

Night and shift work patterns and incidence of type 2 diabetes and hypertension in a prospective cohort study of healthcare employees¹

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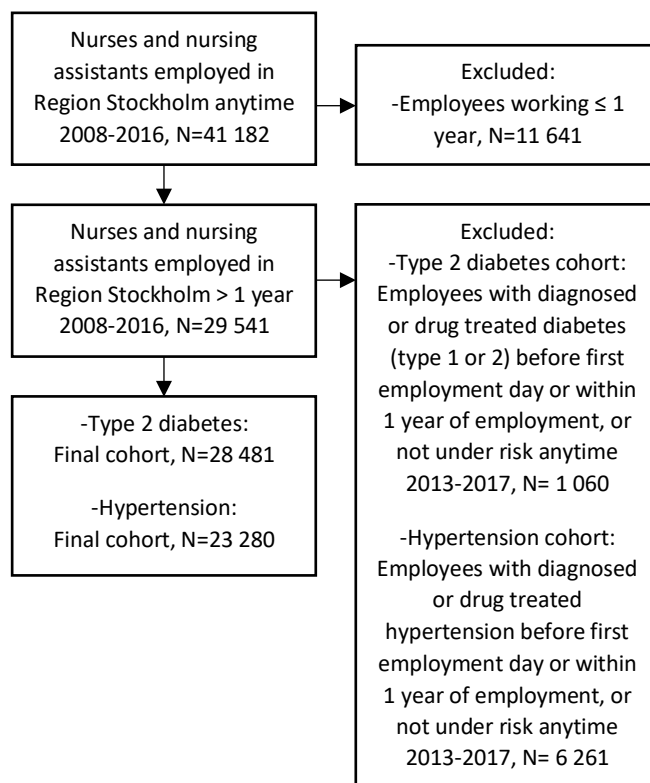


Figure S1. Flowchart for the inclusion and exclusion procedure, cohort for type 2 diabetes and cohort for hypertension

Table S1: Baseline characteristics of the study participants (N=23 280) in the cohort for hypertension (ICD: I10).

Variables	Never night work ^a		Ever night work ^a		Total cohort	
	N	%	N	%	N	%
Sex						
Women	11 799	89.8	8 575	84.5	20 374	87.5
Men	1 335	10.2	1 571	15.5	2 906	12.5
Age^b						
<40	4 606	35.1	5 187	51.1	9 793	42.1
40-49	3 591	27.3	2 685	26.5	6 276	27.0
≥50	4 937	37.6	2 274	22.4	7 211	31.0
Country of birth						
Sweden	10 462	79.7	7 858	77.4	18 320	78.7
Nordic counties except Sweden	671	5.1	486	4.8	1 157	5.0
Europe except Nordic countries	615	4.7	582	5.7	1 197	5.1
Outside Europe	1 386	10.6	1 218	12.0	2 604	11.2
Profession						
Nurses	7 300	55.6	6 291	62.0	13 591	58.4
Nursing assistants	5 834	44.4	3 855	38.0	9 689	41.6

^aAt the end of follow-up, based on all years with information on work hours 2008-2016.

^bAt the beginning of follow-up.

Table S2: Discrete-time proportional hazard models for incident type 2 diabetes (ICD: E11) among healthcare employees during follow-up 2013-2017, contributing to a total of 92 792 person-years (PY) for analyses of shift work patterns. Each of the models was estimated separately. A three-year time window was applied.

Exposure ^a	PY	No of cases	Type 2 diabetes	
			HR ^b (95% CI)	HR ^c (95% CI)
Type of shift work				
Always day ^d work	24 821	59	Ref.	Ref.
Day and afternoon ^e shifts (no nights)	36 728	100	1.56 (1.13-2.18)	1.26 (0.91-1.78)
Day and/or afternoon shifts, and nights ^f	25 316	42	1.24 (0.83-1.85)	1.12 (0.74-1.67)
Night shifts only	5 927	31	1.96 (1.25-3.03)	1.55 (0.98-2.42)
Frequency of any shifts (afternoon and/or night shifts), per year				
Always day work	24 821	59	Ref.	Ref.
1-19 times	7 772	18	1.45 (0.83-2.41)	1.33 (0.76-2.22)
20-62 times	22 687	41	1.22 (0.81-1.82)	1.06 (0.70-1.58)
63-120 times	28 908	72	1.53 (1.08-2.18)	1.22 (0.85-1.75)
>120 times	8 604	42	2.09 (1.39-3.11)	1.66 (1.10-2.51)
<i>Trend test (risk increase per 10 times)^g</i>			<i>1.02 (1.00-1.03)</i>	<i>1.01 (1.00-1.03)</i>
Frequency of night shifts, per year				
Never night shifts ^h	61 549	159	Ref.	Ref.
1-19 times	10 460	16	1.04 (0.60-1.70)	1.07 (0.61-1.75)
20-62 times	8 315	14	1.07 (0.59-1.79)	1.12 (0.62-1.87)
63-120 times	6 574	14	0.84 (0.46-1.40)	0.81 (0.45-1.36)
>120 times	5 894	29	1.48 (0.97-2.17)	1.32 (0.87-1.95)
<i>Trend test (risk increase per 10 times)ⁱ</i>			<i>1.02 (0.98-1.07)</i>	<i>1.01 (0.97-1.06)</i>
Frequency of ≥3 consecutive night shifts, per year				
Never night shifts ^h	61 549	159	Ref.	Ref.
0 times	6 450	8	0.66 (0.30-1.26)	0.69 (0.31-1.32)
1-5 times	9 536	15	1.11 (0.62-1.82)	1.15 (0.64-1.89)
6-14 times	6 190	12	0.99 (0.52-1.70)	0.96 (0.50-1.65)
15-20 times	4 151	21	1.82 (1.12-2.81)	1.70 (1.05-2.63)
>20 times	4 916	17	1.11 (0.64-1.78)	1.00 (0.58-1.60)
<i>Trend test (risk increase per 10 times)ⁱ</i>			<i>1.11 (0.91-1.36)</i>	<i>1.06 (0.86-1.29)</i>

^aBased on the exposure during the years with information on work hours up to three years preceding the outcome (average value for frequencies). The cut-off points in categorizing exposure for shift work patterns were based on 1-25th percentile, 25th-50th percentile, 50th-75th percentile and >75th percentile in the distribution of the exposed group, except for type of shift work.

^bAdjusted for calendar year (inherent in the analytical model), sex and age (continuous).

^cAdditionally adjusted for country of birth (Sweden; Nordic countries except Sweden; Europe except Nordic countries; other countries) and profession (Nurses including midwives; Nursing assistants).

^dDay shifts: starts after 06:00 and ends no later than 18:00.

^eAfternoon shifts: starts after 12:00 and ends later than 18:00, but not a night shift.

^fNight shifts: at least three hours within 22:00 hours – 06:00 hours.

^gTrend among those who worked any shifts.

^hThose who worked day and/or afternoon shifts, but no night shifts.

ⁱTrend among those who worked night shifts.

Table S3: Discrete-time proportional hazard models for incident hypertension (ICD: I10) among healthcare employees during follow-up 2013-2017, contributing to a total of 73 697 person-years (PY) for analyses of shift work patterns. Each of the models was estimated separately. A three-year time window was applied.

Exposure ^a	PY	No of cases	Hypertension	
			HR ^b (95% CI)	HR ^c (95% CI)
Type of shift work				
Always day ^d work	18 216	282	Ref.	Ref.
Day and afternoon ^e shifts (no nights)	29 512	330	1.03 (0.88-1.21)	0.98 (0.83-1.16)
Day and/or afternoon shifts, and nights ^f	21 447	190	1.03 (0.85-1.24)	1.01 (0.84-1.22)
Night shifts only	4 522	73	1.00 (0.77-1.29)	0.95 (0.72-1.23)
Frequency of any shifts (afternoon and/or night shifts), per year				
Always day work	18 208	282	Ref.	Ref.
1-19 times	6 281	63	0.97 (0.73-1.27)	0.95 (0.72-1.25)
20-62 times	18 703	187	1.05 (0.87-1.27)	1.02 (0.85-1.24)
63-120 times	23 824	245	1.02 (0.86-1.21)	0.98 (0.82-1.17)
>120 times	6 663	98	1.03 (0.82-1.30)	0.97 (0.76-1.23)
<i>Trend test (risk increase per 10 times)^g</i>			<i>1.00 (0.99-1.01)</i>	<i>1.00 (0.99-1.01)</i>
Frequency of night shifts, per year				
Never night shifts ^h	47 728	612	Ref.	Ref.
1-19 times	9 068	75	1.08 (0.84-1.37)	1.10 (0.86-1.39)
20-62 times	7 170	52	0.94 (0.70-1.23)	0.95 (0.70-1.25)
63-120 times	5 229	66	1.02 (0.78-1.30)	1.01 (0.78-1.29)
>120 times	4 502	70	0.98 (0.76-1.24)	0.95 (0.73-1.21)
<i>Trend test (risk increase per 10 times)ⁱ</i>			<i>1.00 (0.97-1.02)</i>	<i>0.99 (0.97-1.01)</i>
Frequency of ≥3 consecutive night shifts, per year				
Never night shifts ^h	47 728	612	Ref.	Ref.
0 times	5 379	56	1.09 (0.82-1.42)	1.11 (0.83-1.44)
1-5 times	8 318	65	1.07 (0.82-1.37)	1.08 (0.83-1.39)
6-14 times	5 199	33	0.67 (0.46-0.94)	0.67 (0.46-0.93)
15-20 times	3 276	55	1.24 (0.93-1.62)	1.23 (0.92-1.60)
>20 times	3 797	54	0.97 (0.72-1.27)	0.94 (0.70-1.23)
<i>Trend test (risk increase per 10 times)^j</i>			<i>0.99 (0.89-1.11)</i>	<i>0.98 (0.87-1.09)</i>

^aBased on the exposure during the years with information on work hours up to three years preceding the outcome (average value for frequencies). The cut-off points in categorizing exposure for shift work patterns were based on 1-25th percentile, 25th-50th percentile, 50th-75th percentile and >75th percentile in the distribution of the exposed group, except for type of shift work.

^bAdjusted for calendar year (inherent in the analytical model), sex and age (continuous).

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^fNight shifts: at least three hours within 22:00 hours – 06:00 hours.

^gTrend among those who worked any shifts.

^hThose who worked day and/or afternoon shifts, but no night shifts.

ⁱTrend among those who worked night shifts.