## **Supplementary**

This document contains supplementary information for Lyne et al "Sleep in early rheumatoid arthritis"

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Supplementary Table S1: Crude and adjusted ORs with disease duration as exposure and sleep domain as outcome in the full cohort with 4131 observations of sleep data from 3265 patients with early RA diagnosed during 1996-2018 in Sweden.

	N (% reporting problems)	Crude odds ratio	Adjusted odds ratio*
At least one type of problem (global sleep measure)	1578 (38)	1.04 (1.01-1.06)	1.04 (1.02-1.07)
Sleep problems	1010 (25)	1.08 (1.00-1.18)	1.09 (1.00-1.18)
Non-restorative sleep	718 (18)	0.98 (0.88-1.09)	0.99 (0.89-1.10)
Insomnia	454 (11)	1.09 (0.97-1.23)	1.10 (0.98-1.24)
Insufficient sleep	398 (10)	1.10 (0.97-1.24)	1.10 (0.98-1.25)
Sleep quality perceived as poor	775 (19)	1.06 (0.96-1.16)**	1.06 (0.97-1.17)
Sleep considered a health problem	809 (20)	1.05 (0.96-1.15)	1.07 (0.97-1.17)

<sup>\*</sup>Adjusted for sex and age at the time of answering the follow-up questionnaire

<sup>\*\*</sup> Adjusted for sex as the fully crude model did not converge.

Supplementary Table S2: The crude and adjusted ORs with pain-level as exposure and sleep domain as outcome in full cohort of 3265 individuals diagnosed with RA during 1996-2018 in Sweden and with a disease duration of 1-12 years at the time of data collection.

	Pain-level	N (% reporting problems)	Crude odds ratio	Adjusted odds ratio*
Sleep	Low	349 (17)	Ref	Ref
problems	Intermediate	486 (30)	1.63 (0.96-2.76)	1.57 (0.93-2.67)
	High-grade	124 (51)	3.42 (1.27-9.26)	3.23 (1.19-8.78)
Non-	Low	252 (12)	Ref	Ref
restorative sleep	Intermediate	342 (21)	1.93 (1.02-3.65)	1.91 (1.01-3.62)
	High-grade	93 (38)	8.40 (3.18-22.22)	8.44 (3.13-22.78)
Insomnia	Low	117 (6)	Ref	Ref
	Intermediate	232 (14)	2.92 (1.30-6.52)	2.85 (0.93-8.70)
	High-grade	81 (33)	3.39 (0.85-13.50)	3.22 (0.63-16.39)
Insufficient	Low	119 (6)	Ref	Ref
sleep	Intermediate	191 (12)	3.09 (1.21-7.88)	0.83 (0.28-2.47)
	High-grade	71 (29)	18.65 (5.82-59.71)	7.63 (1.45-40.04)
Sleep quality	Low	246 (12)	Ref	Ref
perceived as poor	Intermediate	385 (24)	2.64 (1.39-5.01)	2.55 (1.34-4.85)
	High-grade	113 (46)	9.22 (3.38-25.14)	8.73 (3.18-23.94)
Sleep	Low	250 (12)	Ref	Ref
considered a health	Intermediate	409 (25)	3.01 (1.61-5.62)	2.73 (2.73-2.73)
problem	High-grade	118 (48)	14.90 (5.64-39.38)	8.92 (5.98-13.30)

<sup>\*</sup>Adjusted for sex, age at the time of answering the questionnaire and disease duration.

Supplementary Table S3: The crude and adjusted ORs with HAQ > 1 as exposure and sleep domain as outcome in full cohort of 3265 individuals diagnosed with RA during 1996-2018 in Sweden and with a disease duration of 1-12 years at the time of data collection.

	HAQ-level	N (% reporting problems)	Crude odds ratio	Adjusted odds ratio*
Sleep problems	Low	712 (21)	REF	REF
	High	227 (45)	3.80 (1.81-7.99)	3.59 (1.68-7.68)
Non-restorative sleep	Low	507 (15)	REF	REF

	High	159 (32)	5.03	6.09
			(2.38-10.62)	(2.73-13.59)
Insomnia	Low	279 (8)	REF	REF
	High	135 (27)	3.49	4.40
			(1.34-9.11)	(2.11-9.18)
Insufficient sleep	Low	255 (7)	REF	REF
	High	112 (22)	6.93	6.86
			(2.85-16.84)	(6.80-6.93)
Sleep quality	Low	528 (15)	REF	REF
perceived as poor	High	186 (37)	4.39	4.20
			(2.02-9.56)	(1.89-9.37)
Sleep considered a	Low	542 (16)	REF	REF
health problem	High	202 (40)	7.04	8.18
			(3.41-14.53)	(3.75-17.81)

<sup>\*</sup>Adjusted for sex, age at the time of answering the questionnaire and disease duration.

Supplementary Table S4: The crude and adjusted ORs with disease duration as exposure and sleep domain as outcome in the subcohort consisting of 1837 individuals newly diagnosed with RA during 1996-2008 and that answered the 2008-2009 questionnaire.

	N (% reporting problems)	Crude odds ratio	Adjusted odds ratio*
At least one type of problem	759 (42)	1.00 (0.97-1.03)	1.01 (0.98-1.04)
Sleep problems	502 (28)	1.03 (0.99-1.06)	1.03 (1.00-1.07)
Non-restorative sleep	349 (19)	0.99 (0.95-1.02)	1.00 (0.96-1.04)
Insomnia	219 (12)	0.99 (0.95-1.04)	1.00 (0.96-1.05)
Insufficient sleep	184 (10)	0.98 (0.93-1.03)	0.99 (0.94-1.04)
Sleep quality perceived as poor	355 (19)	0.98 (0.95-1.02)	0.99 (0.95-1.03)
Sleep considered a health problem	382 (21)	0.99 (0.95-1.03)	1.01 (0.97-1.05)

<sup>\*</sup> Adjusted for sex and age at the time of answering the questionnaire.

Supplementary Table S5: The crude and adjusted ORs with pain-level as exposure and sleep domain as outcome in the subcohort consisting of the 1837 individuals newly diagnosed with RA during 1996-2008 and that answered the 2008-2009 questionnaire.

		2008-2009		1-1	ear follow-	up	3-1	3-year follow-up		
Pain-level	N (%) with	Crude OR	Adjusted	N (%) with	Crude OR	Adjusted	N (%) with	Crude OR	Adjusted	
	problems		OR*	problems		OR*	problems		OR*	
				Sleep pro	blems					
Low	140 (18)	Ref	Ref	105 (16)	Ref	Ref	104 (17)	Ref	Ref	
Intermediate	258 (34)	2.4	2.3	135 (27)	2.0	1.9	93 (28)	1.9	1.8	
		(1.9-3.0)	(1.8-2.9)		(1.5-2.6)	(1.4-2.5)		(1.4-2.6)	(1.3-2.5)	
High-grade	57 (52)	5.1	4.8	34 (52)	5.7	5.4	33 (47)	4.5	4.2	
		(3.3-7.7)	(3.2-7.4)		(3.4-9.7)	(3.2-9.3)		(2.7-7.5)	(2.5-7.0)	
	•			Non-restora	tive sleep		•			
Low	101 (13)	Ref	Ref	85 (13)	Ref	Ref	66 (11)	ref	ref	
Intermediate	179 (23) 2.1 2.0 102 (20) 1.7 1.7	61 (18)	1.9	1.8						
		(1.6-2.7)	(1.6-2.7)		(1.3-2.4)	(1.2-2.3)		(1.3-2.7)	(1.3-2.7)	
High-grade	41 (37)	4.1	3.9	28 (43)	5.1	5.1	24 (35)	4.5	4.3	
		(2.7-6.4)	(2.5-6.1)		(3.0-8.7)	(2.9-8.9)		(2.6-7.8)	(2.5-7.7)	
	Т		Т	Insom			Т			
Low	47 (6)	Ref	Ref	33 (5)	Ref	Ref	37 (6)	Ref	Ref	
Intermediate	111 (14)	2.7	2.7	66 (13)	2.9	2.7	55 (16)	3.0	3.0	
		(1.9-3.9)	(1.9-3.8)		(1.9-4.5)	(1.8-4.2)		(2.0-4.7)	(1.9-4.7)	
High-grade	70 (36)	9.2	9.0	18 (28)	7.3	6.8	23 (33)	7.7	7.3	
		(5.7-15.0)	(5.5-14.7)		(3.8-13.8)	(3.5-13.2)		(4.3-14.1)	(4.0-13.5)	
	ı		ı	Insufficien	•		ı			
Low	50 (6)	Ref	Ref	32 (5)	ref	ref	37 (6)	ref	ref	
Intermediate	91 (12)	2.0	1.9	48 (10)	2.1	2.0	52 (15)	2.9	2.8	
		(1.4-2.9)	(1.3-2.8)		(1.3-3.3)	(1.2-3.1)		(1.8-4.5)	(1.8-4.4)	
High-grade	27 (24)	4.9	4.6	22 (34)	10.0	9.5	22 (31)	7.3	7.0	
		(2.9-8.2)	(2.7-7.7)		(5.4-18.8)	(5.0-17.9)		(4.0-13.4)	(3.8-12.9)	
	•			quality per			•			
Low	92 (11)	Ref	Ref	72 (11)	Ref	Ref	82 (13)	Ref	Ref	
Intermediate	188 (24)	2.5	2.4	110 (22)	2.3	2.2	87 (26)	2.3	2.2	
		(1.9-3.2)	(1.8 -3.1)		(1.7-3.2)	(1.6 -3.0)		(1.6-3.2)	(1.6 -3.1)	
High-grade	49 (44)	6.1	5.8	32 (49)	7.9	7.7	32 (46)	5.6	5.3	
		(4.0-9.5)	(3.8-9.0)		(4.6-13.7)	(4.4-13.3)		(3.3-9.5)	(3.1-8.9)	
				onsidered a	•					
Low	99 (12)	Ref	Ref	75 (11)	Ref	Ref	76 (12)	Ref	Ref	
Intermediate	202 (26)	2.5	2.4	125 (25)	2.6	2.5	82 (24)	2.3	2.3	
	(+)	(1.9-3.3)	(1.9-3.2)	22 (12)	(1.9-3.5)	(1.8-3.5)	22 (12)	(1.6-3.3)	(1.6-3.3)	
High-grade	53 (48)	6.5	6.3	32 (49)	7.6	7.7	33 (48)	6.7	6.4	
		(4.3-10.0)	(4.1-9.8)		(4.4-13.0)	(4.4-13.4)		(3.9-11.3)	(3.7-10.9)	
*Adjusted fo	r cov and	222 2t tha	+: f			i T	h = 2000 /2	000		

<sup>\*</sup>Adjusted for sex and age at the time of answering the questionnaire. The 2008/2009 subcohort was additionally adjusted for disease duration.

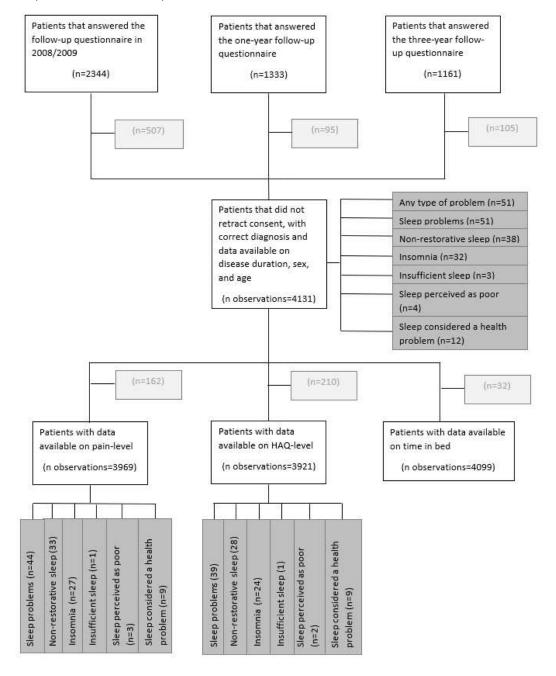
Abbreviations: OR, odds ratio.

Supplementary Table S6: The crude and adjusted ORs with HAQ-level as exposure and sleep domain as outcome in the tree cohorts consisting of those that answered the questionnaire in 2008-2009, the questionnaire at 1 year after diagnosis, and at 3 years after diagnosis.

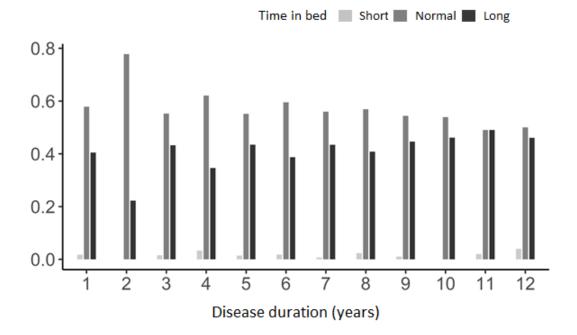
			1-у	ear follo	w-up		3-	3-year follow-up				
	N (%) wit		-	Adjusted			Crude			N (%)	Crude	Adjusted
	problem	s OF	l l	OR*	with		OR	OR*		with	OR	OR*
					proble	problems				problems		
					Sleep	prol	olems					
Low	329 (23)	Ref	Ref		209 (20)	Re	f	Ref		174 (19)	Ref	Ref
High	125 (46)	2.8	2	2.7	55 (44)		3.3	3.3		47 (45)	3.4	3.3
_		(2.1-3.7)	(2.0	)-3.5)		(2	.2-4.8)	(2.2-4.9)			(2.3-5.2)	(2.2-5.1)
	•				Non-rest	orat	ive sleep					
Low	232 (16)	Ref	F	Ref 1	63 (15)	Re	f	Ref		112 (12)	Ref	Ref
High	82 (30)	2.2	2	2.2 4	4 (35)		3.1	3.4		33 (32)	3.3	3.6
Ü	` ′	(1.6-2.9)	(1.7	7-3.0)	` ,	(2	.0-4.5)	(2.2-5.		, ,	(2.1-5.2)	(2.2-5.8)
	•		<u> </u>		Ins	omr						
Low	123 (9)	Ref	Ref	8	80 (7)		Ref Ref			76 (8)	Ref	Ref
High	69 (25)	3.5	3	3.8 3	3 (26)		4.4	4.7		33 (32)	5.0	5.2
Ū		(2.5-4.9)	(2.7	7-5.3)	, ,	(2		(2.9-7.	6)	` '	(3.1-8.1)	(3.2-8.6)
	•	•		•	Insuffi	ient	sleep					
Low	109 (8)	Ref	Ref	6			f	Ref		79 (9)	Ref	Ref
High	57 (20)	3.1	3	3.2 2	9 (23)		4.5	4.7		26 (25)	3.5	3.6
o	, ,	(2.2-4.4)	(2.2	-4.5)	- ( - /	(2	.8-7.4)	(2.8-7.		- ( - /	(2.1-5.8)	2.1-6.0)
					Sleep pero	eive	d as poo	r				· · · · · · · · · · · · · · · · · · ·
Low	218 (15)	Ref	Ref	1	57 (15)	Re	f	Ref		153 (17)	Ref	Ref
High	100 (36)	3.2	3	3.0 4	7 (38)		3.5	3.7		39 (38)	3.0	2.8
Ü		(2.3-4.1)	(2.3	-4.0)	(/	(2	.4-5.2)	(2.5-5.		( /	(1.9-4.6)	(1.8-4.4)
		, ,		,	considere	,		_ `			,	, ,
Low	230 (16)	Ref	Ref	1	72 (16)	Re	f	Ref		140 (15)	Ref	Ref
High	113 (41)	3.6	3	3.9 4	7 (38)		3.2	3.6		42 (40)	3.7	3.9
-	, ,	(2.7-4.7)	(2.9	-5.2)		(2	.1-4.7)	(2.4-5.		` '	(2.4-5.7)	(2.5-6.1)

<sup>\*</sup> Adjusted for sex and age at the time of answering the questionnaire. The 2008/2009 subcohort was additionally adjusted for disease duration.

Figure S1: Flowchart of the inclusion and exclusion of patients in each analysis. The light gray boxes represent individuals that were excluded completely from analysis due to either incorrect diagnosis, retracted consent, or missing data on predicting variables as well as covariates. The dark gray boxes represent the number of missing values for each sleep domain, which were excluded in the descriptive statistics and analysis with each individual domain.



*Figure S2*: Time in bed (proportion of short, normal, long) for full cohort stratified by disease duration for 4131 observations from 3265 individuals newly diagnosed with RA during 1996-2018 in Sweden.



*Figure S3*: Proportion experiencing problems with each sleep domain stratified by 10-year interval age groups for 4131 observations from 3265 individuals newly diagnosed with RA during 1996-2018 in Sweden.

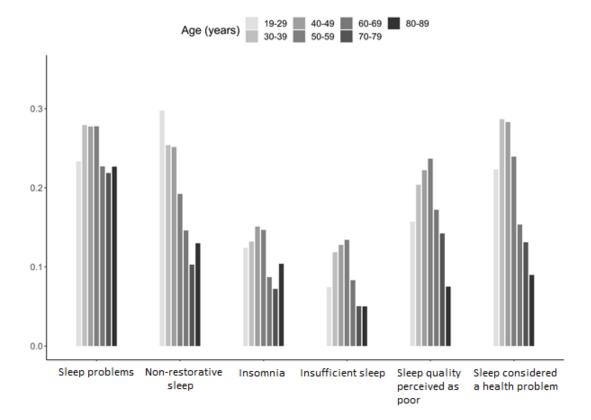


Figure S4: Proportion of patients experiencing problems with each sleep domain stratified sex for 4131 observations from 3265 individuals newly diagnosed with RA during 1996-2018 in Sweden.

