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Short-term effects of night shift work on breast cancer risk: a cohort study of payroll data [1]

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1 *Supplementary tables A–D*

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Supplementary table A. Age and age-standardized participant characteristics of person years (%) by work hours, female employees of the Danish public sector 2007 – 2012

Participant characteristics	Only day shifts (412 920 person years)	Ever non-day, non-night shifts (39 932 person years)	Ever night shifts				
			1st quartile 1-5 shifts (71 661 person years)	2nd quartile 6-23 shifts (80 575 person years)	3rd quartile 24-67 shifts (79 890 person years)	4th quartile 68-1325 shifts (86 084 person years)	All, 1-1325 shifts (318 210 person years)
Age (years)							
<40	40	39	50	54	46	29	49
40-49	25	26	25	24	27	30	25
50-59	23	25	20	18	22	30	20
≥60	12	10	6	5	6	11	6
Calendar year of follow up							
2007	13	11	13	5	1	0	9
2008	16	15	17	15	7	3	14
2009	17	17	17	19	14	10	17
2010	18	18	18	20	22	19	19

2011	18	19	18	21	27	29	20
2012	18	19	18	21	29	39	21
Age at first child's birth							
<20 years	5	5	5	4	4	5	4
20-29 years	53	56	56	57	57	57	57
≥30 years	16	14	16	18	16	14	16
No children	26	24	23	22	23	24	23
Number of children							
0	26	24	23	22	23	24	23
1	17	16	17	17	16	16	17
2	40	40	39	40	39	37	39
3	14	16	17	18	18	18	18
≥4	3	3	4	4	4	5	4
Family history of breast or ovarian cancer							
No	90	91	91	91	91	91	91
Yes	2	3	3	2	2	2	3
No information	8	6	7	7	6	7	7
Oral contraception							
No	39	38	39	38	37	37	38
Yes	61	62	61	62	63	63	62
Hormone replacement therapy							
No	75	75	74	74	75	77	75
Yes	25	25	26	26	25	23	25
Other sex hormones							
No	88	88	87	86	87	88	87
Yes	12	12	13	14	13	12	13
Medications for alcoholism							
No	98	99	98	99	99	99	99
Yes	2	1	2	1	1	1	1
Mammography screening							
No	4	4	4	4	4	5	4
Yes	16	17	16	18	21	21	18
Not invited	81	79	80	78	75	74	78

Highest family education							
Unspecified	1	1	1	1	1	1	1
Primary and secondary school	8	6	2	2	2	2	2
Advanced level education	36	38	27	20	21	32	25
Vocational education	6	5	3	2	2	3	2
Undergraduate and bachelor degree	31	41	51	56	62	57	54
Higher education	18	11	17	19	12	6	16

Supplementary table B. Rate ratios (RR) and 95% confidence intervals (95% CI) of all breast cancer and ER-/HER2-, ER+/HER2-, ER-/HER2+, and ER+/HER2+ breast cancer subtypes by night shifts since start of follow up. Results from female employees of the Danish public sector 2007-2012

Number of night shifts since entry	Cases	Person years	Crude RR	95% CI	Adjusted RR[a]	95% CI
All breast cancer						
Only day shifts	751	412 920	1		1	
Ever non-day, non-night shifts	69	39 932	0.95	0.74-1.22	0.94	0.73-1.20
1st quartile 1-5 night shifts	102	71 661	0.78	0.63-0.96	0.88	0.71-1.08
2nd quartile 6-23 night shifts	98	80 575	0.67	0.54-0.83	0.87	0.70-1.08
3rd quartile 24-67 night shifts	106	79 890	0.73	0.60-0.89	0.99	0.80-1.21
4th quartile 68-1325 night shifts	119	86 084	0.76	0.63-0.92	0.85	0.70-1.04
Ever night shifts	425	318 210	0.73	0.65-0.83	0.90	0.80-1.01
Trend among night-shift workers			P=0.06		P=0.56	
Trend among day and night shift workers			P<0.001		P=0.10	
ER-/HER2- breast cancer						
Only day shifts	80	412 920	1		1	
Ever non-day, non-night shifts	7	39 932	0.90	0.42-1.96	0.89	0.41-1.94
1st quartile 1-5 night shifts	11	71 661	0.79	0.42-1.49	0.82	0.44-1.58
2nd quartile 6-23 night shifts	11	80 575	0.70	0.38-1.32	0.83	0.44-1.56
3rd quartile 24-67 night shifts	12	79 890	0.78	0.42-1.42	0.89	0.48-1.64
4th quartile 68-1325 night shifts	15	86 084	0.90	0.52-1.56	0.86	0.49-1.64
Ever night shifts	49	318 210	0.79	0.56-1.13	0.85	0.59-1.23
Trend among night-shift workers			P=0.40		P=0.66	
Trend among day and night shift workers			P=0.31		P=0.46	
ER+/HER2- breast cancer						
Only day shifts	503	412 920	1		1	
Ever non-day, non-night shifts	44	39 932	0.90	0.66-1.23	0.89	0.65-1.21
1st quartile 1-5 night shifts	63	71 661	0.72	0.56-0.94	0.82	0.63-1.07
2nd quartile 6-23 night shifts	52	80 575	0.53	0.40-0.70	0.72	0.54-0.96
3rd quartile 24-67 night shifts	64	79 890	0.66	0.51-0.85	0.92	0.71-1.20
4th quartile 68-1325 night shifts	71	86 084	0.68	0.53-0.87	0.75	0.58-0.97
Ever night shifts	250	318 210	0.64	0.55-.75	0.80	0.68-0.95
Trend among night-shift workers			P<0.05		P=0.33	
Trend among day and night shift workers			P<0.001		P<0.05	
ER-/HER2+ breast cancer						
Only day shifts	37	412 920	1		1	
Ever non-day, non-night shifts	<4	39 932	0.84	0.26-2.72	0.89	0.27-2.89
1st quartile 1-5 night shifts	4	71 661	0.62	0.22-1.75	0.67	0.24-1.89
2nd quartile 6-23 night shifts	13	80 575	1.80	0.96-3.39	2.14	1.12-4.08
3rd quartile 24-67 night shifts	7	79 890	0.98	0.44-2.19	1.22	0.54-2.78
4th quartile 68-1325 night shifts	13	86 084	1.69	0.90-3.17	1.87	0.97-3.60
Ever night shifts	37	318 210	1.30	0.82-2.05	1.49	0.93-2.39
Trend among night-shift workers			P=0.52		P=0.67	
Trend among day and night shift workers			P=0.13		P<0.05	
ER+/HER2+ breast cancer						
Only day shifts	55	412 920	1		1	
Ever non-day, non-night shifts	5	39 932	0.94	0.38-2.35	1.01	0.40-2.54
1st quartile 1-5 night shifts	13	71 661	1.36	0.74-2.49	1.50	0.81-2.76
2nd quartile 6-23 night shifts	11	80 575	1.02	0.54-1.96	1.23	0.64-2.37
3rd quartile 24-67 night shifts	13	79 890	1.22	0.67-2.24	1.44	0.78-2.68

4th quartile 68-1325 night shifts	11	86 084	0.96	0.50-1.83	0.96	0.49-1.85
Ever night shifts	48	318 210	1.13	0.77-1.67	1.26	0.84-1.89
Trend among night-shift workers			P=0.38		P=0.18	
Trend among day and night shift workers			P=0.75		P=0.51	

[a]Poisson regression model adjusted for calendar year, age, age at birth of first child, number of births, family history of breast cancer or ovarian cancer, oral contraception, hormone replacement therapy, other sex hormones, medication related to alcoholism, mammography screening attendance, and highest family educational level. For details, confer the text.

Supplementary table C. Rate ratios (RR) and 95% confidence intervals (95% CI) of all breast cancer by night shifts during the past 1 – 5 years time windows. Results from female employees of the Danish public sector 2008-2012

Time window	Cases	Person years	Crude RR	95% CI	Adjusted RR[a]	95% CI
Past 1 year						
Only day shifts	748	399 092	1		1	
Ever non-day, non-night shifts	74	35 173	1.12	0.88-1.43	1.11	0.87-1.42
0.1-0.9 per month	86	69 805	0.66	0.53-0.82	0.81	0.65-1.01
1.0 – 3.9 per month	103	82 933	0.66	0.54-0.81	0.87	0.70-1.07
4.0 – 9.9 per month	23	21 893	0.56	0.37-0.85	0.72	0.48-1.10
≥10.0 per month	8	6 744	0.63	0.32-1.27	0.54	0.27-1.10
Ever night shifts	220	181 375	0.64	0.55-0.74	0.80	0.69-0.93
Trend among night-shift workers			P=0.02		P=0.39	
Trend among day and night shift workers			P<0.001		P=0.01	
Past 1-2 years						
Total	822	465 255				
Only day shifts	569	286 744	1		1	
Ever non-day, non-night shifts	35	17 711	1.00	0.71-1.40	1.02	0.72-1.44
0.1-0.9 per month	103	73 097	0.71	0.58-0.88	0.68	0.58-0.80
1.0 – 3.9 per month	93	67 525	0.69	0.56-0.86	0.93	0.75-1.17
4.0 – 9.9 per month	18	15 427	0.59	0.37-0.94	0.73	0.46-1.17
≥10.0 per month	4	4 751	0.42	0.16-1.13	0.37	0.14-0.99
Ever night shifts	218	160 800	0.84	0.54-1.30	0.89	0.72-1.10
Trend among night-shift workers			P=0.43		P=0.64	
Trend among day and night shift workers			P<0.001		P=0.04	
Past 1-3 years						
Only day shifts	397	192 055	1		1	
Ever non-day, non-night shifts	17	8 386	0.98	0.60-1.59	0.99	0.61-1.62
0.1-0.9 per month	87	60 612	0.69	0.55-0.88	0.85	0.67-1.07
1.0 – 3.9 per month	64	49 368	0.63	0.48-0.82	0.83	0.64-1.09
4.0 – 9.9 per month	16	10 351	0.75	0.45-1.23	0.90	0.55-1.49
≥10.0 per month [b]	<4[b]	3 120	0.47	0.15-1.45	0.42	0.13-1.31
Ever night shifts	167-171[b]	123 451	0.67	0.56-0.80	0.83	0.69-1.00
Trend among night-shift workers			P=0.27		P=0.87	
Trend among day and night shift workers			P<0.001		P=0.04	
Past 1-4 years						
Only day shifts	240	110 486	1		1	
Ever non-day, non-night shifts	7	3 255	0.99	0.47-2.10	1.03	0.49-2.19
0.1-0.9 per month	61	41 568	0.68	0.51-0.89	0.83	0.63-1.11
1.0 – 3.9 per month	41	30 722	0.61	0.44-0.86	0.83	0.59-1.17
4.0 – 9.9 per month	8	6 080	0.61	0.30-1.23	0.73	0.36-1.48
≥10.0 per month [b]	<4[b]	1 783	0.26	0.04-1.84	0.24	0.03-1.73
Ever night shifts [b]	110-114[b]	80 153	0.64	0.51-0.80	0.80	0.64-1.01
Trend among night-shift workers			P=0.63		P=0.87	
Trend among day and night shift workers			P<0.001		P=0.05	
Past 1-5 years						
Only day shifts [b]	113	43 611	1		1	
Ever non-day, non-night shifts [b]	<4	708	0.54	0.07-3.90	0.64	0.09-4.59
<1 per month	40	19 468	0.79	0.55-1.14	1.00	0.69-1.45
1 - <4 per month	22	13 117	0.65	0.41-1.02	0.91	0.57-1.46

4 - <10 per month	7	2 484	1.09	0.51-2.33	1.32	0.61-2.85
10+ per month [b]	<4[b]	714	-	-	-	-
Ever night shifts	69-73[b]	35 783	0.75	0.56-1.01	0.97	0.71-1.32
Trend among night-shift workers			P=0.98		P=0.62	
Trend among day and night shift workers			P=0.05		P=0.70	

[a]Poisson regression model adjusted for calendar year, age, age at birth of first child, number of births, family history of breast cancer or ovarian cancer, oral contraception, hormone replacement therapy, other sex hormones, medication related to alcoholism, mammography screening attendance, and highest family educational level. For details, confer the text.

[b] Accoring to the data confidentiality policy of Statistics Denmark no less than 4 cases per cell must be reported.

Supplementary table D. Rate ratios (RR) and 95% confidence intervals (95% CI) of all breast cancer by night shift work since entry and during the past 1 – 4 year time windows. Results from female employees of the inception population first employed in the Danish public sector 2008-2012

Time windows	Cases	Person years	Crude RR	95% CI	Adjusted RR[a]	95% CI
Since entry						
Only day shifts	144	116 823	1		1	
Ever non-day, non-night shifts	17	11 681	1.18	0.71-1.95	1.15	0.69-1.91
Ever night shifts	69	71 113	0.77	0.58-1.03	0.88	0.66-1.17
Past 1 year						
Only day shifts	128	98 747	1		1	
Ever non-day, non-night shifts	12	5 474	1.69	0.94-3.06	1.39	0.77-2.53
Ever night shifts	37	40 208	0.69	0.48-0.98	0.82	0.56-1.18
Past 1-2 years						
Only day shifts	78	60 066	1		1	
Ever non-day, non-night shifts [b]	<4	2 016	0.76	0.19-3.11	0.70	0.17-2.88
Ever night shifts	36	31 217	0.89	0.60-1.33	1.14	0.76-1.71
Past 1-3 years						
Only day shifts	43	30 965	1		1	
Ever non-day shifts, non-night shifts [b]	<4	646	-	-	-	-
Ever night shifts	29	18 828	1.13	0.71-1.81	1.33	0.82-2.17
Past 1-4 years						
Only day shifts	15	10 547	1		1	
Ever non-day shifts, non-night shifts [b]	<4	124	-	-	-	-
Ever night shifts	10	7 390	0.96	0.43-2.14	1.01	0.44-2.32

[a] Poisson regression model adjusted for calendar year, age, age at birth of first child, number of births, family history of breast cancer or ovarian cancer, oral contraception, hormone replacement therapy, other sex hormones, medication related to alcoholism, mammography screening attendance, and highest family educational level. For details, confer the text.

[b] According to the data confidentiality policy of Statistics Denmark no less than 4 cases per cell must be reported.