (n=160 138), in Sweden 2007-2018, after delay of the start of follow-up by 6 months for PsA cases diagnosed from July 1, 2006, onwards (and for their respective comparator-subjects). HR:1.12 (95%CI:1.08-1.17) by matched Cox proportional hazard regression. CI, confidence interval; HR, hazard ratio; PsA, psoriatic arthritis; y, years.



Supplementary Figure S3. Sensitivity analysis, splitting the follow-up time into three consecutive 4-year periods for newly diagnosed psoriatic arthritis cases. Kaplan-Meier survival curves, comparing all-cause mortality between PsA cases diagnosed 2007-2017 ("newly diagnosed cases") and general population comparator-subjects, matched for sex, age and county, in Sweden 2007-2018, with the follow-up time split into: **A.** 0-4 years after diagnosis (PsA cases n=20 458; comparator-subjects n=100 904); p=0.006 for the between-group comparison by matched Breslow test. **B.** 4-8 years after diagnosis (remaining PsA cases n=14 612; comparator-subjects n=69 154); HR 1.12 (95%CI 1.01-1.25) by matched Cox proportional hazard regession. **C.** 8-12 years after diagnosis (remaining PsA cases n=6 667; comparator-subjects n=30 473); HR:1.21 (95%CI:1.02-1.42) by matched Cox proportional hazard regression. CI, confidence interval; HR, hazard ratio; PsA, psoriatic arthritis; y, years.

C. To account for potential survivorship bias:

As described in the Study population and follow-up section of Methods, the matching of comparator-subjects to PsA cases was done at the time of the first registered arthritis diagnosis in outpatient care for the index case. Thus, mainly for prevalent PsA cases diagnosed prior to the start of our study period on January 1, 2007, there is a time-lag between the matching and the individual start of follow-up, with a potential for survivorship bias since only comparator-subjects still alive at the start of follow-up will be included in the analysis. To account for this, we performed a sensitivity analysis limited to PsA cases for whom all 5 matched comparator-subjects were included in the assessment, which did not change the conclusion from our main analysis (**Supplementary Figure S4**).



Supplementary Figure S4. Sensitivity analysis to account for potential survivorship bias. Kaplan-Meier survival curves, comparing all-cause mortality between PsA cases (n=29 703) and general population comparator-subjects, matched for sex, age and county (n=148 515), in Sweden 2007-2018, when limiting the analysis to PsA cases for whom all 5 matched comparator-subjects could be included in the assessment. p<0.001 for the between-group comparison by matched Breslow test. PsA, psoriatic arthritis; y, years.

Supplementary Table S7. Prior hospital-based and smaller population-based mortality studies in psoriatic arthritis

Period	Country	N of PsA cases	Type of study	All-cause mortality SMR (95%CI)
1978-1993 [2]	Canada	428	Hospital-based	1.62 (1.21-2.12)
1978-2004 [3]	Canada	680	Hospital-based	1.36 (1.12-1.64)
1978-2017 [4]	Canada	1490	Hospital-based	0.92 (0.80-1.05)
1985-2007 [5]	UK	453	Hospital-based	0.82 (0.58-1.13)
1995-2011 [6]	Sweden	464	Hospital-based	1.22 (0.89-1.63)
1970-2017 [7]	USA	164	Population-based	0.85 (0.61-1.15)
1997-2006 [8]	Denmark	607	Population-based	1.74 (1.32-2.30)[a]
1999-2008 [9]	Hong-Kong	778	Population-based	1.59 (1.16-2.03)

a. Not SMR (95%CI), but rate ratio (95%CI) of all-cause mortality in relation to the general population. SMR, standardized mortality ratio.

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