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## Bullying at work and onset of a major depressive episode among Danish female eldercare workers

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**Objective** The aim of this study was to analyze whether exposure to workplace bullying among 5701 female employees in the Danish eldercare sector increases the risk of onset of a major depressive episode (MDE).

**Methods** Participants received questionnaires in 2004–2005 and again in 2006–2007. MDE was assessed with the Major Depression Inventory. We examined baseline bullying as a predictor of onset of MDE at follow-up using multiple logistic regression. We further conducted a cross-sectional analysis at the time of follow-up among participants who at baseline were free of bullying, MDE, and signs of reduced psychological health. Finally, we analyzed reciprocal effects, by using baseline bullying and baseline MDE as predictors for bullying and MDE at follow-up.

**Results** Onset rates of MDE in the groups of no, occasional, and frequent bullying were 1.5%, 3.4%, and 11.3%, respectively. Odds ratios (OR) for onset of MDE were 2.22 [95% confidence interval (95% CI) 1.31–3.76] for occasional bullying and OR 8.45 (95% CI 4.04–17.70) for frequent bullying, after adjustment for covariates. In the cross-sectional analysis, OR were 6.29 (95% CI 2.52–15.68) for occasional bullying and 20.96 (95% CI 5.80–75.80) for frequent bullying. In the analyses on reciprocal effects, both baseline bullying [occasional: OR 2.12 (95% CI 1.29–3.48) and frequent: OR 6.39 (95% CI 3.10–13.17)] and baseline MDE [OR 7.18 (95% CI 3.60–14.30)] predicted MDE at follow-up. However, only baseline bullying [occasional: OR 7.44 (95% CI 5.94–9.31) and frequent: OR 11.91 (95% CI 7.56–18.77)] but not baseline MDE [OR 0.93 (95% CI 0.47–1.84)] predicted bullying at follow-up.

**Conclusions** Workplace bullying increased the risk of MDE among female eldercare workers. MDE did not predict risk of bullying. Eliminating bullying at work may be an important contribution to the prevention of MDE.

**Key terms** anxiety; depression; healthcare worker; longitudinal study; mental health; mobbing; negative act; occupational health; psychosocial factor; stress; workplace bullying.

The role of adverse psychosocial work environment exposures in the aetiology of major depressive episodes (MDE) has gained considerable interest over the last few years (1). Two recent comprehensive reviews reported that high psychological demands, low job control (only in one review), and low social support predicted onset of MDE and depressive symptoms in prospective studies (2, 3). A third review found further evidence for an effect of effort–reward imbalance (4). The reviews pointed out that psychosocial work environment factors other than those defined by the demand–control–support and the effort–reward imbalance models only rarely have

been investigated and that there is a need for a broader research approach on the impact of the work environment on the onset of MDE.

Exposure to bullying at work could be a psychosocial working condition that increases the risk of MDE. In their seminal work on “social origins of depression”, Brown & Harris have argued that a major cause for MDE is the “inability to hold good thoughts about ourselves” (5, p233). Humiliating experiences, such as becoming the target of bullying, will likely contribute to this inability, and humiliation has indeed predicted onset of MDE in the Virginia Twin Registry Study

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(6). Moreover, being bullied might evoke a feeling of helplessness, which has been discussed for a long time as an important social psychological contributor to MDE (7).

Against this background, it is remarkable that there is very little research on workplace bullying and MDE. Most of the research in this area is cross-sectional, with the well-known limitation of establishing temporality (8–10). Although several studies have investigated prospective associations between workplace bullying and psychological distress (11–14), to the best of our knowledge, only one prospective study (15) so far has analyzed the effect of workplace bullying on the onset of MDE. In this study, Kivimäki et al showed that prolonged bullying, defined as being exposed to bullying both at baseline and follow-up, predicted onset of self-reported physician-diagnosed depression in a sample of 5432 hospital employees during a two-year follow-up (15). However, the analyses were not fully prospective as the predictor variable concerned changes in exposure to bullying from baseline to follow-up.

Research on the effect of psychosocial working conditions (including bullying) on the risk of MDE faces several methodological challenges, also in prospective studies. Currently, it is particularly controversially discussed whether reduced psychological health at baseline, including sub-clinical depressive symptoms, might affect reporting and onset of adverse working conditions at baseline in addition to the risk of developing MDE during follow-up, which would bias results toward an overestimation of the effect (16–18). An underestimation, however, is also possible: exposure to bullying does not start at baseline measurement, but usually has been present before. Consequently, when a prospective study excludes participants with clinical and sub-clinical depressive symptoms at baseline, the exposed group of the study population consists of participants who have been exposed to bullying for some time but have not yet shown any health effects. Hence, the study population might over-represent employees with high resilience, which would lead to an underestimation of the average population effect of bullying.

The aim of the present study was to investigate the effect of workplace bullying on the onset of MDE in a cohort of female eldercare workers, while accounting for the above-described methodological challenges. To do so, we applied three analytic strategies: (i) a “classic” prospective analysis, excluding baseline MDE cases and applying a subgroup analysis of participants who were free of any signs of reduced psychological health at baseline; (ii) a cross-sectional analysis of follow-up data that only included participants who were at baseline free of bullying, MDE, and signs of reduced psychological health; and (iii) a full panel analysis, in which we used bullying and MDE both as predictors and as outcomes.

## Methods

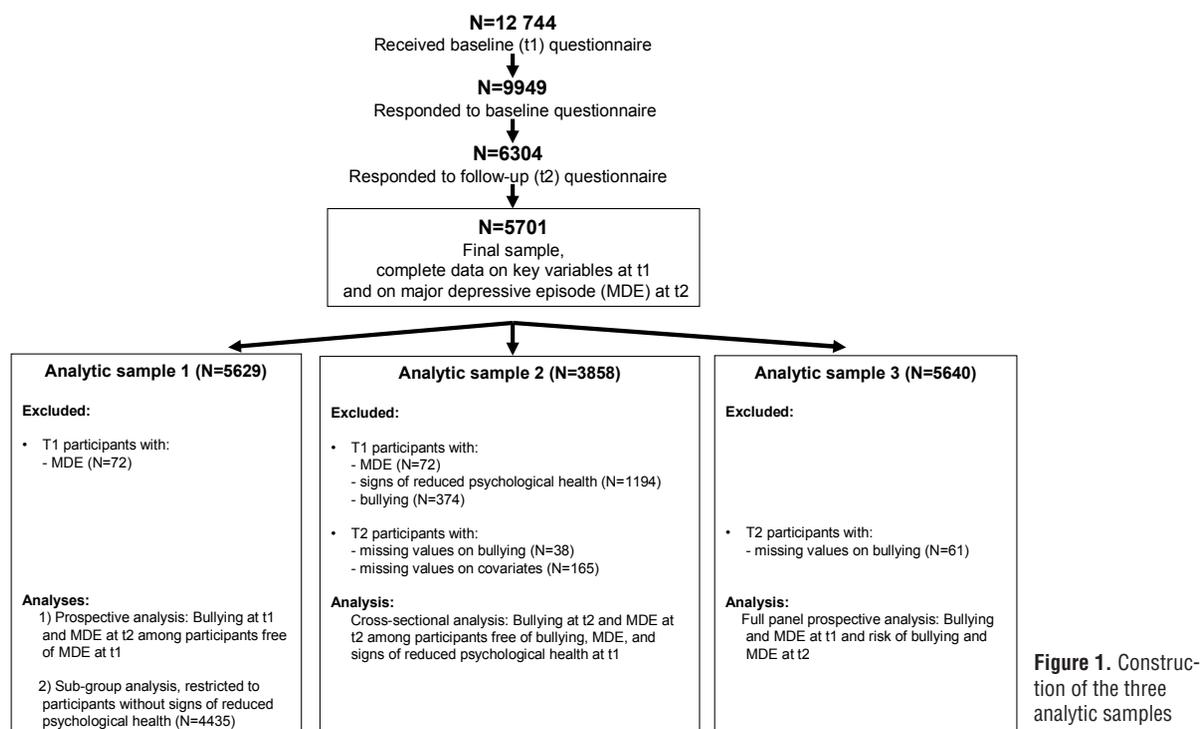
### Study design and participants

The analyses are based on an ongoing longitudinal study in the Danish eldercare sector. In 2004, 65 Danish municipalities were invited to participate in the study. The municipalities were selected to reflect the existing variation between Danish municipalities in a number of relevant factors including organization of elderly care, frequency of elderly people needing care, the socioeconomic wealth of the municipality, and local labor market conditions. Of the 65 invited municipalities, 36 accepted the invitation. Analyses showed that the 36 participating and the 29 non-participating municipalities did not differ with regard to organization of elderly care and the frequency of elderly people needing care. Participating municipalities, however, had a lower socioeconomic wealth and more problematic labor market conditions than non-participating municipalities.

From December 2004 until June 2005, all employees working in the eldercare sector in the 36 participating municipalities received a comprehensive questionnaire on sociodemographics, working condition, and health (data collection at t1). Figure 1 gives an overview about the data collection and how we constructed the three analytic samples. In brief, of the 12 744 employees who received the questionnaire, 9949 responded (78.1%). From October 2006 to September 2007, we sent out a follow-up questionnaire (data collection at t2). Of the 9949 baseline responders, 1998 were lost to follow-up because they had left their workplace, 1516 did not respond to the questionnaire, and 131 did not participate for other reasons (eg, address was unknown), yielding a sample of 6304 (63.4%) responders at follow-up.

When we compared the 6304 responders with the 1516 non-responders, neither baseline bullying nor baseline MDE predicted non-response at follow-up. However, when we compared the responders with the 1998 employees who had left their workplace, we found that both baseline bullying [occasional bullying: odds ratio (OR) 1.21, 95% confidence interval (95% CI) 1.02–1.42; frequent bullying: OR 1.70, 95% CI 1.20–2.39] and MDE (OR 1.88, 95% CI 1.31–2.70) predicted leaving the workplace during follow-up.

Of the 6304 participants who had participated in both rounds, 234 were men. We excluded them from the analyses because previous research on work environment and severe depressive symptoms indicated differential effects for men and women (19). Hence, analyses should not be adjusted but stratified by gender, which was not possible in the present study due to the small number of male participants. We also excluded 369 participants due to missing values on key baseline variables or missing values on MDE at follow-up, yielding a final



study sample of 5701 participants. The mean age was 46.2 [standard deviation (SD) 8.9] years, and most participants were cohabiting (N=4675, 82.0%). Participants worked mainly in care work (N=4754, 83.4%), 557 (9.8%) worked in non-care work (eg, kitchen, cleaning, administration) and 390 (6.8%) had a supervisory function. Mean seniority was 8.8 (SD 7.2) years, and mean duration between baseline and follow-up assessment was 20 (SD 2) months, with a range of 14–26 months.

Based on the final study sample, we created three analytic samples (figure 1). Analytic sample 1 was used for the prospective analysis on bullying and MDE and included 5629 participants who were free of MDE at baseline. Analytic sample 2 was used for the cross-sectional analysis at t2 and included 3858 participants, who at baseline were free of bullying, MDE, and signs of reduced psychological health. Analytic sample 3 was used for the full panel analysis on reciprocal effects and included 5640 participants with complete data on bullying and MDE both at baseline and follow-up.

### Measurement of bullying at work

To measure bullying, the participants were first given the following definition: “Bullying takes place when a person repeatedly and for a longer period is exposed to offensive or negative acts at his/her workplace. To say that something is bullying, it is necessary that the person

feels that it is difficult to defend himself/herself against these acts”. Following this definition, participants were asked “Have you been exposed to bullying at your current workplace within the last 12 months?” with the response categories “no”; “yes, now and then”; “yes, monthly”; “yes, weekly”; and “yes, daily or almost daily”. We created a 3-level exposure variable, with the categories (i) “no” (reference group); (ii) “occasional bullying” (combining “now and then” and “monthly”); and (iii) “frequent bullying” (combining “weekly” and “daily/almost daily”).

Next, we asked the participants “If yes, who is/was bullying you?” with the response options (i) direct supervisor/manager; (ii) other supervisors/managers; (iii) colleagues; (iv) subordinates; (v) clients; (vi) relatives of clients; (vii) other persons. Multiple answers to this question were allowed.

### Measurement of MDE

We assessed MDE in the questionnaires using the Major Depression Inventory (MDI). The MDI consists of 10 items assessing the presence of depressive symptoms. Each item measures the presence of a symptom during the last two weeks on a scale ranging from 0 (the symptom has not been present at all) to 5 (the symptom has been present all of the time). Unlike most other self-rating scales, the MDI includes an algorithm that allows assessment of MDE in accordance with the criteria of

the Diagnostical and Statistical Manual, 4<sup>th</sup> revision (DSM-IV) of the American Psychiatric Association (20). The algorithm includes both core and accompanying symptoms. MDE is assessed if during the last two weeks at least five symptoms were present for at least “more than half of the time”. Among those five symptoms, at least one of the two core symptoms (“feeling low in spirits or sad”; “lost interest in daily activities”) must have been present for “all of the time” or “almost all of the time”. A detailed description of the MDI and of the algorithm has been published elsewhere (21). The DSM-IV algorithm has been tested in a Danish clinical validation study (21), where it showed acceptable sensitivity and specificity when compared to a clinical diagnosis based on the Schedule for Clinical Assessment in Neuropsychiatry (SCAN). The MDI has further been validated against the SCAN in a Swedish population-based study (22) and against the Hamilton Depression Scale in another Danish clinical study (23).

In addition to the DSM-IV algorithm, we used the MDI sum score, which ranges from 0–50 points (21, 24). Participants with an MDI score of  $\geq 10$  at baseline were classified as “showing signs of reduced psychological health” and were excluded in some of the analyses of analytic sample 1 and in all analyses of analytic sample 2. This was based on previous findings in the same study population that revealed an increasing risk of long-term sickness absence at this cut-off point (25).

### Measurement of covariates

We included age (continuous, in years), cohabitation (yes/no), type of job (care work, non-care work, supervisory function), and seniority (in years) as potential confounders. All these variables had been associated with MDE or depressive symptoms in earlier studies (26–29). We also adjusted the analyses for length of follow-up (in months).

Further, we measured exposure to violence and threats during the last 12 months, with the same response categories as we used for exposure to bullying. Violence and threats predicted treatment with antidepressants in a recent Danish study (30) and might be regarded as a form of bullying.

### Statistical analysis

We used multiple logistic regression analyses to investigate the association between bullying and MDE. In analytic sample 1, we analyzed the predictive effect of bullying at t1 on risk of MDE at t2 among the 5629 participants free of MDE at t1. We calculated crude OR and OR adjusted for age, cohabitation, type of job, seniority, and length of follow-up. We repeated the analyses for participants with no signs of reduced psychological health

at t1. Furthermore, we analyzed whether effect estimates changed, when we excluded participants bullied by clients and adjusted for exposure to violence and threats. This was motivated by the consideration that bullying by clients and bullying that involves violence or threats might be distinct forms of bullying.

In analytic sample 2, we conducted cross-sectional analyses with exposure to bullying at t2 and prevalence of MDE at t2 among the 3858 participants who at t1 were free of bullying, MDE, and signs of reduced psychological health.

In analytic sample 3, we conducted a full panel design analysis to study possible reciprocal associations among the 5640 participants who had complete data on bullying and MDE at both t1 and t2. We used logistic regression to analyze whether bullying and MDE at t1 predicted MDE at t2 when adjusted for covariates (model 1) and further adjusted for each other (model 2). We used ordinal logistic regression to analyze whether bullying and MDE at t1 predicted bullying at t2 when adjusted for covariates (model 1) and further adjusted for each other (model 2).

## Results

### Prevalence of bullying and type of perpetrator

The prevalence of bullying was 10.0% (N=986) for occasional bullying and 1.9% (N=185) for frequent bullying among the 9826 participants, who responded to the question on bullying in the baseline survey. The 1171 participants who had been bullied named the following perpetrators (percentages add up to more than 100, due to multiple answers): colleagues (N=840, 71.7% of all bullying cases), direct supervisor/manager (N=231, 19.7%), clients (N=110, 9.4%), top management (N=89, 7.6%), subordinates (N=59, 5.0%), relatives of clients (N=55, 4.7%), and others (eg, colleagues from a different ward, N=29, 2.5%).

### Prospective analysis on bullying at t1 and risk of onset of MDE at t2 among participants free of MDE at t1

Table 1 presents the prospective associations between bullying at t1 and risk of onset of MDE at t2 in analytic sample 1. Of the 5629 participants initially free of MDE at t1, 102 (1.8%) developed MDE at t2. In the groups of no, occasional, and frequent exposure to bullying, onset rates were 1.5%, 3.4%, and 11.3%, respectively. Bullying predicted onset of MDE, both in the crude and the adjusted analyses. A test for trend indicated a dose–response relation between frequency of exposure to bullying and risk of MDE.

When we restricted the analysis to participants

who had no signs of reduced psychological health at t1, bullying remained predictive of MDE (table 1). Further exclusion of participants bullied by clients and adjustment for exposure to violence and threats changed effect estimates only marginally (data not shown in table).

**Cross-sectional analysis on the association between bullying and MDE at follow-up**

Table 2 presents the cross-sectional associations between bullying at t2 and MDE at t2, among participants who at t1 were not exposed to bullying, MDE, and signs of reduced psychological health. Bullying was strongly associated with MDE, with OR of 6.29 (95% CI 2.52–15.68) and 20.96 (95% CI 5.80–75.80) for occasional and frequent bullying, respectively.

**Reciprocal effects between bullying and MDE**

Table 3 presents the prospective associations of bullying and MDE at t1 on risk of MDE at t2. Both bullying and MDE at t1 predicted MDE at t2, when adjusted for covariates (model 1). When bullying and MDE at t1 were adjusted for each other, OR were attenuated but remained statistically significant for both predictors (model 2).

Table 4 presents the prospective associations of bullying and MDE at t1 on risk of bullying at t2. Both bullying and MDE at t1 predicted bullying at t2, when adjusted for covariates (model 1). When bullying and MDE at t1 were adjusted for each other, bullying at t1 remained a statistically significant predictor of bullying at t2, but MDE at t1 no longer showed an association with bullying at t2 (model 2).

**Table 1.** Prospective analyses on exposure to workplace bullying at baseline (2004–2005) and onset of a major depressive episode (MDE) at follow-up (2006–2007) among females employees in eldercare free of MDE at baseline. [MDI=major depression inventory; OR=odds ratio; 95% CI=95% confidence interval.]

	Total		Cases		Crude			Adjusted <sup>a</sup>		
	N	N	%	OR	95% CI	P-value	OR	95% CI	P-value	
All participants	5629									
Exposure to bullying						<0.001				<0.001
No	5021	75	1.5%	1.00	Reference		1.00	Reference		
Occasional	528	18	3.4%	2.33	1.38–3.92		2.22	1.31–3.76		
Frequent	80	9	11.3%	8.36	4.03–17.35		8.45	4.04–17.70		
Participants with no signs of reduced psychological health at baseline (MDI score ≤9)	4435									
Exposure to bullying						0.002				0.002
No	4061	35	0.9%	1.00	Reference		1.00	Reference		
Occasional	329	7	2.1%	2.50	1.10–5.67		2.48	1.09–5.65		
Frequent	45	2	4.4%	5.35	1.25–22.95		5.61	1.29–24.36		

<sup>a</sup> Logistic regression analysis: adjusted for age, cohabitation, type of job (employee in care or non-care work, supervisor), seniority, length of follow-up.

**Table 2.** Cross-sectional analyses on the association between exposure to workplace bullying and major depressive episode (MDE) at follow-up (2006–2007), among female employees in eldercare who at baseline (2004–2005) were free of bullying, MDE, and signs of reduced psychological health. [OR=odds ratio; 95% CI=95% confidence interval.]

	Total		Cases		Adjusted <sup>a</sup>		P-value
	N	N	%	OR	95% CI		
Exposure to bullying							<0.001
No	3688	25	0.7%	1.00	Reference		
Occasional	145	6	4.1%	6.29	2.52–15.68		
Frequent	25	3	12.0%	20.96	5.80–75.80		

<sup>a</sup> Logistic regression analysis: adjusted for age, cohabitation, type of job (employee in care or non-care work, supervisor), seniority.

**Table 3.** Prospective analyses on exposure to workplace bullying and major depressive episode (MDE) at baseline (2004–2005) and MDE at follow-up (2006–2007) among females employees in eldercare. [OR=odds ratio; 95% CI=95% confidence interval.]

	Model 1 <sup>a</sup>		Model 2 <sup>b</sup>	
	OR	95% CI	OR	95% CI
Bullying at baseline				
No	1.00	Reference	1.00	Reference
Occasional	2.44	1.50–3.95	2.12	1.29–3.48
Frequent	8.60	4.37–16.91	6.39	3.10–13.17
MDE at baseline				
No	1.00	Reference	1.00	Reference
Yes	10.62	5.57–20.25	7.18	3.60–14.30

<sup>a</sup> Model 1: Bullying and MDE at baseline are adjusted for age, cohabitation, type of job (employee in care or non-care work, supervisor), seniority, and length of follow-up.

<sup>b</sup> Model 2: Bullying and MDE at baseline are adjusted for covariates from model 1 and further adjusted for each other.

**Table 4.** Prospective analyses on exposure to workplace bullying and major depressive episode (MDE) at baseline (2004–2005) and bullying at follow-up (2006–2007) among females employees in eldercare. [OR=odds ratio; 95% CI=95% confidence interval.]

	Model 1 <sup>a</sup>		Model 2 <sup>b</sup>	
	OR	95% CI	OR	95% CI
Bullying at baseline				
No	1.00	Reference	1.00	Reference
Occasional	7.42	5.93–9.28	7.44	5.94–9.31
Frequent	11.84	7.54–18.59	11.91	7.56–18.77
MDE at baseline				
No	1.00	Reference	1.00	Reference
Yes	2.11	1.12–3.97	0.93	0.47–1.84

<sup>a</sup> Model 1: Bullying and MDE at baseline are adjusted for age, cohabitation, type of job (employee in care or non-care work, supervisor), seniority, and length of follow-up

<sup>b</sup> Model 2: Bullying and MDE at baseline are adjusted for covariates from model 1 and further adjusted for each other.

## Discussion

In this prospective study, bullying at work strongly predicted onset of MDE among female eldercare workers. Tests for trends indicated a dose–response relationship across the three exposure levels of no, occasional, and frequent bullying.

To the best of our knowledge, this study is only the second prospective epidemiological study on workplace bullying and MDE. In 2003, Kivimäki et al (15) showed that prolonged bullying predicted self-reported physician-diagnosed depression after two years of follow-up with an adjusted OR of 4.81 in a cohort of Finnish hospital workers. Other prospective studies have investigated the effect of workplace bullying on psychological distress, a concept that likely shares common characteristics with caseness of MDE (11–14). Two Norwegian studies found a prospective association between workplace bullying and onset of psychological distress in the general workforce (12, 13). A third Norwegian study, conducted among nurse assistants, however, only found an effect of violence and threats, but not of workplace bullying (11). In France, a small-scale follow-up study of targets of workplace bullying showed high levels of psychopathological symptoms that persisted for at least 12 months (14).

Our results are also in line with recently reported cross-sectional findings on workplace bullying and depressive symptoms from France, Sweden, and Norway (8–10). Niedhammer et al (8) found that bullying was associated with depressive symptoms in a large study of the general working population in the south-east of France. Hansen et al (9) reported associations between bullying and depressive symptoms in a study with employees from Southern Sweden. Hauge et al (10) showed that workplace bullying substantially contributed to the variation in depressive symptoms in a

representative sample of the Norwegian workforce. Of these three studies, only Niedhammer et al (8) reported OR, which varied between 6.25–11.11 depending on how bullying was categorized.

It is widely assumed that the aetiology of MDE is multifactorial, involving both genetic and environmental factors (31–36). According to Kendler et al, major depression “is an etiologically complex disorder influenced by risk factors from multiple domains that act in developmental time” (34, p115). The “comprehensive developmental model for major depression” that is suggested by Kendler et al, includes “difficulties” and “stressful life events” but does not explicitly name exposure to adverse psychosocial working conditions, such as workplace bullying (33, 34). Our results suggest that this is a shortcoming and that exposure to adverse psychosocial working conditions should be considered as a component in the model. We could not examine in the present study whether exposure to workplace bullying might interact with other potential causes of MDE, for example, traumatic childhood experiences, marital conflicts, adverse life events, or low socioeconomic position (37–41) or whether workplace bullying might partly mediate the effect of some of these factors (eg, of low socioeconomic position) or other factors on risk of MDE. This should be investigated in future studies.

It will be also important to investigate through which mechanism exposure to bullying affects mental health. Exposure to workplace bullying may cause prolonged feelings of helplessness and despair as well as deterioration of self-esteem (14, 42), psychological phenomena that have been discussed as contributors in the aetiology of MDE (5–7, 32–34, 43). Exposure to bullying may also cause anxiety (14), which has been shown to be a precursor of MDE (44).

Several studies have shown reciprocal effects between workplace bullying and mental health. Kivimäki et al (15) reported that depression predicted risk of bullying among Finnish healthcare workers. Finne et al (12) showed that a high level of mental distress was prospectively associated with risk of bullying among Norwegian employees (12). In the present study, however, MDE at baseline was not associated with risk of bullying at follow-up when analyses were adjusted for bullying at baseline. Hence, we did not find reciprocal associations between workplace bullying and MDE, but only a uni-directional effect of workplace bullying on risk of MDE.

## Methodological considerations

The prevalence of workplace bullying was 11.9%, which is rather high when compared to the prevalences of 4–5% reported in Norwegian and Finnish studies (11–13, 15), two of which were also from the care sector (11, 15). Our results, however, are only slightly higher

than the prevalences found in another Danish eldercare worker cohort that reported a prevalence of 9.1% (45) and a study of the general Danish workforce that found a prevalence of 8.3% (46). We do not know, whether these results indicate that bullying is more prevalent in Denmark than other Nordic countries, there are cultural differences in response styles between the countries, or the differences were driven by the specific response categories used in the three Danish studies that prompted participants also to report bullying that occurred only “now and then”.

As delineated in the introduction, the effect of bullying on MDE can be overestimated if reduced psychological health at baseline affects both reporting of exposure at baseline and onset of MDE at follow-up. However, when we restricted analyses to participants with no signs of reduced psychological health at baseline, the results remained statistically significant.

Excluding baseline cases and participants with signs of reduced psychological health might have led to an underestimation of the true effect of workplace bullying on MDE because mental health at baseline might have been affected by exposure to workplace bullying prior to baseline measurement. To address this problem, we supplemented the prospective analysis with a cross-sectional analysis of the follow-up data of participants who at baseline were free of bullying, MDE, and signs of reduced psychological health. The 170 participants who became exposed to bullying during the time span from baseline to follow-up had a remarkably high likelihood of developing MDE, with OR of 6.29 and 20.96 for occasional and frequent bullying, respectively. We interpret this result as an indication that new exposure to bullying strongly increases risk of onset of MDE within a relatively short time period.

### Strengths and weaknesses of the study

The strengths of this study are the prospective design, the relatively large sample size, and the repeated measure of both the exposure and the outcome variable. We assessed MDE with the MDI, a well-established and widely-used instrument that has been validated in clinical and population-based studies (21–23). We acknowledge, however, that the gold standard for assessing MDE is a clinical diagnostic interview and that the results from this study should to be replicated in a study that uses such an instrument.

The response rate at both baseline and follow-up were acceptable, but we still lost a considerable proportion of participants during follow-up. Our analysis showed that bullying at baseline predicted leaving the workplace during follow-up. This is in line with a previous study reporting that workplace bullying increases risk of leaving the current workplace (47). Leaving the

workplace during follow-up was also predicted by baseline MDE in our study. This is not a surprising result, since MDE is a highly disabling disorder often severely impairing workability (48).

Given that baseline MDE predicted leaving the workplace, it seems reasonable to assume that participants who developed MDE during follow-up would also be at an increased risk of leaving the workplace and subsequently of loss to follow-up. This might explain why there were only relatively few cases in the prospective analyses, since these analyses were restricted to participants still employed in the same organization at follow-up. If participants who developed MDE in relation to bullying were more likely to be lost to follow-up than those participants who developed MDE due to other causes, our analyses would have underestimated the effect of workplace bullying on MDE.

A limitation of the study is that MDE was measured at baseline and again after 20 months but not continuously during the follow-up period. Hence, it is possible that some participants had developed MDE at some point during follow-up, but were in remission when we conducted the follow-up survey. Furthermore, we do not know how many of the cases at follow-up had first-time onset of MDE and how many were cases with recurrent MDE. This is a limitation, because the literature suggests that risk factors for first onset of MDE are different from risk factors for recurrent MDE (49).

The questionnaire did not include a measure for personality factors and therefore we could not adjust for personality traits as potential confounders. This is a limitation of the study, although it is unclear from the literature, whether or not certain traits might predispose people to become targets of bullying. For example, a Norwegian study on bullying and personality concluded that although some targets tended to show some differences in personality questionnaires compared to non-targets, there was no evidence for a general victim personality profile (50). Furthermore, it has to be considered that differences shown in personality questionnaires, might be a consequence rather than an antecedent of bullying (50).

Our study did not allow analysis of the effect of other potential causes of MDE, such as traumatic childhood experiences, marital conflicts, or adverse life events (37–40). This is a limitation because these exposures might have confounded or modified the effect of workplace bullying on risk of MDE. Particularly the investigation of possible effect modification by these and other factors will be an important task for future research.

Because of the low number of cases, confidence intervals were wide. However, even though the precision of the effect estimates was low, there was no indication that effects might have been due to chance. Regardless of whether we used a prospective, cross-sectional, or

full panel design, and whether or not we excluded participants with reduced psychological health at baseline, bullying was consistently associated with risk of MDE.

Both our study and the Finnish study by Kivimäki et al (15) were conducted in the care sector. Although our sample also included some employees not involved in patient care, such as administrative assistants or cleaners, the study sample was predominately composed of care workers. Studies on bullying and MDE in other occupational sectors and the general workforce are needed to elucidate whether the associations found in these two studies are specific to this occupational sector or if they can be generalized to other sectors. Studies in other occupational sectors or in the general workforce would further allow investigating whether workplace bullying also increases risk of MDE among men. In the present study, we could not conduct such an analysis because of the very low number of male participants.

### Implications for intervention

Our results suggest a strong effect of workplace bullying on the risk of onset of MDE among female employees in the eldercare sector. Thus, eliminating bullying at work may be an important contribution to the prevention of MDE.

The two main groups of perpetrators were colleagues and, to a lesser extent, supervisors. This is in line with results from two other Danish studies, another eldercare worker cohort that followed-up recent graduates from Danish health care colleges (45) and a study with the general Danish workforce (46). Interventions that may help to prevent bullying by colleagues and supervisors may include the distribution of information about bullying and its potential consequences, courses in conflict management for supervisors and key staff members, and dialogue meetings with all employees in which psychosocial work environment problems are identified and discussed (51). Furthermore, it has been proposed that detailed action plans, that include guidelines on how complaints about bullying should be handled, and the appointment of a designated person (eg, a shop steward), who can be contacted anonymously by targets of bullying, may help to reduce both the prevalence of bullying and its negative consequences (52).

To summarize, we conclude that our study provides evidence that workplace bullying increases risk of MDE among women in the eldercare sector. Eliminating bullying at work may be an important contribution to the prevention of MDE.

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