

## **SUPPLEMENTARY TABLES**

### **“Cohort profile: LIFEWORK, a prospective cohort study on occupational and environmental risk factors and health in the Netherlands”**

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**Table S1.** Overview of data collected for the LIFEWORK study, including differences in data collection per subcohort

Data	Baseline <sup>a</sup> (2011/2012)	Follow-up <sup>a</sup> (2015–2017)	Linkage (frequency)	Same data in all 3 <sup>b</sup> (Y/N/H)	Differences across 3 subcohorts <sup>c</sup>			Comments
					AMIGO <sup>4</sup> (n=14829)	EPIC-NL (n=13961)	Nightingale (n=59941)	
<b>QUESTIONNAIRE</b>								
<b>General</b>								
General (e.g., sex, height, weight, handedness)	√	√		Y	√	√	√	Only characteristics that might be expected to change (e.g., weight) were asked in follow-up.
Demographic information (country of birth, education, marital status)	√	√		H	√	√	√	Minor differences in country of birth, marital status and education questions.
Lifestyle (alcohol use, smoking)	√	√		H	√	√	√	Minor differences in questions; harmonized categories have been created.
Physical activity	√	√		H	√ (F)	√	√	
Basic diet				N	√ (F)			
Extended food frequency questionnaire				N		√ (F)		
Waist-hip circumference (self-reported)		√		Y	√ (F)	√ (B/F)	√ (F)	Only collected for EPIC-NL at baseline (2011); for all 3 subcohorts at follow-up.
<b>Residence</b>								
Bedroom floor	√	√		Y	√	√	√	
Bedroom, extended (window opening habits, if streetside)	√	√		N	√	√	√ (B)	
Domestic/indoor environment (incl. cooking, ventilation)	√	√		N	√	√		
Historical addresses (those resided at for at least 12 months)	√			Y	√ (B)	√ (B)	√ (B)	Address changes after baseline are obtained from municipal records.
Green space (proximity to and use of)		√		N	√ (F)	√ (F)		
Noise exposure, sensitivity[1]		√		N	√ (F)	√ (F)		
Light at night exposure in bedroom		√		Y	√ (F)	√ (F)	√ (B/F)	
Use of electronics (light at night) in hour before sleep		√		Y	√ (F)	√ (F)	√ (F)	
<b>Employment</b>								
Current (job, tasks, hours, physical exertion)	√	√		H	√	√	√	Asked in follow-up only if participant changed occupation since baseline.
Historical occupations (at least 6 months)	√	√		H	√	√	√	The complete history of jobs only asked at baseline; participants asked to update at

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					AMIGO <sup>4</sup> (n=14829)	EPIC-NL (n=13961)	Nightingale (n=59941)	
Shift and night work <sup>d</sup> (ever shift work; if permanent or rotating)	√	√		H	√	√	√	follow-up if job changed since baseline.
Extended information on shift work				N			√	Shift and night work was more comprehensively assessed in the Nightingale questionnaire
Work satisfaction and job stress[2]				N	√			Start and stop time of shift, rotating or permanent, and speed and direction of a rotating system, years on a particular non-day shift schedule and cumulative exposure to the shift system over the subject's working life, and shift intensity (i.e. time off between successive work days on the shift schedule).
<b>Occupational EMF exposures</b>								
Including induction/electric welding, induction/electric/gas oven, induction/electric hob, MRI, detection gate, industrial sewing machine, radar installations (last 3 months (EPIC/AMIGO), last 6 months (Nightingale))	√	√		H	√	√	√	Only questions relevant for nurses asked in Nightingale.
<b>Mobile phone use history[3]</b>								
First use (year)	√			Y	√	√	√	
Frequency of voice calls in 5 year period (categorical)	√	√		Y	√	√	√	
Duration of voice calls in 5 year period (categorical)	√	√		Y	√	√	√	
Hands-free usage in 5 year period (categorical)	√	√		Y	√	√	√	
<b>Mobile phone use in past 3 months[3]</b>								
Frequency and duration of voice calls (categorical)	√	√		Y	√	√	√	
Hands-free usage (categorical)	√	√		Y	√	√	√	
Mobile internet usage (categorical)	√	√		Y	√	√	√	
Smartphone usage (categorical)		√		Y	√ (F)	√ (F)	√ (F)	
Text messaging (categorical)	√	√		Y	√	√	√	
Internet usage (categorical; during the week and weekend)	√	√		N	√	√		
Tablet, computer usage (categorical)		√		N	√ (F)	√ (F)		
<b>Cordless phones[3]</b>								
First use at home (year)	√			Y	√	√	√	
First use at work (year)	√			Y	√	√	√	

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					AMIGO <sup>4</sup> (n=14829)	EPIC-NL (n=13961)	Nightingale (n=59941)	
Frequency of voice calls in past 3 months (categorical)	√	√		Y	√	√	√	
Duration of voice calls in past 3 months (categorical)	√	√		Y	√	√	√	
<b>Environmental exposures</b>								
Concerns about environmental exposures and health				N	√			
Perceived environmental exposures and health risks				N	√			
<b>Health and well-being</b>								
General well-being (SF-12)[4]	√	√		Y	√	√	√	
Headaches (HIT-6)[5], migraine (ID-Migraine)[6]	√	√		Y	√	√	√	Migraine questions more extensive in EPIC-NL follow-up.
Hearing and tinnitus	√	√		Y	√	√	√	
Sleep habits and problems (MOS Sleep Scale)[7]	√	√		Y	√	√	√	
Chronotype MCTQShift[8]/(MEQ)[9]				N		√ (B)	√	MEQ was assessed in EPIC-NL and Nightingale baseline. MCTQShift was assessed in Nightingale follow-up.
Recollection/memory				N	√			
Respiratory symptoms: (European Community Respiratory Health Survey)[10]	√	√		N	√	√		
Somatization symptoms (Four-Dimensional Symptom Questionnaire)[11]				N	√			
Stress (Sheldon Cohen Scale)[12]		√		N	√ (F)	√ (F)		
Historical and prevalent chronic diseases/conditions (self-reported doctor diagnosis and age at diagnosis) <sup>e</sup>	√	√		Y	√	√	√	See Table S3 for the prevalence rates for diseases/conditions that were assessed in all subcohorts, and footnote (e) for a list of conditions additionally assessed in specific subcohorts.
Medications (selected <sup>f</sup> )	√	√		H	√	√	√	See footnote (f).
Parkinson's disease screening[13]	√	√		N	√	√		
Family history of disease <sup>g</sup>	√	√		H	√	√	√ (B)	See footnote (g).
<b>Reproductive health (women only)</b>								
Menstruation	√	√		N	√ (F)	√	√	
Pregnancies	√	√		H	√	√	√	
Hormone use (incl. oral contraceptives, hormone replacement therapy)	√	√		N	√ (F)	√	√	
Fertility (incl. infertility treatments, time to pregnancy)	√	√		N	√ (F)	√	√	Time to pregnancy added at follow-up. Some questions (e.g., time to pregnancy) were not asked in EPIC-NL because this

Data	Baseline <sup>a</sup> (2011/2012)	Follow-up <sup>a</sup> (2015–2017)	Linkage (frequency)	Same data in all 3 <sup>b</sup> (Y/N/H)	Differences across 3 subcohorts <sup>c</sup>			Comments
					AMIGO <sup>4</sup> (n=14829)	EPIC-NL (n=13961)	Nightingale (n=59941)	
Birth outcomes	√	√		H	√ (F)	√	√	population was older (much time had elapsed pregnancy).
<b>OTHER DATA SOURCES</b>								
<b>Mobile phone traffic data from operators</b>								
Frequency and duration of voice calls	√	√	√ (monthly)	Y	√	√	√	Data is available for the subset that consented and were matched (~20%).
Frequency of text messages	√	√	√ (monthly)	Y	√	√	√	
Data use volume (kB)	√	√	√ (monthly)	Y	√	√	√	
<b>Routine health data (long-term follow-up)</b>								
Vital status (Municipal Personal Records Database; in Dutch: Basisregistratie personen) and cause of death registry (Statistics Netherlands)			√ ((bi)annually)	Y	√	√	√	WHO coding guidelines: Only one underlying cause of death is recorded; secondary causes are also recorded.
Netherlands Cancer Registry (including topography, morphological classification, date of diagnosis)			√ ((bi)annually)	Y	√	√	√	Classification: International classification of diseases for oncology (ICD-O). Data are available from 1989.
Hospital Discharge Registry (In Dutch: LBZ; previously LMR)			√ (periodically, depending on research projects)	N		√		Hospital admissions, outpatient consultation and emergency department visits (ICD-9 coding); data from 1995 onwards; coverage >80% of Dutch population.
General Practitioner database (NIVEL Primary Care Database)			√ (periodically, depending on research projects)	N	√			Diagnoses coded following International Classification of Primary Care (ICPC). Available for AMIGO only. EPIC-NL participants' general practitioners can be approached with questionnaires.

B, baseline; F, follow-up questionnaire; HIT, Headache Impact Test; MCTQShift, Munich ChronoType Questionnaire for Shift-Workers; MEQ, Morningness-Eveningness Questionnaire; MOS, Medical Outcomes Study; MRI, magnetic resonance imaging; SF, Short Form Health Survey.

<sup>a</sup> Baseline questionnaires were completed in 2011–2012. The first (comprehensive LIFEWORK) follow-up questionnaire was conducted in 2015–2017 to obtain repeated measures on the exposures and health outcomes; some additional topics were assessed at follow-up, as indicated. If a box is checked, data was collected in at least two subcohorts.

<sup>b</sup> Y/N/H indicates whether the data collected (in questionnaires or via registry linkages) was collected in exactly the same way (Y) across all three subcohorts; was collected but using different questions or collection methods and was (or can later be) harmonized following a standardized protocol (H); or was not collected across all three subcohorts of LIFEWORK (N).

<sup>c</sup> If checked data is collected at both baseline and follow-up in this cohort. B/F indicates whether the data was collected at only baseline (B) or only follow-up(F)

<sup>d</sup> AMIGO: two extra questionnaires were sent out in 2013 and 2014 to a subset of the population with respect to symptoms, environmental risk and perception. Refer to Martens et al.[14] for a description.

<sup>e</sup> Diseases/conditions assessed at baseline: asthma, Chronic Obstructive Pulmonary Disease (COPD), cancer (differences between cohorts), angina pectoris, heart attack, other heart disease, stroke, high blood pressure, diabetes, high cholesterol, chronic liver disease, thyroid disease, chronic inflammatory bowel disease (Crohn's disease/colitis ulcerosa, only AMIGO/Nightingale), stomach ulcer (only AMIGO/Nightingale), chronic fatigue syndrome, depression, Attention Deficit Hyperactivity Disorder (ADHD, only AMIGO/Nightingale), hearing problems/deafness, cataract, glaucoma, migraine, concussion, epilepsy, Parkinson's disease, Amyotrophic Lateral Sclerosis (ALS), Multiple Sclerosis (MS), Dementia/Alzheimer's disease, auto-immune disease (only AMIGO/Nightingale). More extensive questions on cancer [breast, lung, bowel, ovarian, uterine, cervical, endometrial, Hodgkin's lymphoma, non-Hodgkin's lymphoma, leukemia, skin cancer (melanoma, basal/squamous cell), pancreatic] were assessed in the Nightingale baseline questionnaire.

<sup>f</sup> Medication: aspirin, painkillers, medication for high blood pressure, medication for high cholesterol, asthma medication, sleep medication (Nightingale only), Parkinson disease medication, COPD medication (AMIGO/EPIC-NL only), diabetes medication (insulin/tablets), antidepressants, immunomodulators (Nightingale only). More extensive set of questions on hormone medications asked in Nightingale questionnaire.

<sup>g</sup> Family history asked for father/mother (AMIGO/EPIC-NL/Nightingale baseline and AMIGO/EPIC-NL follow-up), brothers/sisters (EPIC-NL/Nightingale baseline, AMIGO/EPIC-NL follow-up), sons/daughters (Nightingale baseline, AMIGO follow-up): cancer, diabetes, Parkinson's disease, Alzheimer's disease (not baseline EPIC-NL/AMIGO), stroke, heart attack, asthma, hay fever. More extensive questions on cancer in Nightingale (aunts' and grandparents' incidence of breast cancer, ovarian cancer, cervical cancer).

**Table S2.** Test-retest repeatability (maximum n=237) for mobile and cordless phone items in the LIFEWORK baseline questionnaire<sup>a</sup>

Variable	Overall			1–4 months <sup>b</sup>			≥ 5 months <sup>b</sup>		
	N	Percent Agreement	Reliability ( $\kappa_w$ or ICC)	N	Percent Agreement	Reliability ( $\kappa_w$ or ICC)	N	Percent Agreement	Reliability ( $\kappa_w$ or ICC)
<b>Past mobile phone use</b>									
Mobile phone use 2010 (frequency, categorical)	109	62.4	0.53	31	71.0	0.64	78	59.0	0.51
Mobile phone use 2005 (frequency, categorical)	109	61.5	0.67	31	71.0	0.59	78	57.7	0.69
Mobile phone use 2000 (frequency, categorical)	109	62.4	0.66	31	58.1	0.51	78	64.1	0.70
Mobile phone use 1995 (frequency, categorical)	109	78.0	0.33	31	74.2	0.52	78	79.5	0.27
Mobile phone use 1990 (frequency, categorical)	109	90.8	0.50	31	87.1	0.61	78	92.3	0.47
Mobile phone use 2010 (duration, categorical)	107	51.7	0.55	32	56.2	0.80	75	49.3	0.47
Mobile phone use 2005 (duration, categorical)	107	59.8	0.69	32	65.6	0.65	75	57.3	0.70
Mobile phone use 2000 (duration, categorical)	107	57.0	0.70	32	50.0	0.52	75	60.0	0.75
Mobile phone use 1995 (duration, categorical)	107	79.4	0.21	32	75.0	0.34	75	81.3	0.18
Mobile phone use 1990 (duration, categorical)	107	90.4	0.04	32	90.0	0.40	75	90.5	-0.04
Hands-free device use 2010 (categorical)	100	71.0	0.41	28	82.1	0.45	72	66.7	0.40
Hands-free device use 2005 (categorical)	100	80.0	0.45	28	89.3	0.46	72	76.4	0.45
Hands-free device use 2000 (categorical)	100	89.0	0.42	28	89.3	0.00	72	88.9	0.59
Hands-free device use 1995 (categorical)	100	96.0	0.22	28	96.4	0.00	72	95.8	0.29
Hands-free device use 1990 (categorical)	100	98.0	-0.01	28	96.4	0.00	72	98.6	0.00
Year starting using mobile phone	128	30.5	0.00	37	32.4	0.00	91	29.7	0.66
<b>Recent mobile phone use</b>									
Past 3 months: mobile phone use (frequency, categorical)	109	74.3	0.69	31	77.4	0.54	78	73.1	0.71
Past 3 months: mobile phone use (duration, categorical)	107	57.9	0.73	32	56.2	0.62	75	58.7	0.76
Past 3 months: hands-free use (categorical)	100	68.0	0.49	28	67.9	0.61	72	68.1	0.45
Number of mobile phones (continuous)	71	87.3	0.70	23	87.5	0.55	48	87.5	0.78
Past 3 months: number of text messages (categorical)	143	69.2	0.68	40	67.5	0.77	103	69.9	0.64
Laterality (left, right, equal, categorical)	138	78.3	0.69	38	84.2	0.76	100	76.0	0.66
<b>Cordless phone use</b>									
Talked on cordless phone regularly (yes/no)	225	87.6	0.39	78	93.6	0.67	147	84.4	0.25
Year starting using cordless phone at home (continuous)	160	23.1	0.62	54	24.1	0.75	106	22.6	0.56
Year starting using cordless phone at work (continuous)	64	37.5	0.62	28	39.3	0.65	36	36.1	0.60

Variable	Overall			1–4 months <sup>b</sup>			≥ 5 months <sup>b</sup>		
	N	Percent Agreement	Reliability (κ <sub>w</sub> or ICC)	N	Percent Agreement	Reliability (κ <sub>w</sub> or ICC)	N	Percent Agreement	Reliability (κ <sub>w</sub> or ICC)
Past 3 months: cordless phone calls (frequency, categorical)	185	61.0	0.51	68	64.7	0.58	117	57.3	0.46
Past 3 months: cordless phone calls (duration, categorical)	178	33.1	0.38	65	33.8	0.46	113	32.7	0.30

<sup>a</sup> Subjects who filled in the LIFEWORK baseline questionnaire twice within a period of less than 1 month (N=27) and men (N=1) were excluded from this analysis.

<sup>b</sup> Stratified by the number of months between participant's completion of the first subcohort's questionnaire and the second subcohort's questionnaire; 5 months approximates the median of 151 days.



**Table S3.** Self-reported health outcomes<sup>a</sup> (prevalence or ever diagnosed) at LIFEWORK baseline (2011–2012; n=88 466)

Disease	N	%
Asthma	5 724	6.5
COPD	2 667	3.0
Angina pectoris	2 163	2.4
Heart attack	967	1.1
Other heart condition	3 739	4.2
Stroke / TIA	1 230	1.4
High blood pressure	16 618	18.8
Type I diabetes	434	0.5
Type II diabetes	2 558	2.9
High cholesterol	9 951	11.2
Chronic liver disease	351	0.4
Thyroid-related disorder	5 273	6.0
Chronic fatigue syndrome	745	0.8
Migraine	9 003	10.2
Concussion (ever)	8293	9.4
Epilepsy	756	0.9
Parkinson’s disease	150	0.2
ALS	59	0.1
MS	322	0.4
Dementia/Alzheimer’s disease	85	0.1
Depression	7470	8.4
Deaf or hard of hearing	4656	5.3
Cataracts	3589	4.1

ALS, Amyotrophic Lateral Sclerosis; COPD, Chronic Obstructive Pulmonary Disease; MS, Multiple Sclerosis; TIA, Transient Ischemic Attack.

<sup>a</sup>This set of outcomes was assessed in the baseline and follow-up questionnaires of all three subcohorts: “Did a doctor ever diagnose you with any of the following diseases or conditions?” and age at first diagnosis. Additional outcomes were assessed in some subcohorts, as indicated in footnote (e) of Table S1.

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