



Cohort Profile

Cohort Profile: The Swedish Longitudinal Occupational Survey of Health (SLOSH)

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Editorial decision 17 November 2017; Accepted 29 November 2017

Why was the cohort set up?

Sweden has played a major role in the development of psychosocial work environment research.¹ In addition, Sweden, along with the other Nordic countries, has unique possibilities to link questionnaire data to administrative registers on demographics, employment and health. Despite this, the country has not previously had a prospective cohort with regularly repeated measures of work environment and health. The strengths of longitudinal studies in epidemiological research, as opposed to cross-sectional studies, are well known. Still, a significant part of the available evidence on associations between psychosocial work characteristics and health has been based on cross-sectional studies, making it difficult to separate cause and effect. Both selection and reverse causation are often plausible alternatives to a causal interpretation.^{2,3} Associations may also be inflated by common method bias, since self-ratings are often used for both exposures and outcomes.⁴ Repeated measures of both psychosocial work factors and health outcomes have become more common, but are often treated with cross-sectional methodologies using information on exposure variables from one time point to predict outcome variables from the next.⁵ Although preferable to cross-sectional studies, such approaches do not rule out reverse causation and contribute little or no understanding of causal mechanisms. Longitudinal studies with multiple repeat measures of both exposures and outcomes are therefore needed to advance our understanding of causality.

The need for a life course perspective on social causes of disease is also increasingly recognized. This includes the need to study the effects of accumulated exposures, differential effects in different phases of life (critical or sensitive periods), and chains of risk (where the disease outcome can be distal from the original social cause).^{6,7} Life course studies thus require cohorts that follow people during longer periods of their lives. This may be particularly salient in studies of labour market exposures, since earlier studies have often had an unstated and unrealistic assumption that work environment exposures are stable. The post-industrial labour market is in fact characterized by a relatively high degree of change, where individuals can expect to have many jobs, often in different occupations, across their working lives, possibly interspersed with spells of unemployment or further education.

Internationally, there are several major longitudinal cohort studies with a focus on work environment and health. Some of them, such as the Whitehall II study in England,⁸ the French GAZEL cohort^{9,10} and the Finnish Public sector study,¹¹ have multiple repeat measures on a range of factors concerning work, private life and health. All of these studies are, however, restricted to specific groups of employees: civil servants, employees at a gas or electricity company, or public sector employees, respectively. Existing nationally representative cohort studies, such as the prospective panels of the Danish Work Environment Cohort Study¹² and the Swedish Level of Living Survey,¹³

have relatively infrequent follow-ups, limited sample size and/or do not measure both work environment and health extensively, limiting their utility for studies of health effects of the psychosocial work environment.

In 2006, the Swedish Longitudinal Occupational Survey of Health (SLOSH) was initiated by the former Institute for Psychosocial Medicine (now the Stress Research Institute, Stockholm University) in Sweden to redress these issues. SLOSH was conceived as a follow-up of the cross-sectional Swedish Work Environment Survey (SWES), making it approximately representative of the country's active workforce. SLOSH uses both postal questionnaires with a wide range of questions on work organization, work environment and health, and administrative register data to follow the respondents irrespectively of their employment status. Because results from the study will be generalizable to a variety of occupations and sectors, SLOSH was anticipated to make a unique contribution to our understanding of the relationships between work organizations, work environment and health. The original overall aim was 'to further work environment research by a longitudinal approach in a nationally representative survey of the Swedish working population'. As the cohort ages and more people retire or leave the labour market permanently or temporarily, the study becomes increasingly valuable also for research on retirement, unemployment, precarious work etc. The aim has thus been expanded to the investigation of longitudinal associations between work organization, work environment, labour force participation, health and well-being, taking social conditions, individual differences, health behaviours, coping strategies, work-private life interaction, sleep and ageing into account.

The study was initially funded by the Swedish Council for Working Life and Social Research (FAS, now Forte) and has subsequently been supported by the Swedish Research Council (VR) and by Stockholm University. The cohort has additionally benefited from Stockholm Stress Centre, a Forte (Swedish Research Council for Health, Working Life and Welfare) Centre of Excellence.

Who is in the cohort?

The SLOSH cohort thus far comprises participants in Swedish Work Environment Surveys (SWES) 2003, 2005, 2007, 2009 and 2011. The SWES participants are in turn sampled from the Labour Force Survey (LFS) conducted biennially by Statistics Sweden.¹⁴ Usually more than 20 000 persons randomly drawn from the entire Swedish population, stratified by county, sex, citizenship and inferred employment status, are biennially asked to participate in the LFS. These people are then contacted by telephone, from among whom a random sub-sample of gainfully employed

people, 16-64 years of age, are sent self-completion SWES questionnaires.

The numbers of participants in SWES 2003-11 have varied over the years: 9214 in 2003, 9703 in 2005, 7729 in 2007, 6354 in 2009 and 7926 in 2011, representing about 50-64% of the individuals invited to LFS. A few participated in several of the surveys, resulting in a total cohort of 40 877 individuals.

The first follow-up (wave 1) was conducted in 2006, when SWES 2003 respondents were followed up. Since then, further follow-ups have been conducted every second year (see also [Figure 1](#)). In 2008, all eligible respondents to SWES 2003 were contacted for a second time (wave 2), when the study was extended by also inviting participants from SWES 2005. In 2010 (wave 3), all eligible respondents from SWES 2003 and 2005 were contacted again for a third or second time, respectively, and the study was extended with an additional sub-cohort consisting of participants in SWES 2007 from the counties of Stockholm and Västra Götaland, to allow for in-depth studies involving psychological and physiological tests requiring visiting a research department or laboratory. In 2012 (wave 4), all eligible participants of SWES 2003 and 2005 were invited to participate for a fourth or third time, respectively. In 2014 (wave 5) and 2016 (wave 6), however, all participants in SWES 2003 and 2005, as well as 2007, 2009 and 2011, were invited. The data collection is illustrated in [Figure 1](#), according to the baseline sub-cohort (SWES cohort).

Those who were invited were asked to respond to one of two versions of the questionnaire, whichever best suited their situation. People in paid work for 30% or more of full time during the past 3 months were asked to fill in a questionnaire for people in paid work $\geq 30\%$ ('workers'), whereas those in paid work less than 30% or not working at all, who had left the labour market temporarily or permanently, were asked to fill in a questionnaire for those in paid work $< 30\%$ ('non-workers'). The questionnaires were mainly postal self-completion pen and paper questionnaires, but in 2012, in an effort to evaluate the possibility to move to web questionnaires, some respondents were given a possibility to respond via the internet. As this did not increase the response rate, only pen and paper versions have been used since.

The response rates and more details about the data collection are presented in [Supplementary Table 1](#), available as [Supplementary data](#) at *IJE* online. The overall response rate to the follow-up questionnaires has varied from 65% in 2006 (5985 respondents; 5141 to the 'worker questionnaire' and 844 to the 'non-worker questionnaire'), to 61% in 2008 (11 441 respondents; 9756 to the 'worker questionnaire' and 1685 to the 'non-worker questionnaire'), 57% in 2010 (11 525 respondents; 9132 to the 'worker

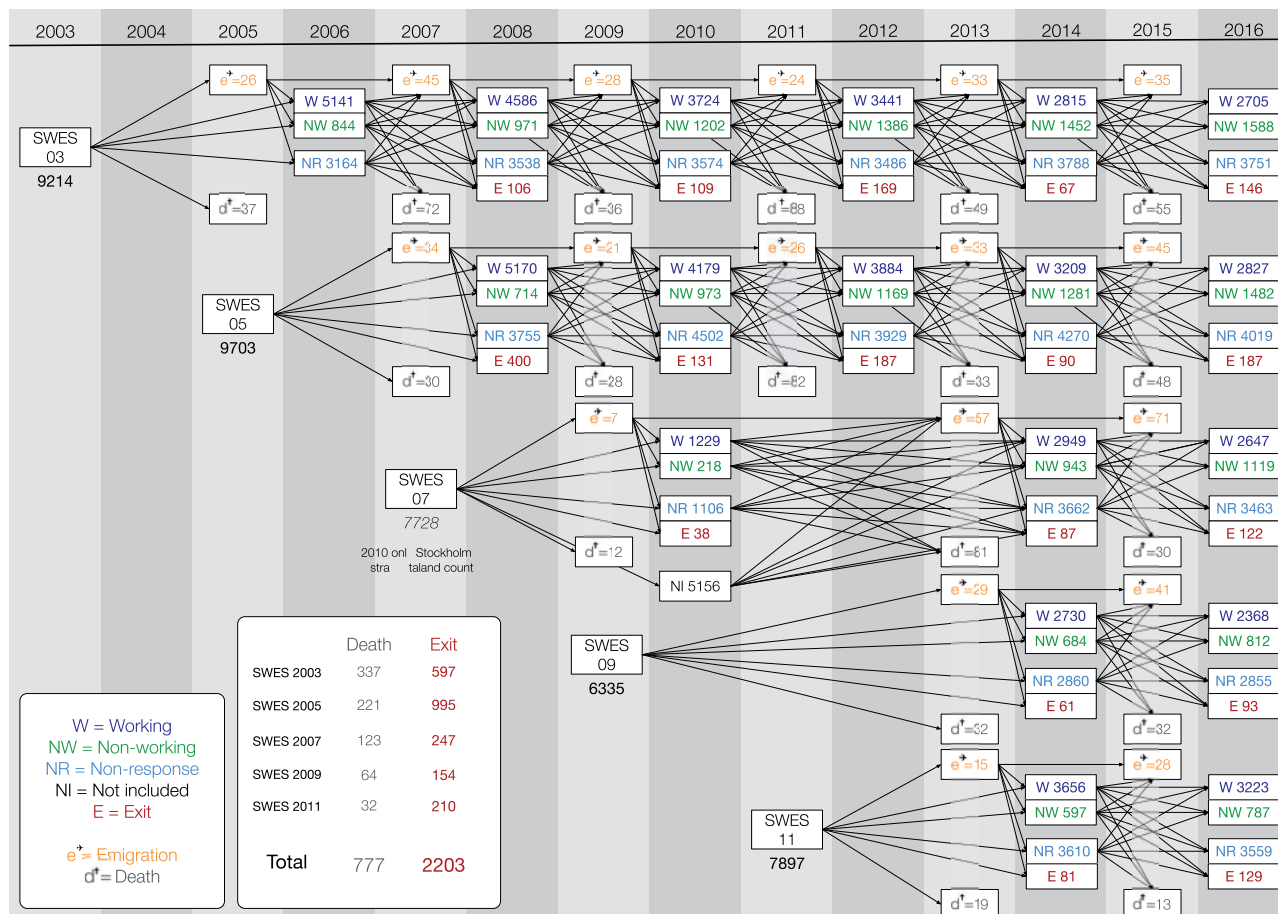


Figure 1. SLOSH study design and data collection 2006 to 2016. The figure also illustrates the number of respondents to the different versions of the questionnaire (W=“Working”, i.e. in paid work 30 % or more of full time during the past 3 months, NW=“Non-working”, i.e. in paid work <30 % of full time during the past 3 months or not at all) and the number of people exiting the study (E, i.e. declined further participation), emigrated (e) or had died (d) each wave. It should, however, be noted that the numbers do not completely add up because some of the respondents, non-respondents are also included among those exiting the study i.e. reporting that they did not want to participate in future surveys. Furthermore, some SWES participants were not eligible because of unknown address etc.

questionnaire’ and 2393 to the ‘non-worker questionnaire’), 57% in 2012 (9880 respondents; 7325 to the ‘worker questionnaire’ and 2555 to the ‘non-worker questionnaire’), 53% in 2014 (20 316; 15 359 responded to the ‘worker questionnaire’ and 4957 to the ‘non-worker questionnaire’) and 51% in 2016 (19 360 respondents; 13 572 responded to the ‘worker questionnaire’ and 5788 to the ‘non-worker questionnaire’).

Since occupational status is unknown among non-responders to LFS, it is uncertain how well the respondents represent the overall working population. Demographic information provided in SWES or derived from registers can, however, be used to compare respondents and non-respondents to SLOSH questionnaires. Table 1 shows sociodemographic characteristics complemented with information about health and work-related factors for all respondents to SWES 2003 and of responders/non-responders to the first SLOSH follow-up. A general pattern is that women are more likely to respond to the SLOSH

questionnaires than men, older people more than younger and married more than unmarried. The likelihood to respond is also higher among university educated and those born in Sweden.

In addition to questionnaire follow-ups, the SWES respondents 1989-2001 and 2013 (an additional 78 122 individuals among whom a minority have participated more than once) have been followed up through national registers and provide a complementary data resource for analyses of prospective relationships between working conditions and health, e.g. studies of rare exposures/outcomes and subgroups.

How often have they been followed up?

SLOSH questionnaires have thus far been sent out six times, i.e. every 2 years from 2006 to 2016, and data will continue to be collected in the same way in the foreseeable future. However, new sub-cohorts have been followed up

Table 1. Sociodemographic characteristics of the participants in SWES 2003 and of responders/non-responders to the first SLOSH follow-up (wave 1) in 2006

	All SWES 2003 participants, <i>n</i> = 9214	SWES 2003 participants not responding to SLOSH 2006, emigrated or dead, <i>n</i> = 3226	SWES 2003 participants responding to SLOSH 2006, <i>n</i> = 5985	Responders to SLOSH 2006 follow-up 'working', <i>n</i> = 5141	Responders to SLOSH 2006 follow-up 'non-working', <i>n</i> = 844
Women (%)	51.3	45.2	54.6	53.2	62.7
Mean age in years (range)	43.2 (16-65)	40.6 (16-65)	44.6 (16-65)	44.4 (16-65)	45.8 (16-65)
Born in Sweden (%)	97.4	97.0	97.6	97.7	97.0
Married/registered partner (%)	49.8	44.3	52.7	53.3	49.3
Region of living (%)					
Big cities	67.6	68.4	67.2	67.9	63.0
Medium-sized cities	25.5	25.2	25.7	25.4	28.0
Small cities/villages	6.9	6.4	7.1	6.8	9.0
Education (%)					
Low	14.3	16.2	13.3	12.1	20.5
Intermediate	50.0	54.2	47.7	47.5	49.1
High	35.7	29.7	39.0	40.4	30.4
Socioeconomic position (%)					
Unskilled employees	25.7	30.6	23.1	21.3	34.1
Skilled employees	17.8	20.9	16.2	16.5	14.3
Assistant non-manual employees	14.6	13.4	15.3	15.0	16.6
Intermediate non-manual employees	25.6	21.5	27.7	28.4	23.3
Professionals and upper-level executives	16.4	13.7	17.8	18.8	11.7
Sector (%)					
Public sector	40.9	34.8	44.3	44.5	42.4
Private sector	59.1	65.2	55.8	55.5	57.7
Job strain ^a (%)	24.9	24.2	25.3	25.1	26.3
Low support ^a (%)	38.2	37.9	38.4	37.8	42.3
Subjected to personal persecution/ bullying in past year (%)	8.5	8.7	8.4	7.9	10.9
Exposed to violence or threats of violence in past year (%)	14.4	12.7	15.3	15.2	15.8
Mean number of gross days with sick leave 2003 (range)	12.9 (0-527)	13.3 (0-527)	12.7 (0-367)	10.2 (0-367)	27.8 (0-334)

^aAssessed by a proxy of the demand-control-support model.

successively, as illustrated in Figure 1. Up to 2016, SWES 2003 participants have been followed up six times, and the SWES 2005 participants have been followed up five times. People participating in SWES 2007 from Stockholm and Västra Götaland counties, have been followed up three times, whereas participants in SWES from other parts of the country and from SWES 2009 and 2011 have been followed up twice.

Each time, all eligible participants in the baseline SWES surveys of concern (see Figure 1) were invited who were still alive, living in the country and with known address and who had not actively opted out of the study earlier. Only a portion of the eligible participants from SWES 2007 were, however, invited in 2010. All in all, 28 672

(70%) of the 40 877 individuals included in SWES 2003-11 had responded to a follow-up questionnaire at least once by 2016. Out of those respondents, 7384 had responded once, 10 149 twice, 2673 three times, 2079 four times, 3832 five times and 2555 six times. In total, 2203 individuals had actively opted out by 2016.

Those lost to follow-up appear to differ to some extent from those responding repeatedly. This is exemplified in Table 2 for the SWES 2003 sub-cohort, showing that characteristics of the respondents to the second, third, fourth fifth or sixth follow-ups differed slightly from those of all respondents in 2006. The same pattern was also observed for the SWES 2005 cohort.

Table 2. Characteristics of all respondents to the first SLOSH follow-up (wave 1) and those responding up to six times

	Respondents to SLOSH 2006 (first wave), <i>n</i> = 5985	Responders to SLOSH 2006 and 2008 (all 2 subsequent waves), <i>n</i> = 4690	Responders to SLOSH 2006-2010 (all 3 subsequent waves), <i>n</i> = 3884	Responders to SLOSH 2006-2012 (all 4 subsequent waves), <i>n</i> = 3340	Responders to SLOSH 2006-2014 (all 5 subsequent waves), <i>n</i> = 2868	Respondents to SLOSH 2006-2016 (all 6 subsequent waves), <i>n</i> = 2555
Women %	54.6	55.6	56.6	57.1	57.5	57.5
Mean age, years (range)	47.6 (19-68)	48.4 (19-68)	49.3 (19-68)	49.8 (20-68)	50.2 (20-68)	50.4 (20-68)
Married/registered partner %	52.7	54.4	56.5	57.5	58.0	59.1
Born in Sweden %	97.7	97.9	98.0	97.9	98.2	98.2
University education %	40.5	42.0	42.8	43.5	44.2	45.1
Public sector %	44.6	46.5	47.7	48.8	49.8	49.4
Current smoking %	11.6	11.2	10.8	10.5	10.2	10.0
Excess alcohol consumption ^a %	5.1	4.7	4.5	4.5	4.6	4.6
Physical inactivity ^b %	19.5	18.6	17.8	17.5	17.2	17.0
Obesity (BMI ≥ 30) %	14.9	14.8	14.9	15.2	15.4	14.9
Longstanding illness/disability %	22.6	23.3	23.3	23.1	23.1	23.2
Suboptimal self-rated health ^c %	19.9	19.5	19.1	19.4	19.3	19.0
Symptoms of major depression ^d %	5.3	4.9	5.0	4.8	4.6	4.4
	Respondents and 'working' 2006 (first wave), <i>n</i> = 5141	Respondents and 'working' 2006-08 (all 2 subsequent waves), <i>n</i> = 3644	Respondents and 'working' 2006-10 (all 3 subsequent waves), <i>n</i> = 2670	Respondents and 'working' 2006-12 (all 4 subsequent waves), <i>n</i> = 2017	Respondents and 'working' 2006-14 (all 5 subsequent waves), <i>n</i> = 1537	Respondents and 'working' 2006-16 (all 6 subsequent waves), <i>n</i> = 1205
Job strain ^e %						
Low social support %	30.3	30.7	29.8	29.1	29.2	29.3
Effort-reward imbalance ^f %	51.4	52.3	51.6	52.3	53.3	54.2
Subjected to personal persecution/bullying in past year %	14.3	14.5	15.2	14.2	14.2	14.0
Exposed to violence or threats of violence in past year %	17.4	17.6	17.6	17.8	18.3	19.0
Suboptimal self-rated health %	19.9	18.9	18.0	18.3	17.9	17.1

^aDefined as excessive if exceeding 20 units (men) or 13 units (women) weekly, or five units per occasion at least weekly (see more Magnusson Hanson *et al.* 2016³³).

^bDefined as very little or no exercise (see more Magnusson Hanson *et al.* 2016³³).

^cDefined as poor or neither good nor bad self-rated health (see more Leineweber *et al.* 2013²⁰).

^dDefined as symptom scores of 17 or higher on the Symptom Checklist Core Depression Scale (see more Magnusson Hanson *et al.* 2014²²).

^eDefined in accordance with the demands-control model (see more Fransson *et al.* 2015³¹).

^fDefined as a ratio of efforts that exceeded rewards in return (see more Siegrist *et al.* 2004³⁴).

What has been measured?

Although some questions from SWES are repeated in the SLOSH follow-up, the follow-up questionnaires include a broader set of questions compared with the LFS interviews and SWES questionnaire. The two different versions of the questionnaire (one for 'workers' and one for 'non-

workers') were developed to more specifically assess the respondents' situation at follow-up. Both assess health (part 2), health-related behaviours and social situation (part 3), whereas part 1 focuses on either factors related to working life or factors related to having left active working life temporarily or permanently. An overview of the main

Table 3. Overview of questionnaire measures included at least once in SLOSH^a

Main category of information	Main subcategories of information	Example of scales included
Baseline SWES questionnaire		
Work situation	Working time, Physical exposures, Working postures and movements, Stress and social contacts, Demands, difficulties and support, Influence, Risks and threats, Education and learning, Work environment management, Occupational health service	Proxies for psychological demands, control and support
Health and health-related measures	Feelings after work, Health-related symptoms, Recovery/rest, Sickness presenteeism	
SLOSH working >= 30%		
Part 1 Work situation	Employment and work, Changes regarding employment and workplace, Physical work environment, Cohesion at work, collaboration, social support, Demands, Control, Effort-reward imbalance, Resources and responsibilities, Democracy, Influence, Organizational justice, Risks and insecurity at work, Conflicts, threat and violence, Leadership, Management, New technology and flexible working conditions, self-employed, Lean production, Coping, Over-commitment, Performance-based self-esteem, Working hours, Overtime, Control over working hours, Time use, Work-family conflict/enhancement, Elderly at work, Retirement, Past, future and qualifications	Psychological demands, decision latitude and social support, ³⁵⁻³⁸ Efforts and rewards from the Effort-reward imbalance scale, ^{39,40} Procedural justice from organizational justice, ⁴¹ Leadership from GLOBE, ⁴² Leadership climate, ⁴³ Work-time control, ⁴⁴ Time use, ⁴⁵ Work-to-family conflict and Work-to-family enhancement, ^{46,47}
Part 2 Health and well-being	Self-rated health, Physical health, Work-related health, Health symptoms, Diseases, Long-term stress, Sleep, Cognition, Symptoms of emotional exhaustion and depression, Sickness absence, Sickness presentee-ism, Work incapacity, Hearing, Humour, Length, Height, Dietary habits, Angina pectoris, Relaxation techniques	Emotional exhaustion subscale from the Maslach Burnout Inventory-General Survey (MBI-GS), ⁴⁸ Symptom Checklist Core depression (SCL-CD ₆) subscale from the Symptom Checklist 90, ²² Cognitive complaints, ⁴⁹ a newly developed long-term stress scale, Sleep disturbances and awakening problems from the Karolinska Sleep Questionnaire ⁵⁰
Part 3 Health related behaviors and social situation	Family situation and social support, Education, Socioeconomic status and early socioeconomic status, Life events, Health behaviours such as smoking, alcohol consumption, physical activity, Life satisfaction, Economic situation	The MacArthur Scale of Subjective Social Status, ⁵¹ Alcohol use disorders identification test (AUDIT) ⁵² /Cut-Annoyed-Guilty-Eye Questionnaire (CAGE) ⁵³
SLOSH non-working or working < 30%		
Part 1 Non-work situation	Current situation, About having stopped working, Work situation at previous work, Experiences and reactions at having stopped working, New job, Work training, Rehabilitation, Experience of employment measures and contact with authorities, Experience of retirement, Care of relatives	Economic hardship and shame ⁵⁴
Part 2 Health and well-being	Self-rated health, Physical health, Work-related health, Health symptoms, Diseases, Long-term stress, Sleep, Cognition, Mental health including symptoms of emotional exhaustion and depression, Sickness absence, Sickness presentee-ism,	A modified version of the Emotional exhaustion subscale from the Maslach Burnout Inventory – General Survey (MBI-GS), ⁴⁸ Symptom Checklist Core depression subscale (SCL-CD ₆ from the Symptom Checklist 90, ²² Cognitive complaints, ⁴⁹ A newly developed long-term stress scale, Sleep disturbances and awakening problems from the Karolinska Sleep Questionnaire, ⁵⁰ Physical functioning, Role-physical, Bodily pain, General health, Vitality, Social functioning, Role-emotional and Mental health scales from SF-36 ⁵⁵

(continued)

Table 3. Continued

Main category of information	Main subcategories of information	Example of scales included
Part 3 Health related behaviours and social situation	Family situation and social support, Education, Socioeconomic status and early socioeconomic status, Life events, Health behaviours such as smoking, alcohol consumption and physical activity, Life satisfaction, Economic situation	The MacArthur Scale of Subjective Social Status, ⁵¹ Alcohol use disorders identification test (AUDIT) ⁵² /Cut-Annoyed-Guilty-Eye Questionnaire (CAGE) ⁵³

^aBoth SWES and SLOSH surveys have changed through the years. For more details concerning which years core items and scales have been measured in the SLOSH follow-ups, see [Supplementary Table 2a-d](#) (available as [Supplementary data](#) at *IJE* online). An even more complete documentation can be retrieved by request from the SLOSH data manager. For details on what items are measured in what years in SWES, we refer to documentation by Statistics Sweden.

categories of items and scales is presented in [Table 3](#). Certain core questions are measured in all waves, but some items and scales have changed over time. In [Supplementary Tables 2-4](#) (available as [Supplementary data](#) at *IJE* online), more information is given about when core items and scales have been included. The questionnaire content is supplemented by a range of information from public administrative registers including, for example, data on demographics, employment, sickness absence, hospital diagnoses, mortality and prescribed redeemed drugs. The same information was linked to the participants of SWES 1989-2001 and 2013. An overview of the information retrieved from these registers is given in [Table 4](#).

What has been found? Key findings and publications

As more follow-up data are collected, the findings from SLOSH are increasingly based on advanced modelling of repeat data, with the aim of providing better evidence of the potential causal links between psychosocial labour market exposures and health statuses. One example of this, with important implications, is a study examining the cross-lagged relationships between workplace demand, control and support, on the one hand, and disturbed sleep and awakening problems on the other. The results suggested reverse and reciprocal—in addition to the commonly hypothesized causal—relationships between work characteristics and sleep problems, based on a 2-year time lag.¹⁵ In particular, sleep disturbances were found to predict worsened social support, rather than vice versa. These findings are in agreement with experimental studies from our institute, which show that sleep-deprived people elicit more negative perceptions in others.¹⁶ Prevention and treatment of sleep problems might therefore have positive effects on people's perceived and actual psychosocial work environment. A further study used four waves of questionnaire data to investigate sleep as a possible mediator of the long-term relationship between psychosocial working conditions and depressive symptoms ([Figure 2](#)).¹⁷ Although partial mediation was found, sleep does not appear to be a

major mediator of this relationship. In line with the earlier study, however, we found evidence for an effect of depression on later workplace social support.

In other studies, working conditions, career development and health have been in focus, showing both similarities and differences in prediction of promotion/salary increase between men and women.¹⁸ Job promotion also appeared to increase depressive symptoms and a decrease self-rated general health, at least in a short-term perspective.¹⁹

Work-family conflict/work-home interference has also been the focus of a series of SLOSH-based studies. Interestingly, there was a clear prospective relationship with self-rated health²⁰ and risk of self-rated major depression²¹ in women, but not in men. In contrast, men but not women had an increased risk of problem drinking²⁰ and treatment with antidepressant medication.²² The risk of emotional exhaustion was elevated in both sexes following high work-family conflict. This indicates a need to look for different symptoms in women and men. Other papers have investigated the ageing workforce and retirement where, for example, voluntary work in later life has been associated with lower self-reported cognitive complaints and a lower risk of dementia.²³

Several studies based on SLOSH have furthermore examined the validity and psychometric properties of scales used in the questionnaires. A short measure of effort reward imbalance (ERI) exhibited satisfactory psychometric properties and criterion validity.²⁴ The brief depression scale in SLOSH, the Symptom Checklist-Core Depression scale (SCL-CD₆), was found to be valid as a measure of depression.²² It showed higher unidimensionality than the commonly used Center for Epidemiological Studies-Depression Scale (CES-D) and may thus be better suited as a severity measure. A cut-point indicative of major depression was suggested and proved predictive of both antidepressant treatment and hospitalization in depressive episodes. In another paper, the factor structure and invariance across time of the Demand-Control Questionnaire was examined, confirming the four factors of psychological demand, skill discretion, decision authority and

Table 4. Overview of register data linked to SLOSH

Authority	Register/source	Example of information retrieved	Years
Statistics Sweden	LISA, integrated database for labour market research	Sociodemographic characteristics, Children 0-6 years of age, Emigration, Income from work, Age-related pension, Early retirement, Unemployment benefits, Studies, some benefits from the social insurance agency, Education, Occupational status, Sector, Branch of business, Enterprise, Establishment. Information about enterprises where people are employed including e.g. if enterprise has changed staff considerably, Number of employees, Economic data on establishments, municipalities, county councils	1985 ^{a,b}
National Board of Health and Welfare	Patient register, inpatient data	Dates for hospital admission, Diagnoses, and Scope of medical practice	1964 ^{b,c}
	Patient register, outpatient data	Date for hospital outpatient care, Diagnoses, and Scope of medical practice	2001 ^{b,c}
	Cancer register	Diagnoses, Date of diagnoses, Localization, Tumour incidence, Histopathology, Benign tumours	1958 ^b
	Causes of death register	Date of death, Underlying cause of death, Multiple cause of death, Accident, injury/poisoning	1961 ^b
	Statistics on myocardial infarctions based on the Patient and Causes of death register	Date of incidence, Main diagnosis, Age, Consecutive number for the incidence, Death	1990 ^b
	Prescribed drug register	Date of redeemed prescriptions from a pharmacy, Name of drug, ATC code, Amount, Scope of practice	2005 ^{d,c}
The Swedish Social Insurance Agency	Microdata for analysis of the Social Insurance	Sickness absence e.g. Timing, Extent, Diagnosis and early retirement, Sickness benefit/activity compensation such as date, extent, Diagnosis or reason	1994 ^b

^aInformation about establishments is available from 1985 and onwards, and about e.g. sociodemographics and occupational status is available from 1987, certain benefits from 1993 and onwards and certain economic data from 1997.

^bCurrently being updated up to 2015-16.

^cA selection of diagnoses or ATC groups from 2009 onwards.

^dCurrently being updated up to 2017.

social support.²⁵ Improved model fit was, however, obtained if two items were excluded. The factor structure was also demonstrated as fairly stable across time.

SLOSH is moreover part of the IPD-Work consortium, in which individual participant data meta-analyses are carried out based on many datasets across Europe on working conditions and health/health-related factors. SLOSH data have, for instance, been used in studies that have found job strain to be a risk for leisure time physical activity,²⁶ high alcohol intake,²⁷ smoking,²⁸ body mass index (BMI),²⁹ diabetes,³⁰ stroke³¹ and depression.³² For more information about publications and the study, see [www.slosh.se].

What are the main strengths and weaknesses?

The main strength is that SLOSH is a large nationally representative cohort of persons who are followed repeatedly over a long period of their lives, irrespective of employment status at follow-up. This allows for the assessment of how health and well-being are influenced by labour market

participation, accumulation of work environment exposures, and interactions between working life and private life. Repeat data on exposures, mediators and outcomes furthermore make it possible to analyse potential mechanisms and causal pathways, which in turn can give better evidence of causation and point to possible targets for intervention. SLOSH also includes a range of measures comparable to other international cohorts.

A potential limitation is that healthy-worker selection at baseline and the accumulated health selection and attrition over time can threaten the generalizability of the findings. Another limitation is that all information about work environment and social situation, as well as many health variables, are self-rated, introducing the risk of common method variance. Furthermore, the nationally representative sample does not allow multi-level methodology to be used to empirically separate individual- from workplace-level exposures. To some extent, these problems are mitigated by the fact that comprehensive information from public registers can be combined with self-reports. Information from registers can also be used to limit

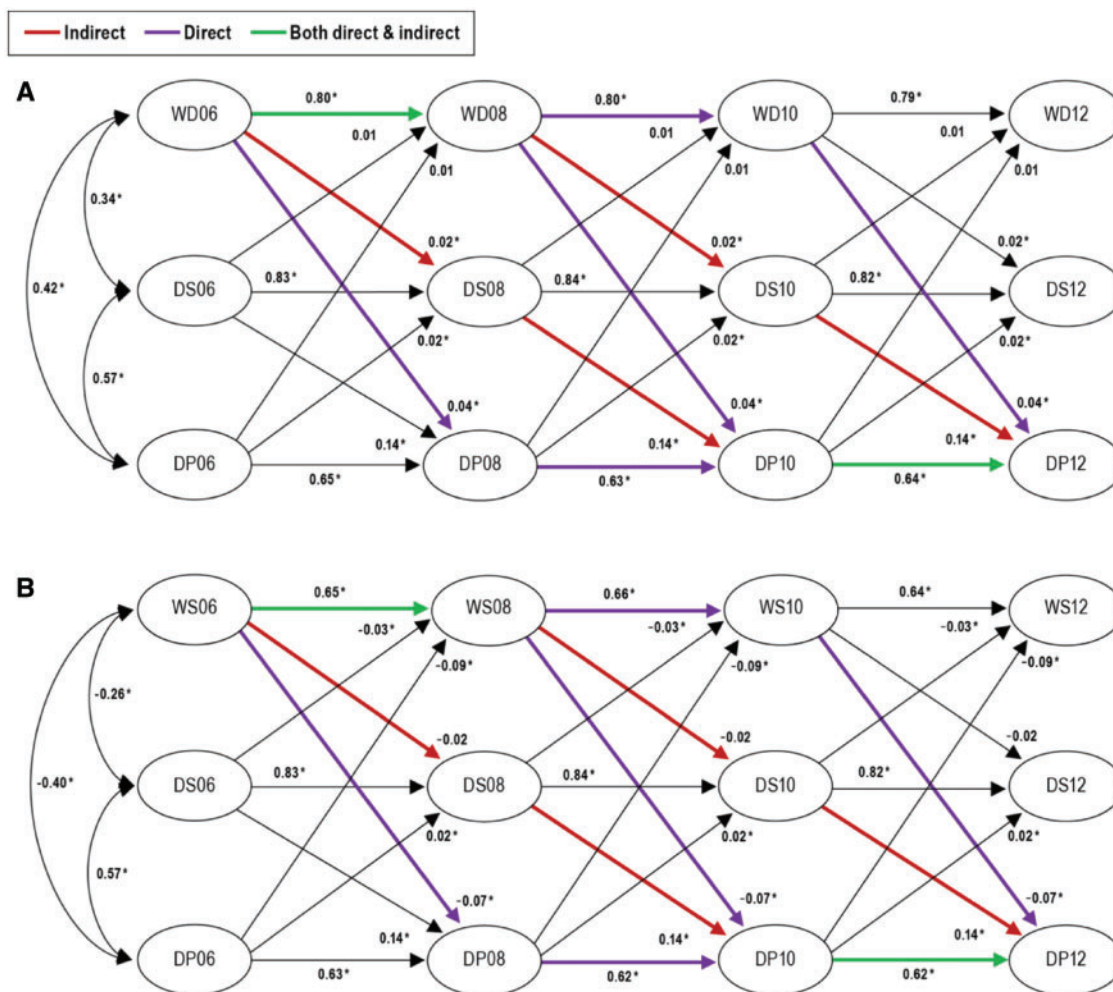


Figure 2. (A) Standardized structural coefficients for the mediation model of work demands sleep disturbances, and depression. WD, work demands; DS, disturbed sleep; DP, depression. (B) Standardized structural coefficients for the mediation model of workplace support sleep disturbances, and depression. WS, workplace support; DS, disturbed sleep; DP, depression. In Magnusson Hanson et al. 2014.²¹ The Role of Sleep Disturbances in the Longitudinal Relationship Between Psychosocial Working Conditions, measured by Work Demands and Support, and Depression. SLEEP 2014;37: 1977-1985 Reproduced with permission from the publisher.

confounding by taking into account additional relevant covariates, as well as to minimize loss to follow-up—which is virtually zero for those living in Sweden. Register data further extend the possibilities for relevant analyses on numerous research questions and enable more severe health outcomes and death to be studied.

Can I get hold of the data? Where can I find out more?

A strategy for data access has been developed, which strives to make SLOSH data as accessible as possible while satisfying legal requirements and ethical principles as well as protecting the personal privacy of the participants. A freely available online data visualization tool at [http://slosh.daxplore.org/] has been developed, aimed primarily at users outside the scientific community. Requests for

data for specific research projects or collaborations are welcome, and can be addressed to [data@slosh.se]. The application form and more information about the study can be found at [www.slosh.se].

Supplementary Data

Supplementary data are available at *IJE* online.

Profile in a nutshell

- The Swedish Longitudinal Occupational Survey of Health (SLOSH) is a longitudinal cohort study with repeated follow-ups aiming to investigate longitudinal associations between work organization, work environment, labour force participation, health and well-being, taking social conditions, individual

differences, health behaviours, coping strategies, work-private life interaction, sleep and ageing into account.

- In SLOSH, several nationally representative subsamples of working individuals, 16-64 years of age at inclusion, responding to baseline questionnaires, have been followed up biennially with more comprehensive self-report questionnaires.
- Since the start in 2006, six waves of follow-up data have been collected with successively increasing numbers of men and women invited. In total 40 877 individuals have been invited, and 28 672 (70%) have responded to follow-up questionnaires at least once.
- Further waves of follow-up are planned in 2018 and every second year in the foreseeable future.
- The follow-up questionnaires include a wide range of measures on work or non-work situation/leaving the labour force temporarily or permanently, social situation, health and well-being. The questionnaire data are also linked to register data on demographics, employment, enterprises and establishments and health.
- A strategy for data access has been developed, striving to satisfy legal requirements and ethical principles. Requests for data for specific research questions or collaboration are welcome via email: [data@slosh.se]. For more information, visit [www.slosh.se].

Funding

The Swedish Longitudinal Occupational Survey of Health (SLOSH) has been supported by the Swedish Research Council for Health, Working Life and Welfare (FORTE) [grant #2005-0734 and #2009-1077], the Swedish Research Council (VR) [#2009-6192, #825-2013-1645 and #821-2013-1646] and through the Stockholm Stress Centre of Excellence financed by the Swedish Research Council for Health, Working Life and Welfare [#2009-1758].

Conflict of interest: None declared.

References

1. Karasek R, Baker D, Marxer F, Ahlbom A, Theorell T. Job decision latitude, job demands, and cardiovascular disease: a prospective study of Swedish men. *Am J Public Health* 1981;71: 694–705.
2. Zapf D, Dormann C, Frese M. Longitudinal studies in organizational stress research: a review of the literature with reference to methodological issues. *J Occup Health Psychol* 1996;1:145–69.
3. Tang K. A reciprocal interplay between psychosocial job stressors and worker well-being? A systematic review of the 'reversed' effect. *Scand J Work Environ Health* 2014;40:441–56.
4. Podsakoff PM, MacKenzie SB, Lee JY, Podsakoff NP. Common method biases in behavioral research: a critical review of the literature and recommended remedies. *J Appl Psychol* 2003;88: 879–903.
5. Bub KL, Ferretti LK. Cutting-edge statistical methods for a life-course approach. *Adv Nutr* 2014;5:46–56.
6. Ben-Shlomo Y, Kuh D. A life course approach to chronic disease epidemiology: conceptual models, empirical challenges and interdisciplinary perspectives. *Int J Epidemiol* 2002;31:285–93.
7. Kuh D, Ben-Shlomo Y, Lynch J, Hallqvist J, Power C. Life course epidemiology. *J Epidemiol Community Health* 2003;57:778–83.
8. Marmot M, Brunner E. Cohort Profile: The Whitehall II study. *Int J Epidemiol* 2005;34:251–56.
9. Goldberg M, Leclerc A, Bonenfant S *et al.* Cohort Profile: The GAZEL Cohort Study. *Int J Epidemiol* 2007;36:32–39.
10. Goldberg M, Leclerc A, Zins M. Cohort Profile Update: The GAZEL Cohort Study. *Int J Epidemiol* 2015;44:77–g.
11. Vahtera J, Laine S, Virtanen M *et al.* Employee control over working times and risk of cause-specific disability pension: the Finnish Public Sector Study. *Occup Environ Med* 2010;67: 479–85.
12. Feveile H, Olsen O, Burr H, Bach E. Danish work environment cohort study 2005: from idea to sampling design. *Statistics in Transition* 2007;8:441–58.
13. Johansson S. 1968 Level of Living Survey in Sweden - Presentation. *Acta Sociol* 1973;16:211–19.
14. Arbetsmiljöverket [The Swedish Work Environment Authority]. *Arbetsmiljön 2015 [The Work Environment 2015]*. Stockholm: Arbetsmiljöverket, 2015.
15. Magnusson Hanson LL, Akerstedt T, Naswall K, Leineweber C, Theorell T, Westerlund H. Cross-lagged relationships between workplace demands, control, support and sleep problems. *Sleep* 2011;34:1403–10.
16. Axelsson J, Sundelin T, Ingre M, Van Someren EJ, Olsson A, Lekander M. Beauty sleep: experimental study on the perceived health and attractiveness of sleep deprived people. *BMJ* 2010; 341:c6614.
17. Magnusson Hanson LL, Chungkham HS, Akerstedt T, Westerlund H. The role of sleep disturbances in the longitudinal relationship between psychosocial working conditions, measured by work demands and support, and depression. *Sleep* 2014; 37:1977–85.
18. Nyberg A, Magnusson Hanson LL, Leineweber C, Johansson G. Do Predictors of career success differ between Swedish women and men? Data from the Swedish Longitudinal Occupational Survey of Health (SLOSH). *PloS One* 2015;10:e0140516.
19. Nyberg A, Peristera P, Westerlund H, Johansson G, Hanson LL. Does job promotion affect men's and women's health differently? Dynamic panel models with fixed effects. *Int J Epidemiol* 2017;46:1137–46.
20. Leineweber C, Baltzer M, Magnusson Hanson LL, Westerlund H. Work-family conflict and health in Swedish working women and men: a 2-year prospective analysis (the SLOSH study). *Eur J Public Health* 2013;23:710–16.
21. Magnusson Hanson LL, Leineweber C, Chungkham HS, Westerlund H. Work-home interference and its prospective relation to major depression and treatment with antidepressants. *Scand J Work Environ Health* 2014;40:66–73.
22. Magnusson Hanson LL, Westerlund H, Leineweber C *et al.* The Symptom Checklist-core depression (SCL-CD6) scale:

- psychometric properties of a brief six item scale for the assessment of depression. *Scand J Public Health* 2014;**42**:82–88.
23. Griep Y, Hanson LM, Vantilborgh T, Janssens L, Jones SK, Hyde M. Can volunteering in later life reduce the risk of dementia? A 5-year longitudinal study among volunteering and nonvolunteering retired seniors. *PLoS One* 2017;**12**:e0173885.
 24. Leineweber C, Wege N, Westerlund H, Theorell T, Wahrendorf M, Siegrist J. How valid is a short measure of effort-reward imbalance at work? A replication study from Sweden. *Occup Environ Med* 2010;**67**:526–31.
 25. Chungkham HS, Ingre M, Karasek R, Westerlund H, Theorell T. Factor structure and longitudinal measurement invariance of the demand control support model: an evidence from the Swedish Longitudinal Occupational Survey of Health (SLOSH). *PLoS One* 2013;**8**:e70541.
 26. Fransson EI, Heikkila K, Nyberg ST *et al*. Job strain as a risk factor for leisure-time physical inactivity: an individual-participant meta-analysis of up to 170,000 men and women: the IPD-Work Consortium. *Am J Epidemiol* 2012;**176**:1078–89.
 27. Heikkila K, Nyberg ST, Fransson EI *et al*. Job strain and alcohol intake: a collaborative meta-analysis of individual-participant data from 140,000 men and women. *PLoS One* 2012;**7**:e40101.
 28. Heikkila K, Nyberg ST, Fransson EI *et al*. Job strain and tobacco smoking: an individual-participant data meta-analysis of 166,130 adults in 15 European studies. *PLoS One* 2012;**7**:e35463.
 29. Nyberg ST, Heikkila K, Fransson EI *et al*. Job strain in relation to body mass index: pooled analysis of 160 000 adults from 13 cohort studies. *J Intern Med* 2012;**272**:65–73.
 30. Nyberg ST, Fransson EI, Heikkila K *et al*. Job strain as a risk factor for type 2 diabetes: a pooled analysis of 124,808 men and women. *Diabetes Care* 2014;**37**:2268–75.
 31. Fransson EI, Nyberg ST, Heikkila K *et al*. Job strain and the risk of stroke: an individual-participant data meta-analysis. *Stroke* 2015;**46**:557–59.
 32. Madsen IEH, Nyberg ST, Magnusson Hanson LL *et al*. Job strain as a risk factor for clinical depression: systematic review and meta-analysis with additional individual participant data. *Psychol Med* 2017;**47**:1342–56.
 33. Magnusson Hanson LL, Peristera P, Chungkham HS, Westerlund H. Longitudinal mediation modeling of unhealthy behaviors as mediators between workplace demands/support and depressive symptoms. *PLoS One* 2016;**11**:e0169276.
 34. Siegrist J, Starke D, Chandola T *et al*. The measurement of Effort-Reward Imbalance at work: European comparisons. *Soc Sci Med* 2004;**58**:1483–99.
 35. Karasek B, Theorell T. *Healthy Work*. New York, NY: Basic Books, 1990.
 36. Karasek RA. Job demands, job decision latitude, and mental strain - implications for job redesign. *Admin Sci Q* 1979;**24**: 285–308.
 37. Theorell T, Perski A, Akerstedt T *et al*. Changes in job strain in relation to changes in physiological state. A longitudinal study. *Scand J Work Environ Health* 1988;**14**:189–96.
 38. Johnson JV, Hall EM. Job strain, work place social support, and cardiovascular disease: a cross-sectional study of a random sample of the Swedish working population. *Am J Public Health* 1988;**78**:1336–42.
 39. Siegrist J. Adverse health effects of high-effort/low-reward conditions. *J Occup Health Psychol*. 1996;**1**:27–41.
 40. Siegrist J, Wege N, Puhhofer F, Wahrendorf M. A short generic measure of work stress in the era of globalization: effort-reward imbalance. *Int Arch Occup Environ Health* 2009;**82**:1005–13.
 41. Moorman RH. Relationship between organizational justice and organizational citizenship behaviors - do fairness perceptions influence employee citizenship. *J Appl Psychol* 1991;**76**: 845–55.
 42. Brodbeck FC, Frese M, Akerblom S *et al*. Cultural variation of leadership prototypes across 22 European countries. *J Occup Organ Psychol* 2000;**73**:1–29.
 43. Setterlind S, Larson G. The stress profile - a psychosocial approach to measuring stress. *Stress Med* 1995;**11**:85–92.
 44. Ala-Mursula L, Vahtera J, Kivimaki M, Kevin MV, Pentti J. Employee control over working times: associations with subjective health and sickness absences. *J Epidemiol Community Health* 2002;**56**:272–78.
 45. Mardberg B, Lundberg U, Frankenhaeuser M. The total workload of parents employed in white-collar jobs - construction of a questionnaire and a scoring system. *Scand J Psychol* 1991;**32**: 233–39.
 46. Fisher GG, Bulger CA, Smith CS. Beyond work and family: a measure of work/nonwork interference and enhancement. *J Occup Health Psychol* 2009;**14**:441–56.
 47. Odeen M, Westerlund H, Theorell T, Leineweber C, Eriksen HR, Ursin H. Expectancies, socioeconomic status, and self-rated health: use of the simplified TOMCATS Questionnaire. *Int J Behav Med* 2013;**20**:242–51.
 48. Maslach C, Jackson SE, Leiter MP. *Maslach Burnout Inventory Manual*. Sunnyvale, CA: Consulting Psychologists Press, 1996.
 49. Kristensen TS, Hannerz H, Hogh A, Borg V. The Copenhagen Psychosocial Questionnaire - a tool for the assessment and improvement of the psychosocial work environment. *Scand J Work Environ Health* 2005;**31**:438–49.
 50. Nordin M, Akerstedt T, Nordin S. Psychometric evaluation and normative data for the Karolinska Sleep Questionnaire. *Sleep and Biological Rhythms* 2013;**11**:216–26.
 51. Adler NE, Epel ES, Castellazzo G, Ickovics JR. Relationship of subjective and objective social status with psychological and physiological functioning: Preliminary data in healthy white women. *Health Psychol* 2000;**19**:586–92.
 52. Saunders JB, Aasland OG, Babor TF, Delafuente JR, Grant M. Development of the Alcohol-Use Disorders Identification Test (Audit) - WHO Collaborative Project on Early Detection of Persons with Harmful Alcohol-Consumption 2. *Addiction* 1993;**88**:791–804.
 53. Ewing JA. Detecting alcoholism - the CAGE Questionnaire. *JAMA* 1984;**252**:1905–07.
 54. Starrin B, Rantakeisu U, Hagquist C. In the wake of the recession – economic hardship, shame and social erosion. *Scand J Work Environ Health* 1997;**23**:47–54.
 55. Hays RD, Sherbourne CD, Mazel RM. The RAND 36-Item Health Survey 1.0. *Health Econ* 1993;**2**:217–27.