

Exposure to Workplace Bullying and Risk of Depression

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Objective: We examined the prospective association between self-labeled and witness-reported bullying and the risk of newly onset depression. **Methods:** Employees were recruited from two cohorts of 3196 and 2002 employees, respectively. Participants received a questionnaire at baseline in 2006 to 2007 with follow-up in 2008 to 2009 and 2011. New cases of depression were diagnosed in the follow-up using Schedules for Clinical Assessment in Neuropsychiatry interviews and the Major Depression Inventory questionnaire. **Results:** We identified 147 new cases of depression. The odds ratio for newly onset depression among participants reporting bullying occasionally was 2.17 (95% confidence interval [CI]: 1.11 to 4.23) and among frequently bullied 9.63 (95% CI: 3.42 to 27.1). There was no association between percentage witnessing bullying and newly onset depression. **Conclusions:** Frequent self-labeled bullying predicts development of depression but a work environment with high proportion of employees witnessing bullying does not.

Workplace bullying has been defined as *harassing, offending, socially excluding someone or negatively affecting someone's work* repeatedly and regularly over a longer period, for example, 6 months.¹ The concept has gained considerable interest in the past 10 years and other terms used interchangeably are mobbing and harassment. It has been argued that exposure to workplace bullying can be a severe social stressor that can have stronger adverse effects on workers' health than the effect of all other work-related stressors combined.² The prevalence of self-reported bullying varies across studies.¹ For example, in a study among hospital and manufacturing employees, 3% reported workplace bullying,³ whereas in a study among employees in the elderly care sector, 12% reported workplace bullying.⁴ Being exposed to persistent workplace bullying seems to produce severe emotional reactions such as fear and helplessness.³ These feelings may change the individual's perception of their work environment and general life, which might result in subsequent psychiatric diseases such as anxiety and depression.

Cross-sectional studies have found correlations between reports of bullying and several psychological and physical symptoms (for reviews, see, eg, Einarsen and Gemzøe,⁵ Hogh et al,⁶ and Moayed et al⁷). Other studies have found that bullying was associated with reduced self-confidence, low self-worth, shyness, an increased sense of vulnerability as well as feelings of guilt and self-contempt among victims.^{8,9} So far only two follow-up studies on the prospective association between workplace bullying and depression have been published.^{10,11} A 2-year follow-up study among hospital employees found that self-reported bullying at work predicted increased risk of depression.¹⁰ Another prospective study found an exposure-response relation between workplace bullying and risk of onset of a major depressive episode among elder care workers.¹¹

A serious limitation in previous research, including the few prospective follow-up studies on workplace bullying and health, has been the reliance on self-report for the assessment of both the exposure and the endpoint, rendering results vulnerable to common method variance.^{12,13} The high relative risk estimates in the range of 4 to 9 observed even in prospective studies cast doubt as to whether bullying as an objective characteristic of human behavior violating norms for interpersonal relations is causally related to development of major depression. This fundamental problem in earlier research aimed to establish cause-effect relations is approached in this study by the use of an independent measure of bullying, namely the coworkers' joint evaluation of the occurrence of bullying in a work unit. Based on previous research, this study was designed to examine the risk of depression according to workplace bullying measured by the self-labeling method (individual perception of being bullied) and by witnesses' reports to identify the occurrence and intensity of bullying at work-unit level.

Furthermore, we used Schedules for Clinical Assessment in Neuropsychiatry (SCAN) interviews for ascertainment of the outcome in most cases to obtain reliable data on the occurrence of newly onset depression in a prospective design. Given that previous cross-sectional and longitudinal studies have indicated that exposure to workplace bullying increases the risk of depression, we hypothesized that the individual's subjective perception of being bullied is causally related to increased risk of developing depressive disorder.

METHODS AND MATERIALS

Study Design and Population

We recruited participants for this study from two Danish cohorts, the Workplace Bullying and Harassment (WBH) Cohort¹⁴ and the Prisme Cohort¹⁵ (see Table 1). The study participants were investigated three times with approximately 2 years between the examinations. At all occasions, the participants received an extensive questionnaire measuring health status, working conditions, social and family life, education level, history of depression, and mental distress.

Inclusion Criteria

This study population comprised employees who responded to at least two of three surveys during the three-wave study period. Because the aim of this study was to investigate depression 2 years after exposure to bullying respondents with 4 years follow-up time ($n = 1162$) and respondents who participated only at one occasion

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(*n* = 1778) were excluded. A total of 5198 respondents participated at two or three occasions giving a total of 9120 periods to follow-up (see Table 2).

The Workplace Bullying and Harassment Cohort and the Prisme Cohort

The *WBH Cohort* enrolled employees (*n* = 2002) from workplaces throughout Denmark. Participants received a questionnaire at baseline in 2006 and again in 2008. The *Prisme Cohort* comprised hospital and civil-service employees (*n* = 3196) from different workplaces in the Central Denmark Region. Participants received a questionnaire at baseline in 2007 and again in 2009. The WBH and the Prisme cohort have a comparable demographic profile and for that reason the two cohorts were combined in a joint study in 2011. For example, both cohorts are dominated by female respondents and the workplaces are mainly situated in the public sector. Furthermore,

in both cohorts, younger people and men were more likely to leave the cohort after one round.^{14,16} There was, however, a difference between the two cohorts in that the WBH cohort had a larger loss to follow-up than the Prisme-cohort (data not shown).

Work Unit

The 5198 participants were affiliated to 1 of in total 455 work units that were defined by the lowest managerial level (Table 3). The number of employees in a work unit ranged from 1 to 161 workers. All work units were organized into four groups according to the proportion of employees who witnessed workplace bullying: 0% witnesses (*n* = 683), 1% to 20% witnesses (*n* = 2274), 21% to 30% witnesses (*n* = 1353), and more than 30% witnesses (*n* = 1298) (see Table 3). This grouping was defined before analyses were carried out as an appropriate trade-off between exposure contrast and the number of participants in each group. Table 3 also illustrates the

TABLE 1. Source and Study Populations and Outcome Ascertainment by Cohort and Year of Data Collection

Year	Source Population	Study Respondents, Population,*		Invited to SCAN		Participated in SCAN		Prevalence of Depression				New Cases of Depression			
		%	<i>N</i>	%	<i>N</i>	%	SCAN	%	MDI†	%	SCAN	%	MDI†	%	
The Prisme Cohort															
2007	10,036	4,351 (43)		904‡	595	66	97 (2.2)	-	-	-	-	-	-	-	
2009	4,508	3,204 (71)		1,088§	562	52	78 (2.4)	-	-	63 (2.0)	-	-	-		
2011	4,489	3,278 (73)		225||	142	63	49 (1.4)	-	-	41 (1.3)	-	-	-		
				3,196											
The WBH Cohort															
2006	7,358	3,123 (42)		-	-	-	-	-	100 (3.2)	-	-	-	-		
2008	3,707	2,237 (60)		-	-	-	-	-	65 (3.0)	-	-	52 (2.3)	-		
2011	3,707	2,210 (60)		430||	182	42	33	-	-	31 (1.4)	-	-	-		
				2,002											
Total		18,403		5,198	2,647	1,481	422	187							

*Included respondents with one or two follow-ups (see Table 1: Overview of included and excluded participants).

†Measured by the MDI.

‡Screening criteria for SCAN Interview 2007 were depressive, burnout, and stress symptoms and a random sample.

§Screening criteria for SCAN interview 2009 were depressive, burnout, and stress symptoms, cases of depression from 2007, high psychosocial demands and a random sample.

||Screening criteria for SCAN interview 2011 were depressive and anxiety symptoms, self-reported workplace bullying or negative acts, and a random sample. In the Prisme cohort, the number of invited are relatively lower because the random sample primarily were invited from the WBH cohort.

TABLE 2. Overview of Included and Excluded Participants*

Cohort	Round 1 Baseline	Round 2	Round 3 Follow-Up	Included Participants	Excluded Participants	Courses of Events
Prisme	Participants responding 2 out of 3 rounds	2007	2009	469		469
		2009	2011	52		52
	Participants responding 3 out of 3 rounds	2007	2009	2,675		5,350
	Participants responding 1 out of 3 rounds				688	
WBH	Participants responding 2 out of 3 rounds with 4 yrs follow-up	2007	2011		547	
	Participants responding 2 out of 3 rounds	2006	2008	406		406
		2008	2011	349		349
	Participants responding 3 out of 3 rounds	2006	2008	1,247		2,494
	Participants responding 1 out of 3 rounds only				1,090	
	Participants responding 2 out of 3 rounds with 4 yrs follow-up	2006	2011		615	
Total number of participants				5,198	2,940	9,120

*Overview of participants included in the study. Participants responding at only one occasion and participants with 4 years follow-up time were excluded. Data analysis is based on observations with only 2-year follow-up periods. This overview shows baseline and follow-up year. Participants who responded at all three occasions are occurring twice in the data analysis with different baseline and follow-up information depending on the wave.

TABLE 3. Distribution of Participants According to Percentage of Employees Witnessing Bullying Past 6 Months by Cohort and Size of the Work Units (Upper Part) and Distribution of Employees That Perceive That They Have Been Bullied by Percentage of Employees Witnessing Bullying in Their Work Unit (Lower Part)

	0%			1%–20%			21%–30%			>30%			All		
	Work Units	Persons	%	Work Units	Persons	%	Work Units	Persons	%	Work Units	Persons	%	Work Units	Persons	%
The Prisme study															
Size of work units															
0–10 employees	171	513	30.8	42	321	19.3	32	268	16.1	101	563	33.8	346	1,665	100.0
11–20 employees	4	58	7.2	28	451	56.0	12	226	28.0	3	71	8.80	47	806	100.0
>20 employees	1	39	6.2	8	341	54.2	4	204	32.4	1	45	7.2	14	629	100.0
The WBH Cohort															
Size of work units															
0–10 employees	...	...	...	1	10	7.8	5	46	36.0	8	72	56.3	14	128	100.0
11–20 employees	2	28	17.4	4	85	52.8	2	48	29.8	0	0	...	6	161	100.0
>20 employees	...	...	...	16	1,066	62.2	10	561	32.7	2	86	5.0	28	1,713	100.0
Sum	178	638		99	2,274		65	1,353		115	837		469	5,102*	100.0
Distribution of employees reporting workplace bullying within exposure groups															
<i>Never</i>		586	98.9		2,034	94.60		1,173	92.73		715	86.88			
<i>Occasionally</i>		4	0.68		106	4.93		80	6.32		97	11.79			
<i>Frequently</i>		2	0.34		10	0.47		12	0.95		11	1.34			

*Ninety-six subjects could not be identified with their work unit and are therefore missing in this table.

relation between witnesses of bullying and perception of bullying in the four exposure groups.

Measures of Self-Labeled Workplace bullying

To calibrate the participants' understanding of bullying, we first presented a definition similar to the one by Einarsen et al¹; "Bullying occurs when one or more persons repeatedly over a longer period are exposed to unpleasant or negative actions or behaviours at work, that it is difficult to defend one-self against." Then we asked, "Have you been exposed to bullying at your current workplace within the last 6 months?" Response categories were "never," "now and again," "monthly," "weekly," and "daily." We created a three-level exposure variable with the following categories: "no," "occasional bullying" (comprising the response categories "now and again" and "monthly"), and "frequent bullying" (comprising the response categories "weekly" and "daily") (Table 3).

Measures of Witnessing Workplace Bullying

To assess witnesses reporting bullying, we first presented the same bullying definition described previously. Next, we asked the participants to state whether or not they had witnessed a colleague being bullied at work during the last 6 months. The five-point scale was used with the following categories: "never," "now and again," "monthly," "weekly," and "daily." We dichotomized the responses between "now and again" and "monthly." The proportion of witnesses per work unit was then estimated and the value was assigned to all employees working at the work unit.

Measures of Diagnosis of Depression

Diagnosis of depression was measured differently in the two cohorts. In the *WBH Cohort*, depression was identified with the Major Depression Inventory (MDI) questionnaire.¹⁷ In the *Prisme Cohort*, depression was measured using the SCAN interview. In the joint study in 2011, SCAN interviews were again used to diagnose depression according to ICD-10 (International Classification of Diseases, 10th Revision) DCR criteria. The SCAN interviews were conducted during the spring, 3 to 6 months after the respondents had filled out the screening questionnaire.

MDI in the WBH Cohort

The MDI is a self-rated questionnaire with an algorithm that leads to ICD-10 categories of mild to severe depression.¹⁷ The MDI consists of 10 items, where items 8 and 10 have a subitem; thus, there were 12 questions in total. Each item measures the presence of symptoms during the past 2 weeks on a scale ranging from 0 (the symptom has not been present at all) to 5 (the symptom is present all the time). The algorithm includes core symptoms (depressed mood; lack of interests; and lack of energy) and accompanying symptoms (reduced self-confidence; bad conscience or feelings of guilt; feeling life is not worth living; difficulty concentrating; restlessness; subdued; sleeping problems; reduced appetite; and increased appetite) of depressive disorder. The 12 questions are included in the scale to classify participants with risk of unipolar depression (*Mild* = sum score 21 to 25, *Moderate* = sum score 26 to 30 or *Severe* = ≥ 31).¹⁷ In this study, we dichotomized into depression or not by a cutoff sum score of 21 or more. The MDI has been satisfactory validated with the SCAN procedure (described later).¹⁷

SCAN Interview in the Prisme Cohort and the Joint Study in 2011

We diagnosed depression according to the ICD-10 classification of mental and behavioral disorders: diagnostic Criteria for Research (ICD-10-DCR)¹⁸ by applying the SCAN interview, version 2.1, part I.¹⁹ The following sections of part I were used: section 3 (worrying and tension), section 4 (panic anxiety and phobias), sections 6 to 8 (depression). All questions referred to the previous

6 months. The interview was computer aided and semistructured.^{19,20} A single interview took about 1 hour, and each was conducted by psychology and medical students trained to manage these interviews.

Screening Criteria for SCAN Interviews

In 2007, the following four screening criteria were used to select respondents for the SCAN interviews^{18,19} ($n = 595$): (1) depressive symptoms (point score of 3 or more on 3 or more of the six depressive symptoms items from the symptom checklist (SCL-DEP6),²¹ $n = 311$); (2) a random sample of people with symptoms of burnout (mean score of 4 or more on Copenhagen Burnout Inventory, $n = 80$); (3) stress symptoms (mean score of 2.5 or more on Perceived Stress Scale, $n = 79$); and (4) a random sample ($n = 434$). The screening criteria from 2007 are also described in Kolstad et al.¹⁵

In 2009, the following four criteria for SCAN interviews ($n = 562$) were (1) depressive, stress, or burnout symptoms, based on the questionnaires from 2009 ($n = 599$); (2) ICD-10 depression, diagnosed with the SCAN interviews in 2007 ($n = 71$); (3) a random sample with people from the random sample in 2007 ($n = 201$); and (4) people who reported high psychosocial load ($n = 167$).

In 2011, the screening criteria for SCAN interview were developed from the criteria from 2007 and 2009. The used screening criteria were ($n = 655$): (1) exposure to at least 1 of 11 Negative Acts of bullying weekly or more frequently, or perceived workplace bullying monthly or more often during the past 12 months ($n = 207$); (2) depressive symptoms ($n = 246$); (3) anxiety symptoms (point score of 2 or more of the three anxiety symptoms items, $n = 186$). The final criterion was (4) a random sample ($n = 220$). The four screenings groups were overlapping.

Statistics

We used logistic regression to examine risk of newly onset depression by self-labeling of bullying at baseline and by the proportion of employees who witnessed bullying in their work units at baseline. The follow-up period from baseline to ascertainment of outcome was approximately 2 years and each participant could contribute up to 2 follow-up periods. Among the 5198 respondents, we identified 9120 two-year periods of follow-up (Table 2). Cases with depression at baseline, measured with SCAN interview or MDI, were excluded from the analysis. Two different methods were used to estimate the risk of depression in relation to workplace bullying. The first method used the self-labeling method of bullying as an indicator of exposure. The second method used the proportion of colleagues within a work-unit that had witnessed bullying as an indicator of exposure. Lacking independence of up to two follow-up periods in the same individual was accounted for by the *proc genmod* repeated-measures procedure with SAS software, version 9.2 (SAS Institute, Inc, Cary, NC). Differences in characteristics across groups categorized by percentage of employees witnessing bullying (Table 4) were evaluated by the use of the Pearson chi-square tests.

The hierarchical structure of the study population characterized by nesting employees within work units may violate the assumption of independent observations potentially causing too narrow confidence limits. To address this issue, we repeated the main analysis by hierarchical logistic regression modeling using SAS 9.1 PROC GLIMMIX. In these analyses, the effect of work units is accounted for by a random intercept variable.^{22,23}

We included a fixed set of covariates selected *a priori* on the basis of current knowledge.^{24–28} From the baseline questionnaire, the following confounders were measured: sex, age (≤ 34 , 35 to 44, 45 to 54, ≥ 55 years), previous episodes of depression (yes/no), family history of depression (yes/no), years of education beyond primary or high school ($<3/3$ to $4/4$), weekly alcohol consumption (≤ 14 [for females] and ≤ 21 [for males]), depressive symptoms (rating of ≥ 3 on <2 , ≥ 2 questions from the SCL-DEP6 (21) or MDI score of 20 or

more), smoking (never, ex-smoker, and smoker). Interactive effects on risk of depression by cohort (Prisme and WBH, respectively) and self-labeled bullying were examined by inclusion of an interaction term (cohort*bullying) in the regression models.

Among respondents in the Prisme cohort, we controlled for personality traits on the basis of the shortened version of Eysenck Personality Questionnaire short-form,^{29,30} measuring extraversion and neuroticism. Among respondents in the WBH cohort, we also controlled for personality traits with the scale Sense of Coherence (SOC)³¹ based on Antonovskys concept.³²

RESULTS

In total, 5198 employees took part in at least one follow-up (see Tables 1 and 2). The distribution of participants according to the percentage of employees witnessing bullying past 6 months is presented in Table 3. also presents the distribution of employees who perceive that they have been bullied by percentage of employees witnessing bullying in their work. Among those, the mean age was 48 years and the sex distribution was 75% females and 25% males. Table 4 presents characteristics of respondents across groups categorized by percentage of employees witnessing bullying past 6 months. Because associations between bullying and depression were not modified by cohort in any of the analyses, we present findings for the cohorts combined.

Prospective Analyses of Newly Onset Depression as Predicted by the Self-Labeling Method

Table 5 presents the prospective association between self-labeled workplace bullying and the risk of newly onset depression. In the respondent groups of the “occasionally” and “frequently” bullied, the adjusted odds ratios (ORs) were 2.17 (95% CI: 1.11 to 4.23) and 9.63 (95% CI: 3.42 to 27.10), respectively. The hierarchical logistic regression analysis using SAS GLIMMIX that account for possible clustering of the outcome within work units showed essentially the same results (adjusted OR 1.97 [95% CI: 1.12 to 3.47] and 7.90 [95% CI: 3.04 to 20.50], respectively).

When adjusting for the participants who changed job at follow-up, the OR for occasionally bullying was 2.43 (95% CI: 1.38 to 4.26) and 10.94 (95% CI: 4.24 to 28.20) for frequently bullying. Separating the analyses for men and women did not change the results significantly. For men, the OR for occasional bullying was 1.44 (95% CI: 0.33 to 6.24) and 27.98 (95% CI: 4.96 to 157.71) for frequent bullying. For women, the OR for occasional bullying was 2.38 (95% CI: 1.33 to 4.25) and for frequent bullying was 5.97 (95% CI: 1.96 to 18.14).

To account for the different measures of depression, we performed a sensitivity analysis based upon the more reliable SCAN interview only and found an adjusted OR of 2.66 (95% CI: 1.48 to 4.77) for occasional bullying and for frequent bullying an OR of 5.31 (95% CI: 1.48 to 19.04), which is close to the results of the overall analysis also, including MDI cases. Both results followed the pattern of the main analysis.

The cohort-specific ORs based upon SCAN verified depression were in the Prisme cohort 3.01 (95% CI: 1.58 to 5.73) for occasional bullying and 6.22 (95% CI: 1.66 to 23.24) for frequent bullying. In the WBH cohort, the corresponding ORs were 0.76 (95% CI: 0.22 to 2.64) and 11.44 (95% CI: 3.80 to 34.46) for occasional and frequent bullying, respectively.

In the Prisme cohort, we adjusted for extraversion and neuroticism at baseline. The OR for occasional bullying was 2.73 (95% CI: 1.33 to 5.67) and for the group reporting frequent bullying the OR was 5.00 (95% CI: 1.36 to 18.46). Among respondents in the WBH cohort, we controlled for personality traits with the SOC scale. This did not change the result for the WBH cohort. For the group reporting occasionally bullying, the OR was 0.64 (95% CI: 0.18 to

TABLE 4. Characteristics of Respondents Across Groups Categorized by Percentage of Employees Witnessing Bullying

	Percentage Witnessing Bullying in Work Units								P
	0% (n = 638)		0–20% (n = 2,274)		20%–30% (n = 1,353)		>30% (n = 837)		
	n	%	n	%	n	%	n	%	
Cohort									
The Prisme Cohort	610	19.67	1,113	35.90	698	22.51	715	21.90	<0.0001
The WBH Cohort	28	1.39	1,161	57.99	655	32.71	158	7.89	
Sex									
Female	511	13.22	1,783	46.15	1,006	26.04	563	14.57	<0.0001
Male	127	9.96	491	38.51	347	27.22	310	24.31	
Age groups									
<30 yrs	15	9.38	63	39.38	62	38.75	20	12.50	0.0002
30–39 yrs	136	12.57	506	46.77	291	26.89	149	13.77	
40–49 yrs	173	12.25	608	43.06	354	25.07	277	19.62	
50–59 yrs	242	13.20	821	44.79	478	26.08	292	15.93	
>60 yrs	72	11.06	276	42.40	168	25.81	135	20.74	
Higher education									
< 3 yrs	145	9.91	616	42.11	391	26.73	311	21.26	<0.0001
3–4 yrs	400	13.73	1,286	44.13	792	27.18	436	14.96	
> 4 yrs	86	12.03	348	48.67	161	22.52	120	16.78	
Living alone									
No	525	12.40	1,890	44.63	1,091	25.76	729	17.21	0.230
Yes	113	12.96	370	42.43	251	28.78	138	15.83	
Body mass index									
<18.5 kg/m ²	17	27.42	4	6.45	24	38.71	17	27.42	0.006
18.5–25.0 kg/m ²	393	13.17	1,329	44.55	801	26.85	460	15.42	
>25 kg/m ²	228	11.32	881	43.72	512	25.41	394	19.55	
Smoking									
Smoker	79	10.39	308	40.53	203	26.71	170	22.37	<0.0001
Ex-smoker	220	12.00	791	43.15	503	27.44	319	17.40	
Never smoked	334	13.34	1,157	46.22	635	25.37	377	15.06	
Alcohol									
<14 (Female)/<21 (Male) units of alcohol	612	12.54	2,160	44.27	1,277	26.17	830	17.01	0.530
>14 (Female)/>21 (Male) units of alcohol	26	10.04	114	44.02	76	29.34	43	16.60	
Family income									
< 500,000	134	20.49	233	35.63	159	24.31	128	19.57	0.029
500–899,999	304	18.70	577	35.49	375	23.06	370	22.76	
> = 900,000	74	19.17	135	34.97	68	17.62	109	28.24	
Life events									
No	558	19.65	1,002	35.29	631	22.23	648	22.82	0.805
Yes	52	17.51	111	37.37	67	22.56	67	22.56	
Family depression									
Yes	149	17.65	288	34.12	201	23.82	206	24.41	0.177
No	404	20.16	717	35.78	443	22.11	440	21.96	
Unknown	43	18.30	92	39.15	41	17.45	59	25.11	
Earlier depression									
Yes	79	17.06	161	34.77	102	22.03	121	26.13	0.337
No	449	18.10	899	36.24	558	22.49	575	23.18	
Workplace bullying									
No	586	13.00	2,034	45.12	1,173	26.02	715	15.86	<0.0001
Occasionally	4	1.39	106	36.93	80	27.87	97	33.80	
Frequently	2	5.71	10	28.57	12	34.29	11	31.43	

2.26), and for the group reporting frequently bullying, the OR was 9.93 (95% CI: 1.49 to 66.16).

Prospective Analyses of Newly Onset Depression as Predicted by the Proportion of Witnesses Within a Work Unit

Table 6 presents the prospective association between the proportion of employees who witnessed workplace bullying at baseline and the risk of newly onset depression after 2 years. The results did not support that witnessing bullying at the work-unit level predicts newly onset depression, neither in the crude nor in the adjusted analysis. The risk of depression was estimated according to the exposure groups with 1% to 20% witnesses, 21% to 30%, and more than 30%. The adjusted ORs for depression were 0.91 (95% CI: 0.51 to 1.64), 0.81 (95% CI: 0.43 to 1.53), and 0.89 (95% CI: 0.46 to 1.73), respectively. The hierarchical logistic regression produced essentially the same results (adjusted OR 0.91 [95% CI: 0.51 to 1.64], 0.92 [95% CI: 0.50 to 1.73], and 1.17 [95% CI: 0.63 to 2.20], respectively).

To control for participants who changed their job between baseline and follow-up, we adjusted the sensitivity analysis for participants who at follow-up answered they had changed work unit. The analysis did not change the results. According to the exposure groups, the OR for depression was 1.20 (95% CI: 0.66 to 2.12), 1.16 (95% CI: 0.62 to 2.20), and 1.24 (95% CI: 0.65 to 2.40), respectively. All work units with 0 to 10 employees were removed from the analysis. This did not change our main result in any of the exposure groups; 0 to 20%: 0.86 (95% CI: 0.35 to 2.10), 21% to 30%: 0.83 (95% CI: 0.32 to 2.12), more than 30%: 0.75 (95% CI: 0.23 to 2.50). We also separated the analysis between men and women. Results were unchanged. For the three exposure groups, the ORs for men were 0.75 (95% CI: 0.20 to 3.60), 1.40 (95% CI: 0.26 to 7.34), and 1.73 (95% CI: 0.33 to 9.13) and for women the OR were 0.96 (95% CI: 0.53 to 1.75), 0.81 (95% CI: 0.42 to 1.56), and 1.02 (95% CI: 0.52 to 2.0).

With respect to the risk of SCAN-verified depression according to work unit proportion of witnessing bullying, the ORs from low to high prevalence were 0.88 (95% CI: 0.49 to 1.60), 0.80 (95% CI: 0.41 to 1.54), and 1.10 (95% CI: 0.57 to 1.92) and the corresponding cohort specific ORs were for the Prisme cohort 0.92 (95% CI: 0.50 to 1.70), 1.04 (95% CI: 0.53 to 2.04), and 1.21 (95% CI: 0.65 to 2.30) and for the WBH cohort 0.50 (95% CI: 0.10 to 2.30), 0.40 (95% CI: 0.01 to 1.89), and 0.40 (95% CI: 0.05 to 3.3).

In the Prisme cohort, we controlled for personality traits by adjusting for extraversion and neuroticism. This did not change the main result. According to the exposure groups, the ORs were 0.93 (95% CI: 0.47 to 1.83), 1.08 (95% CI: 0.51 to 2.25), and 1.46 (95% CI: 0.75 to 2.86), respectively. In the WBH cohort, we controlled for personality traits with the SOC scale. This did not change the main result. When controlling for SOC, the ORs for depression after 2 years were 0.72 (95% CI: 0.10 to 5.20), 0.46 (95% CI: 0.06 to 3.61), and 0.58 (95% CI: 0.06 to 5.32), respectively.

DISCUSSION

We observed a strong prospective association between self-labeled bullying at the workplace the past 6 months and the occurrence of depression 2 years later among employees without depression at baseline. Furthermore, the risk of depression was related to the severity of bullying as the risk was markedly higher in participants reporting weekly or daily bullying than among participants with less frequent bullying. The risk was not attenuated when accounted for by several potential confounders. On the contrary, when we measured bullying at the work-unit level as a non-self-reported measurement by percentage of witnesses, we did not observe an increased risk of newly onset depression.

The results regarding self-labeled bullying corroborate the findings from the only two prospective studies of workplace bullying and depression that, to the best of our knowledge, have been published so far.^{10,11} The first study addressed the risk of self-reported physician diagnosed depression among 5432 health care workers

TABLE 5. Risk of Newly Onset Depression by Self-Reported Workplace Bullying

	Number of Observations	New Cases of Depression by SCAN/MDI	%	OR	OR Adj*	95% CI
Depression						
Perceived workplace bullying						
Never	7,864	113	1.4	1.0	...	...
Occasionally	460	16	3.5	2.47	2.17	1.11–4.23
Frequently	52	6	11.5	8.94	9.63	3.42–27.10

*Adjusted for age, sex, earlier depression, depressive symptoms, family history of depression, higher education, alcohol, smoking.

TABLE 6. Risk of Newly Onset Depression by Percentage of Employees Witnessing Bullying

Percentage Witnessing Workplace Bullying	Number of Observations	New cases of Depression/Depressive Symptoms by SCAN/MDI	%	OR	OR adj*	95% CI
Depression						
0	1,159	19	1.6	1.0	...	...
1%–20%	3,872	63	1.6	0.99	0.91	0.51–1.64
21%–30%	2,276	34	1.5	0.91	0.81	0.43–1.53
>30%	1,539	29	1.9	1.15	0.89	0.46–1.73

*Adjusted for age, sex, earlier depression, depressive symptoms, family history of depression, higher education, alcohol, smoking.

who reported workplace bullying at baseline and at follow-up after 2 years (OR 4.81 [CI 95% 2.46 to 9.40]).¹⁰ In this study, the self-labeling of workplace bullying and depression were not separated in time because information on both was obtained at follow-up. In the second study¹¹ of 5701 eldercare workers in Denmark, the risk of depression ascertained by the MDI was substantially increased in employees free of previous depression who reported workplace bullying 2 years earlier. Thus, the findings of the two earlier studies and of the present are consistent and the observed associations were very strong with regard to the risk of depression among people reporting bullying at work. This study contributes to the two earlier studies by the use of a standardized interview to establish the diagnosis of major depression as opposed to the use of questionnaires. Findings are also consistent with results of several earlier cross-sectional studies, some of which include other employees than health and elder care workers.^{2,33,34} Furthermore, in this study, participants came from a wide range of occupations, whereas the two previous studies were restricted to health care workers.^{10,11} Thus, this study showed that the association between self-labeled bullying and risk of depression may not be limited to specific occupations. Furthermore, in this study, approximately 75% of the participants were women. This is in line with earlier longitudinal studies assessing workplace bullying and depression.^{10,11} These studies are often conducted among health care workers and among employees in public sector, which can explain the sex imbalance in the literature as well as in this study. Finally, an array of larger and smaller work-units is included in this study. When we controlled for the work-unit size, the results did not change.

To our knowledge, this is the first study of depression in relation to workplace bullying where the outcome was ascertained by standardized interviews. Previous studies have measured depression by self-administrated depression checklists only.^{10,11} In this study, the outcome was defined by MDI only in the WBH cohort. Nevertheless, in a Danish validation study, the sensitivity and specificity of the MDI algorithms of moderate to severe depression according to ICD-10-DCR were analyzed by using the SCAN as the index of validity; the sensitivity was 0.86 and the specificity 0.86, indicating a satisfactory agreement between the two instruments.¹⁷ Furthermore, our sensitivity analysis leaving out the MDI cases revealed essentially the same results for respondents reporting frequently bullying, whereas we also discovered a significant increased OR among respondents reporting occasionally bullying.

Our goal was to identify as many of the participants with clinical depression as possible while keeping a high specificity. The selection of participants for SCAN interviews was based on screening criteria, which according to earlier analyses had a sensitivity of 84% and a specificity of 96%. Nevertheless, the design did not allow for detection of new cases of depression that vanished during the follow-up period. Moreover, because the questionnaires were filled in 3 to 6 months before the SCAN interviews were completed, some cases were probably not identified because of remission before the interview was carried out. Nevertheless, incomplete ascertainment of depression is hardly related to the exposure under study and is therefore primarily expected to reduce the statistical power of the study but not to result in bias.

The participation rate for the initial survey was less than 50%. In both cohorts, the respondents differed from the nonrespondents by sex, age, and social class.¹⁶ Obviously, such a low participation rate raises concern regarding selection bias. Using registry data also available for nonrespondents, we compared risk of sick leave and use of antidepressant medicine according to work-unit measures of the psychosocial environment (also available for nonrespondents) in the sample of respondents and the entire sample also including nonrespondents and observed no substantial differences in risk estimates.¹⁶ We believe that the low participation in both cohorts mostly is caused by inconvenience related to the high demands to participate includ-

ing repeated sampling of saliva and lengthy SCAN interviews. In any case, differential participation in the baseline surveys is less likely to cause biased estimates in the follow-up analyses as loss to follow-up was limited. Loss to follow-up was most pronounced in young males and in low socioeconomic classes, which may bias analyses of the association between self-reported bullying and risk of depression if the dropout is differential with respect to both the exposure and the outcome. Comparing baseline characteristics of respondents and nonrespondents does not indicate bias related to loss of follow-up (data not shown).

Because of the lack of independence between self-reported exposure and self-reported outcome, it is difficult to state causality. In occupational health, it is a primary goal to obtain knowledge on adverse working environments that can be targeted by preventive means to improve health. Related to this purpose, it could be suggested that the individual perception of the working environment is useful to the extent that it is a reliable reflection of the working environment. The perception of other people's behaviors and intentions is strongly dependent on the individual norms, attitudes, preconceptions, and social factors. A behavior that one individual perceives as bullying behavior may be perceived as normal (in the literary sense) by managers and colleagues.¹ Even more important, perception of adverse behavior of others and susceptibility to develop mental disorders may share common determinants, for instance, linked to personality characteristics.³⁵ The very strong cross-sectional and longitudinal associations between individual perception of bullying and depression with relative risks in the range of 5 to 10 that has been reported in earlier studies^{10,11} indicate that common-method bias because of lacking independence of exposure and outcome variables may be important. For that reason, it is from a preventive occupational health point of view needed to get independent measures of exposures. In this article, we use witnessing of bullying among employees in work units as such a measure. The interest is not whether witnessing of bullying increases the risk of depression among witnesses. The prevalence of employees witnessing bullying is used to define a bullying work environment independently of individuals who perceive themselves as victims of bullying. If bullying is causing depression among the bullied, we will expect that the risk of depression is higher in work units with a high proportion of witnesses as an indication of a higher and/or more agreed occurrence of bullying behavior. Is this assumption reasonable? First, bullying could be hidden to the majority of employees and in the extreme known only by the victim and the perpetrator. This might, in particular, be an issue in large work units, but risk estimates were close to unity in both large and small work units. Second, the proportion of witnesses may not reflect the number of subjects who are exposed to bullying behavior and for that reason cause bias toward null. This is probably the most serious limitation of our approach and unfortunately we are lacking information on the number of persons that employees consider bullied in each work unit. Nevertheless, the risk of depression was the same in work units with no witnesses of workplace bullying at all compared with workplaces with at least one witness. Third, in small work units, a large group of employees might engage in bullying behavior against one single scapegoat and this particular scenario where most witnesses are perpetrators themselves would hardly be reflected by our questionnaire. Although research indicates that there is an overlap between self-labeled bullying and bullying reported by witnesses,³⁶ it seems obvious that there is a need to develop more reliable methods for measuring of workplace bullying. Thus, this approach does not include employees' personal experiences of being bullied but represents a supplement to the traditional approach.

CONCLUSIONS

In this study, the perception of frequent workplace bullying is a strong predictor of development of a depressive disorder within a 2-year period. Nevertheless, a bullying work environment defined

by a high proportion of employees witnessing bullying seems not to be predictive of depression. The findings of this study provide new perspectives for the understanding of workplace bullying and options for preventive actions. From a preventive and an occupational health point of view, it is crucial to understand the mechanisms that explain the association between perceived bullying and depression. Considering the strong association between the individual perception of bullying and risk of depression, we expected to find an association between prevalence of witnesses reporting bullying and risk of depression among employees working in high-risk units. The discrepant findings of this study may, therefore, indicate a need for more studies applying both self-report and non-self-reported assessments. Furthermore, there is a need to refine and validate tools to measure workplace bullying to enable studies that reliably can separate effects attributable to individual and environmental characteristics.

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