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# Work related sexual harassment and risk of suicide and suicide attempts: prospective cohort study

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## ABSTRACT

### OBJECTIVE

To analyse the relation between exposure to workplace sexual harassment and suicide, as well as suicide attempts.

### DESIGN

Prospective cohort study.

### SETTING

Sweden.

### PARTICIPANTS

86 451 men and women of working age in paid work across different occupations responded to a self-report questionnaire including exposure to work related sexual harassment between 1995 and 2013. The analytical sample included 85 205 people with valid data on sexual harassment, follow-up time, and age.

### MAIN OUTCOME MEASURES

Suicide and suicide attempts ascertained from administrative registers (mean follow-up time 13 years).

### RESULTS

Among the people included in the respective analyses of suicide and suicide attempts, 125 (0.1%) died from suicide and 816 (1%) had a suicide attempt during follow-up (rate 0.1 and 0.8 cases per 1000 person years). Overall, 11 of 4095 participants exposed to workplace sexual harassment and 114 of 81 110 unexposed participants committed suicide, and 61/4043 exposed and 755/80 513 unexposed participants had a record of suicide attempt. In Cox regression analyses adjusted for a range of sociodemographic characteristics, workplace sexual harassment was associated with an excess risk of both suicide (hazard ratio 2.82, 95% confidence interval 1.49 to 5.34) and suicide attempts (1.59, 1.21 to 2.08), and risk estimates remained significantly increased after adjustment for baseline health and certain work characteristics. No obvious differences between men and women were found.

### CONCLUSIONS

The results support the hypothesis that workplace sexual harassment is prospectively associated

with suicidal behaviour. This suggests that suicide prevention considering the social work environment may be useful. More research is, however, needed to determine causality, risk factors for workplace sexual harassment, and explanations for an association between work related sexual harassment and suicidal behaviour.

## Introduction

Work related sexual harassment (referring to any unwanted and unwelcome acts or conduct of sexual nature, whether verbal or non-verbal, experienced as intimidating, hostile, degrading, humiliating, or offensive in circumstances related to work)<sup>1 2</sup> has recently received a lot of attention thanks to the “Me Too” movement. This movement has put an emphasis on the widespread occurrence of sexual harassment, especially work related sexual harassment. Exact prevalences of work related sexual harassment in the working population are, however, difficult to estimate, and previous studies show large discrepancies. Whereas some reports have found that no less than 80% of all women and 30% of all men have experienced work related sexual harassment, other studies show much lower figures ranging from about 1% to 20%, depending on representativeness, how sexual harassment was measured, and the time frame, as well as on cultural context.<sup>3 4</sup>

For organisations and the society, sexual harassment may involve substantial costs associated with turnover of personnel and absenteeism.<sup>5 6</sup> For individuals, sexual harassment may take a toll on self-esteem, life satisfaction, and employment opportunities.<sup>7 8</sup> Work related sexual harassment may also be associated with a range of negative health outcomes. Previous literature has associated workplace sexual harassment with, for example, physical health symptoms, stress, post-traumatic stress, sickness absence, and particularly poorer mental health such as psychological distress, depression, and anxiety.<sup>2 5 7 9 10</sup> Sexual victimisation may also lead to suicidal behaviour, through an increased risk of psychiatric disease and psychosocial factors such as life events, problematic substance use/misuse, and risky lifestyle and behaviours,<sup>11</sup> or through behavioural disinhibition, dysregulated mood, hopelessness, and entrapment.<sup>12</sup> However, studies, especially prospective studies, on workplace sexual harassment and suicidal behaviours are lacking. Many studies have also been based on convenience samples or specific occupational groups. To our knowledge, no population based prospective studies on work related sexual harassment and suicidal behaviours have been reported. To rectify this, we did a prospective study

## WHAT IS ALREADY KNOWN ON THIS TOPIC

Sexual victimisation may lead to suicidal behaviour

However, no population based prospective studies on work related sexual harassment and suicide or suicide attempts have been conducted

## WHAT THIS STUDY ADDS

This large population based cohort study of Swedish men and women indicates that workplace sexual harassment may be a risk factor for both suicide and suicide attempts

on work related sexual harassment and suicide and suicide attempts in a large sample of Swedish men and women in paid work.

## Methods

### Study population

This study was based on data from the Swedish Work Environment Survey (SWES) 1995-2013. SWES is a biennial cross sectional survey, building on the Labour Force Survey. Every second year since 1989, a sample of between 10 000 and 15 000 people aged 16-74 years from the entire Swedish population are contacted as part of the Labour Force Survey. Those invited are selected by simple random sampling after stratification for county, sex, and age and are first interviewed by phone. Subsequently, the participants are asked to respond to self-completion questionnaires. A selected subsample aged 16-64 in paid work, largely representative of the Swedish workforce, are further asked to respond to self-completion questionnaires including a range of questions related to their work situation, as part of the SWES. Non-participation in Labour Force Survey and SWES varied between 13% (1995) and 33% (2013) in the initial interviews and between 23% (1995) and 51% (2013) in the subsequent phone interviews and questionnaires. In total, 86 451 participants responded to the SWES self-completion surveys in 1995-2013. After exclusion of people with reused personal identification numbers, missing data on workplace sexual harassment, and invalid data for the analyses on age at end of follow-up, the study sample included 85 205 respondents.

### Sexual harassment

Two questionnaire items about sexual harassment were used in this study, which were introduced as follows: "Sexual harassment refers to undesirable advances or offensive references to what is generally associated with sexual relations." The respondents were then asked to respond to: "Are you subjected to sexual harassment in your workplace from... 1) superiors or fellow workers? and 2) other people (eg, patients, clients, passengers, students)?" The questions were rated on a seven point Likert-type scale ranging from not at all during the previous 12 months to every day. We categorised people who reported that they were subjected to sexual harassment between once or twice during the previous 12 months and every day as being exposed to sexual harassment. We considered those reporting not being subjected to sexual harassment at all during the previous 12 months to be unexposed. We combined these two items into one variable for the main analyses, indicating any exposure to workplace sexual harassment during the previous 12 months. Because most respondents were exposed only once or twice during the previous 12 months, we did not do dose-response analyses.

### Suicide and suicide attempts

We identified suicide and suicide attempts from the National Patient Register and Causes of Death

Register through linkage based on the Swedish personal identification number. The patient register includes both inpatient and outpatient data (from 2001). We defined people registered with an ICD-10 (international classification of diseases, version 10) code of X60-X84 (self-inflicted harm) or Y10-Y34 (death with undetermined intent) as the underlying cause of death as cases of suicide.<sup>13-16</sup> Likewise, we considered those registered with self-inflicted harm or harm with undetermined intent in the National Patient Register to be cases of attempted suicide.<sup>15</sup> For ICD-8 and ICD-9, we used the corresponding codes E950-959 and E980-989. For the analyses, we considered only incident suicide attempts occurring after response to SWES, excluding people with first attempts before participation in the survey (dating back to 1964 for inpatient data and 2001 based for outpatient data). We followed the respondents from the year of response to SWES questionnaires to the year of either first registered suicide attempt or suicide, death from another cause, emigration, or end of follow-up (31 December 2016).

### Statistical analyses

We estimated the risk of suicide or suicide attempt by using proportional hazard regression analyses with age as the underlying time scale. We tested the proportional hazards assumption by using log-log plots and interaction between time and exposure, and we found no deviations from proportionality.

We fitted models assessing the relation both between workplace sexual harassment and risk of suicide and between workplace sexual harassment and risk of suicide attempts. All people with full information on exposure and outcome were included in the analyses of suicide. The main analyses of suicide attempts were carried out in a subsample with no previous suicide attempts (excluding 649 individuals from the total study sample) to make sure the exposure preceded the outcome, but we also did analyses alternatively adjusting for previous suicide attempts. The analyses were adjusted for sex, family type, country of birth, educational level, and income, as these types of factors have been found to be associated with workplace sexual harassment and risk factors for suicidal behaviour.<sup>7 17 18</sup> Information about sex, age, family situation, country of birth, educational level, and income came from the longitudinal integration database for health insurance and labour market studies (LISA). We used educational level as a categorical variable with three categories ( $\leq 9$  years, 10-12 years, and  $\geq 13$  years). We categorised baseline family type as single, divorced, separated, or widowed without children; single, divorced, separated, or widowed with children; married or living with partner without children; or married or living with partner with children. We categorised country of birth as "Nordic countries," "other European countries," or "other continents." In additional analyses, we added poor mental health at baseline or history of poor mental health. Poor mental health was measured by baseline

reports of being tired or listless (“During the past 3 months have you been tired and listless?”) every day, which we used as an indicator of poor mental health,<sup>19</sup> and/or a diagnosis of mental disorders as indicated by ICD-10 F01-99 or ICD-9/ICD-8 290-319 in the National Patient Register up to the year of survey response.<sup>20</sup> In addition, we adjusted for baseline work characteristics including job demands and control, measured by indices for demands and control based on four items each scored from 0 to 4. We also used an index for support at work measured with two separate questions about support from superiors and fellow workers, scored from 1 to 4, and for descriptive and/or analytical statistics considered workplace violence and bullying assessed by the following items: “Are you exposed to violence or threats of violence in your work?” and “Are you subjected to personal harassment by means of malicious words and actions from supervisors or colleagues?” We also ascertained severe somatic disease from the National Patient Register (including inpatient and outpatient data), including myocardial infarction, congestive heart failure, peripheral vascular disease, cerebrovascular disease, dementia, chronic pulmonary disease, rheumatological disease, peptic ulcer, mild liver disease, diabetes, hemiplegia or paraplegia, renal disease, any malignancy, moderate or severe liver disease, metastatic solid tumour, connective tissue disease, and HIV/AIDS.<sup>21</sup> A variable indicating whether any of these illnesses had been diagnosed before or during the year of survey response was considered as a potential confounder. The data on previous or prevalent mental and somatic disorders dated back to 1994 for inpatient data and 2001 for outpatient data.

As adverse effects may differ for men and women, the analyses were also stratified according to sex, and an interaction term was included in some models, to assess whether the associations tended to differ between men and women. We additionally stratified the analyses by position of the exposed individuals, as workplace sexual harassment is also linked to hierarchical power relations and many previous studies have focused on subordinates.<sup>2-6</sup> We categorised position as supervisor or subordinate. We regarded people with supervisory duties as supervisors and those reporting no supervisory duties as subordinates. Finally, we analysed sexual harassment from superiors or fellow workers versus sexual harassment from other people (for example, patients, clients, passengers, students) separately. We also did a sensitivity analysis with suicide and suicide attempts with self-inflicted harm only. We used SAS Statistical Software 9.4 for all analyses.

#### Patient and public involvement

No patients were involved in setting the research question or the outcome measures, nor were they involved in developing plans for recruitment, design, and implementation of the study. No patients were asked for advice on interpretation or writing up of results. However, part of the research and

dissemination strategy at the Stress Research Institute is developed with patient and public involvement.

#### Results

Overall, 4.8% (4095/85 205) of the included men and women reported workplace sexual harassment during the previous 12 months—1.9% (774/40 853) of all men and 7.5% (3321/44 352) of all women. Those exposed to workplace sexual harassment tended to differ from the rest of the study population on several sociodemographic characteristics (table 1). Among the exposed participants, a higher proportion were women and single, divorced, or separated, and a slightly higher proportion were born outside Europe. Single or divorced men without children and men born outside Europe seemed to be disproportionately affected (supplementary table A). The exposed participants were also generally younger than the remainder of the study sample, and their income from work was lower, especially among women. Furthermore, a higher proportion of the exposed individuals were found to have non-supervisory duties and high strain jobs (characterised by high demands and low control), a pattern that was most obvious among women. A high proportion of the exposed participants concurrently reported exposure to violence or threats of violence and bullying from superiors or colleagues, which was especially true for men. Finally, a higher proportion of the exposed individuals were found to have poor mental health, among both men and women.

#### Sexual harassment and risk of suicide

We followed the study participants for a total of 1 084 512 person years (mean 13 years). In total, 125 (0.1%) people died from suicide during follow-up (rate: 0.1 cases per 1000 person years), 11 (0.3%) among people exposed to any workplace sexual harassment and 114 (0.1%) among those unexposed to workplace sexual harassment.

In the Cox regression analyses (table 2), the hazard ratio for completed suicide was 2.23 (95% confidence interval 1.19 to 4.16) for any workplace sexual harassment. The hazard ratio was considerably higher when we adjusted for sex. After adjustment for sex, birth country, family type, educational level, and income, the hazard ratio was 2.82 (1.49 to 5.34). This corresponded to a population attributable fraction of 0.06. Further adjustment for baseline mental health and working conditions resulted in a more than twofold higher risk of suicide among people exposed to workplace sexual harassment (hazard ratios 2.51 (1.29 to 4.90) and 2.47 (1.25 to 4.87), respectively). As history of somatic disease did not differ notably between exposed and unexposed participants, we made no adjustment for somatic disease.

We noted excess risk estimates in both men and women (table 2), and we found no statistically significant interaction between workplace sexual harassment and sex. Similarly, we detected no statistically significant interaction between workplace sexual harassment and position (superior versus

**Table 1 | Distribution of sociodemographic factors among 85 205 employees in Swedish Work Environment Surveys 1995-2013, according to workplace sexual harassment. Values are numbers (percentages) unless stated otherwise**

Characteristic	All (n=85 205)	Not exposed to workplace sexual harassment (n=81 110)	Exposed to workplace sexual harassment (n=4095)
Sex:			
Male	40 853 (48)	40 079 (49)	774 (19)
Female	44 352 (52)	41 031 (51)	3321 (81)
Mean (SD) age, years	43 (11.9)	43 (11.8)	37 (11.5)
Birth country:	(n=85 198)	(n=81 103)	
Nordic countries	81 288 (95)	77 415 (95)	3873 (95)
Other European countries	2280 (3)	2170 (3)	110 (3)
Elsewhere	1630 (2)	1518 (2)	112 (3)
Family situation:			
Married/living with partner with children	39 682 (47)	38 007 (47)	1675 (41)
Married/living with partner without children	15 451 (18)	15 066 (19)	385 (9)
Single/divorced/separated/widowed with children	6522 (8)	6039 (7)	483 (12)
Single/divorced/separated/widowed without children	23 550 (28)	21 998 (27)	1552 (38)
Education:	(n=83 449)	(n=80 240)	(n=4005)
Primary and lower secondary education	12 861 (15)	12 470 (16)	391 (10)
Upper secondary education	41 295 (49)	39 186 (49)	2109 (53)
University education	29 293 (35)	28 584 (36)	1505 (38)
Mean (SD) income from work, SEK	2 467 210 (1 519 490)	2 487 500 (1 533 790)	2 064 420 (1 128 590)
Supervisory duties:	(n=84 919)	(n=80 835)	(n=4084)
No	59 375 (70)	56 454 (70)	2921 (71)
Yes	25 544 (30)	24 381 (30)	1163 (28)
Mean (SD) job demands, scale 0-4	1.7 (1.3)	1.7 (1.3)	2.1 (1.3)
Mean (SD) job control, scale 0-4	2.5 (1.3)	2.5 (1.3)	1.9 (1.3)
Mean (SD) social support, scale 1-4	1.6 (0.9)	1.6 (0.9)	1.7 (0.9)
Exposure to workplace violence:	(n=84 951)	(n=80 883)	(n=4068)
No	73 395 (86)	71 415 (88)	1980 (49)
Yes	11 556 (14)	9468 (12)	2088 (51)
Exposure to workplace bullying:	(n=85 002)	(n=80 929)	(n=4073)
No	77 773 (91)	74 556 (92)	3217 (79)
Yes	7 229 (9)	6373 (8)	856 (21)
Baseline poor mental health:	(n=84 003)	(n=79 962)	(n=4041)
No	79 930 (95)	76 267 (95)	3663 (91)
Yes	4073 (5)	3695 (5)	378 (9)
Baseline somatic disease:			
No	71 919 (84)	68 411 (84)	3508 (86)
Yes	13 286 (16)	12 699 (16)	587 (14)
Suicide:			
No	85 080 (100)	80 996 (100)	4084 (100)
Yes	125 (0)	114 (0)	11 (0)
Suicide attempt:			
No	83 740 (98)	79 758 (98)	3982 (97)
Yes	1465 (2)	1352 (2)	113 (3)

subordinate), although the risk of suicide seemed to be more marked among subordinates (table 3), which may be at least partly due to a higher number of subordinates (n=59 375 v 25 544) and prevalence of sexual harassment among subordinates (4.9% (2921 exposed) v 4.6% (1163).

In the total sample, 1.5% (1253/85 189) were exposed to sexual harassment from superiors or fellow workers and 3.8% (3247/85 195) were exposed to sexual harassment from other people (for example, patients, clients, passengers, students). When we looked at the association between workplace sexual harassment perpetrated by superiors or fellow workers and suicide (table 4), the risk estimate was above 1 but not statistically significant, which may be at least partly due to low prevalence of exposure and number of suicide cases in the exposed group (n=2). The corresponding analyses on sexual harassment by other people such as clients or customers indicated an

increased risk of suicide (adjusted hazard ratio 3.32, 1.71 to 6.48). The sensitivity analyses on risk of suicide excluding cases with undetermined intent were similar to the main findings (supplementary tables B-D).

#### Workplace sexual harassment and risk of suicide attempts

Among participants without a previous suicide attempt (n=84 556), 816 (1%) were found to have a suicide attempt during follow-up (1072 312 person years; rate 0.8, mean follow-up time 13 years)—61/4043 (2%) among people exposed to any workplace sexual harassment and 755/80 513 (1%) among those unexposed to workplace sexual harassment.

As for suicide, any workplace sexual harassment was also associated with an increased risk of suicide attempt (unadjusted hazard ratio 1.54, 1.19 to 2.01), and the hazard ratio remained similar after adjustment for sociodemographic characteristics (1.59, 1.21 to

**Table 2 | Results from Cox regression analyses on workplace sexual harassment stratified by sex, presented as hazard ratios (HR) and 95% confidence intervals with and without adjustment for covariates**

	All			Men			Women		
	No with valid data	No of cases	HR (95% CI)	No with valid data	No of cases	HR (95% CI)	No with valid data	No of cases	HR (95% CI)
<b>Suicide</b>									
Model 0*	85 205	125	2.23 (1.19 to 4.16)	40853	87	2.99 (1.09 to 8.18)	44 353	38	3.20 (1.39 to 7.33)
Model 1†	84 238	124	2.82 (1.49 to 5.34)	40421	86	2.62 (0.95 to 7.19)	43 817	38	2.94 (1.28 to 6.76)
Model 2‡	83 048	121	2.51 (1.29 to 4.90)	39877	84	2.62 (0.95 to 7.22)	43 171	37	2.39 (0.98 to 5.80)
Model 3§	82 860	121	2.47 (1.25 to 4.87)	39794	84	2.60 (0.92 to 7.34)	43 066	37	2.25 (0.91 to 5.56)
<b>Suicide attempts</b>									
Model 0*	84 556	816	1.54 (1.19 to 2.01)	40540	397	1.79 (1.03 to 3.11)	44 016	419	1.49 (1.10 to 2.02)
Model 1†	83 600	799	1.59 (1.21 to 2.08)	40111	391	1.80 (1.03 to 3.13)	43 489	408	1.49 (1.09 to 2.02)
Model 2‡	82 419	786	1.55 (1.18 to 2.04)	39570	385	1.78 (1.02 to 3.11)	42 849	401	1.44 (1.06 to 1.98)
Model 3§	82 233	785	1.56 (1.18 to 2.05)	39488	384	1.77 (1.01 to 3.12)	42 745	401	1.47 (1.07 to 2.02)

\*Unadjusted analyses.

†Adjusted for sex, birth country, family situation, education, and income at baseline.

‡Adjusted for sex, birth country, family situation, education, income, and poor mental health at baseline.

§Adjusted for sex, birth country, family situation, education, income, demands, control, social support at work, workplace bullying, and poor mental health at baseline.

2.08) (table 2). This corresponded to a population attributable fraction of 0.03. Moreover, further adjustment for baseline poor mental and physical health, as well as working conditions, did not markedly attenuate the risk estimates, and the risk estimates did not differ considerably by sex or position (supervisor versus subordinate). Analyses alternatively adjusting for previous suicide attempts resulted in lower hazard ratios. A model adjusting for previous suicide attempt, sex, birth country, family type, educational level, and income showed a hazard ratio of 1.25 (1.01 to 1.49) and a fully adjusted model a hazard ratio of 1.23 (1.00 to 1.52).

When we looked at the association between workplace sexual harassment perpetrated by superiors or fellow workers and suicide attempts, the analyses showed a statistically significant association when the models were adjusted for sex, birth country, family type, educational level, and income (table 4). The corresponding analyses on sexual harassment by other people such as clients or customers also indicated an increased risk of suicide attempts (adjusted hazard ratio 1.74, 1.30 to 2.31).

In sensitivity analyses excluding cases with undetermined intent, the estimates of association between workplace sexual harassment and suicide attempts were stronger (supplementary tables B-D). The hazard ratio for any exposure to sexual harassment was 2.22 (1.54 to 3.20) in the sensitivity analysis adjusted for sociodemographic characteristics.

## Discussion

This population based cohort study of Swedish men and women showed an association between workplace sexual harassment and both suicide and suicide attempts.

## Strengths and limitations of study

This study has several major strengths such as a prospective design and relatively large sample approximately representative of the Swedish working population. Prospective cohort studies typically provide stronger evidence than other

observational studies. However, the study also has limitations, including a risk that sexual harassment is underreported. In this study, we based our variables on only one single question, and lower rates of exposure to sexual harassment tend to be found with one question than with different questions about particular forms of behaviour.<sup>3 4</sup> However, a definition was provided in this study, which may have increased the validity of the data. Underreporting may have contributed to an underestimation of associations due to non-differential misclassification. On the other hand, the forms of sexual harassment may vary widely, with some people experiencing light forms such as remarks whereas others are exposed to severe forms such as rape. When asked explicitly about sexual harassment, many respondents seem to consider only severe types of sexual harassment.<sup>3</sup> This may be an explanation for the relatively strong associations in this study. No assessment of type and severity was available, however, and we cannot exclude the possibility that the respondents only witnessed sexual harassment at their workplace. When comparing effects on wellbeing, however, some authors have found comparable effects of less intensive but frequent experiences such as gender harassment and more intense but infrequent experiences such as sexual coercion and unwanted sexual attention.<sup>22</sup> We also analysed sexual harassment from superiors or fellow workers and from others separately and found that sexual harassment from others was more strongly associated with suicide than was sexual harassment from superiors and fellow workers. This finding is surprising in light of previous Danish analyses, which found that depressive symptoms were more strongly associated with sexual harassment from superiors and colleagues than with sexual harassment from customers or clients.<sup>23</sup> Although the findings of our study on this point should be interpreted carefully in light of the limited power, further research into how and why the consequences of sexual harassment may differ depending on the relation to the harasser may be justified.

With respect to the ascertainment of suicide and suicide attempts, the Swedish registers generally have

**Table 3 | Results from Cox regression analyses on workplace sexual harassment stratified by occupational position, presented as hazard ratios (HR) and 95% confidence intervals with and without adjustment for covariates**

	Supervisor*			Subordinate*		
	No with valid data	No of cases	HR (95% CI)	No with valid data	No of cases	HR (95% CI)
<b>Suicide</b>						
Model 0†	25 544	35	1.60 (0.38 to 6.70)	59 375	90	2.46 (1.23 to 4.94)
Model 1‡	25 388	35	1.94 (0.45 to 8.42)	58 564	89	3.18 (1.56 to 6.47)
Model 2§	25 089	33	1.04 (0.14 to 7.84)	57 682	88	3.06 (1.50 to 6.25)
Model 3¶	25 035	33	0.95 (0.12 to 7.30)	57 548	88	3.05 (1.47 to 6.33)
<b>Suicide attempts</b>						
Model 0†	25 365	221	1.77 (1.08 to 2.88)	58 908	593	1.43 (1.04 to 1.96)
Model 1‡	25 210	219	1.98 (1.20 to 3.28)	58 107	578	1.42 (1.03 to 1.97)
Model 2§	24 912	217	1.97 (1.19 to 3.26)	57 233	567	1.38 (0.99 to 1.92)
Model 3¶	24 859	217	1.98 (1.19 to 3.31)	57 100	566	1.38 (0.99 to 1.92)

\*Participants with supervisory duties were regarded as supervisors, those reporting no supervisory duties were regarded as subordinates.  
†Unadjusted analyses.  
‡Adjusted for sex, birth country, family situation, education, and income at baseline.  
§Adjusted for sex, birth country, family situation, education, income, and poor mental health at baseline.  
¶Adjusted for sex, birth country, family situation, education, income, demands, control, social support at work, workplace bullying, and poor mental health at baseline.

high completeness and validity.<sup>24</sup> High agreement for suicide between death certificates and other sources of information such as forensic reports, police reports, and toxicological and histological data has also been found.<sup>25</sup> However, the data are likely to cover the most severe cases. Moreover, the number of false positives may have been increased by the inclusion of deaths or diagnoses with undermined intent.<sup>26</sup> This has on the other hand been found to reduce under-detection and incorrect coding, as well as spatial and secular trends in detection and classification of suicide,<sup>13</sup> and additional analyses excluding cases with undetermined intent strengthened the main findings. In addition, the assessment of suicide attempts may be more challenging, with a higher risk for under-ascertainment owing to absence of recorded clinical care. Non-differential misclassification of the outcome may have contributed to attenuation of the results.

The analyses were adjusted for some potential confounding factors including demographic characteristics and other working conditions, which did not seem to explain the associations between workplace sexual harassment and suicide as well as suicide attempts. However, unmeasured factors such as evening/night work and precarious employment are other possible confounders of the associations of interest. People who are more vulnerable to suicidal behaviours might be more likely to be employed in occupations with increased risk of harassment. We also considered records of pre-existing mental and physical disease, which included various psychiatric disorders, substance misuse, and personality disorders. This strengthens the findings but may on the other hand lead to an underestimation of the association if poor mental health and substance misuse act as mediators of the relation between workplace sexual harassment and suicidal behaviour. However, we cannot rule out residual confounding and confounding from other factors, although only very strong confounding could completely explain the results. Pre-existing poor mental health might partly explain the results of the study, as people with pre-existing poor mental health

are more likely to perceive themselves as harassed and more likely to be suicidal. We were also unable to account for certain personality traits such as neuroticism,<sup>18</sup> genetic factors, childhood adversities, and social isolation, which could act as confounders for the association between workplace sexual harassment and suicide.

Also, the response rate in SWES has decreased over time. The non-responders to SWES tend to consist of a higher proportion of young people, people with low education and low income, and immigrants. This attrition may have affected the estimates of prevalence and risk, and decreases the generalisability of the results. A major strength of this study on the other hand is that we had practically no loss to follow-up and long follow-up time.<sup>24</sup>

#### Strengths and weaknesses in relation to other studies

To our knowledge, this is the first study to indicate that workplace sexual harassment increases the risk of suicidal behaviour in the general working population. We are aware of only a few previous studies on this topic. For example, Griffith (2019) showed an association between workplace sexual harassment and suicide attempts in the US,<sup>27</sup> and Jin et al (2018) showed an association with self-harm in Taiwan.<sup>28</sup> However, both of these studies included military personnel only, used a cross sectional design, and studied only suicide attempts and not suicide. The cross sectional design means that their results may have been influenced by recall bias and common method bias. In this study, we instead used a prospective design with exposure assessed by questionnaire but suicide and suicide attempts ascertained from administrative registers. This excludes dependent recall bias and reduces the risk of common method variance. The study is also based on a large sample representative of different sectors and occupations in Sweden, with much greater power than many previous studies on the topic.

Nevertheless, our results are in line with those of the few previous studies on workplace sexual harassment

**Table 4 | Results from Cox regression analyses on workplace sexual harassment from superiors/fellow workers or others, presented as hazard ratios (HR) and 95% confidence intervals with and without adjustment for covariates**

	Workplace sexual harassment from superiors or fellow workers			Workplace sexual harassment from other people (eg, patients, clients, passengers, students)		
	No with valid data	No of cases	HR (95% CI)	No with valid data	No of cases	HR (95% CI)
<b>Suicide</b>						
Model 0*	85 189	125	1.28 (0.31 to 5.19)	85 195	125	2.55 (1.33 to 4.89)
Model 1†	84 223	124	1.42 (0.35 to 5.78)	84 228	124	3.32 (1.71 to 6.48)
Model 2‡	83 035	121	1.36 (0.33 to 5.57)	83 040	121	2.94 (1.46 to 5.93)
Model 3§	82 851	121	1.22 (0.29 to 5.09)	82 855	121	2.93 (1.44 to 5.95)
<b>Suicide attempts</b>						
Model 0*	84 540	816	1.59 (1.02 to 2.48)	84 546	815	1.70 (1.28 to 2.25)
Model 1†	83 585	799	1.60 (1.01 to 2.53)	83 590	798	1.74 (1.30 to 2.31)
Model 2‡	82 406	786	1.56 (0.98 to 2.46)	82 411	785	1.70 (1.27 to 2.27)
Model 3§	82 224	785	1.54 (0.97 to 2.46)	82 228	784	1.71 (1.27 to 2.29)

\*Unadjusted analyses.

†Adjusted for sex, birth country, family situation, education, and income at baseline.

‡Adjusted for sex, birth country, family situation, education, income, and poor mental health at baseline.

§Adjusted for sex, birth country, family situation, education, income, demands, control, social support at work, workplace bullying, and poor mental health at baseline.

and with results on childhood sexual victimisation and suicide attempts.<sup>29</sup> Studies show that people exposed to sexual abuse and repetitive abuse in childhood are particularly vulnerable to suicidality in adulthood.<sup>30</sup> In line with the stress diathesis model, distal factors such as genetics and childhood adversity may have contributed to a diathesis (a predisposition) to suicidal behaviour, and an increased risk of suicidal behaviour could be explained by this diathesis together with proximal risk factors such as exposure to sexual harassment.<sup>31</sup> An interaction between a variety of biological, clinical, psychological, social, cultural, and environmental factors can affect the risk of suicide; most commonly, several risk factors act cumulatively to increase an individual's vulnerability to suicidal behaviour.<sup>12–14</sup> Early life adversities such as sexual or physical abuse have been connected to a range of emotional and behavioural changes, related cognitive deficits, and epigenetic changes. This seems to increase the risk of development of pathological traits, emotional dysregulation, altered brain structure, and impaired executive function, which may increase the vulnerability to suicidal behaviour.<sup>12</sup> Childhood abuse has for instance been found to be strongly associated with a diagnosis of post-traumatic stress disorder,<sup>32</sup> involving, for example, extreme fear, helplessness, persistent arousal, and anxiety, which are risk factors for suicidality. Workplace sexual harassment has also been associated with post-traumatic stress disorder,<sup>7</sup> and it may be associated with similar emotional and behavioural changes, cognitive deficits, and epigenetic changes. Workplace sexual harassment is likely to be associated with other stress responses and could lead to behavioural risks such as eating disorders and drug and alcohol misuse,<sup>7</sup> as well as depressive symptoms,<sup>9, 23</sup> which may in turn increase the risk of suicide or suicide attempts.

### Conclusions and policy implications

All in all, this study supports a prospective association between workplace sexual harassment and suicidal behaviour. Workplace sexual harassment may thus

represent an important risk factor for suicidal behaviour. This suggests that workplace interventions focusing on the social work environment and behaviours could contribute to a decreased burden of suicide. More research is, however, needed to determine causality and on risk factors for workplace sexual harassment and mechanisms explaining the association between work related sexual harassment and suicidal behaviour.

**Contributors:** LLMH conceived and designed the study, did the statistical analysis, and drafted the manuscript. All authors provided critical input to the design and the analysis and interpretation of the data and revised the manuscript critically. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted. LLMH is the guarantor.

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**Competing interests:** All authors have completed the ICMJE uniform disclosure form at [www.icmje.org/coi\\_disclosure.pdf](http://www.icmje.org/coi_disclosure.pdf) and declare: LLMH received grants from the Swedish Research Council for Health, Working Life and Welfare during the conduct of the study; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work.

**Ethical approval:** This study has been approved by the Regional Research Ethics Board in Stockholm (document numbers: 2012/373-31/5, 2013/2173-32, 2015/2187-32, 2015/2298-32, and 2017/2535-32). Participants in the Swedish Work Environment Survey received written information on the survey, and return of the survey indicated informed consent.

**Data sharing:** Relevant data for research purposes from the Swedish Work Environment Surveys and the Longitudinal Integrated Database for Health Insurance and Labour Market Studies (LISA) can be requested from Statistics Sweden. Relevant data for research from the National Patient Register and Causes of Death Register can be requested from the National Board of Health and Welfare.

**Transparency:** The lead author (the manuscript's guarantor) affirms that the manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

**Dissemination to participants and related patient and public communities:** There are no plans to disseminate the results of the research directly to the study participants. Dissemination to the

population, in general, will be through the Stockholm University website, seminars/conferences, and the media.

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## Web appendix: Supplementary tables