Original Contribution

Work-related Violence and Incident Use of Psychotropics

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Although the mental health consequences of domestic violence are well documented, empirical evidence is scarce regarding the mental health effects of violence in the workplace. Most studies have used data from small occupation-specific samples, limiting their generalizability. This article examines whether direct exposure to work-related violence is associated with clinically pertinent mental health problems, measured by purchases of psychotropics (antidepressants, anxiolytics, hypnotics), in a cross-occupational sample of 15,246 Danish employees free from using psychotropics at baseline. Self-reported data on work-related violence were merged with other data on purchases of medications through a national registry to estimate cause-specific hazard ratios during 3.6 years (1,325 days) of follow-up in the years 1996–2008. Outcomes were examined as competing risks, and analyses were adjusted for gender, age, cohabitation, education, income, social support from colleagues, social support from supervisor, and influence and quantitative demands at work. Work-related violence was associated with purchasing antidepressants alone (hazard ratio = 1.38, 95% confidence interval: 1.09, 1.75) or in combination with anxiolytics (hazard ratio = 1.74, 95% confidence interval: 1.13, 2.70) but not with purchasing anxiolytics or hypnotics only. The frequency of violent episodes and risk of caseness were unrelated. Work-related violence is associated with increased risk of clinically pertinent mental health problems. Reducing levels of work-related violence may help to prevent mental disorders in the working population.

mental disorders; psychotropic drugs; violence; work

Abbreviations: CI, confidence interval; COPSOQ, Copenhagen Psychosocial Questionnaire Study; DWECS, Danish Work Environment Cohort Study; HR, hazard ratio; PUMA, Project on Burnout, Motivation, and Job Satisfaction.

The severe mental health consequences of domestic violence are well established (1, 2). There is little evidence, however, concerning the effects of work-related violence, which does not involve an intimate relationship between victim and perpetrator. With an estimated 1.7 million annual episodes of violence in US workplaces alone (3), it is of substantial public health concern to document the consequences of this work environment exposure. Although small occupation-specific studies show adverse emotional consequences including depressed mood and sleep disturbance (4, 5), there is a paucity of larger cross-occupational studies examining clinically pertinent mental health outcomes. One study showed increased hospitalization rates for depression and anxiety disorders in occupations with high levels of work-related violence (6). This study, though, assessed exposure only ecologically, limiting individual-level inference (7). To the best of our knowledge, this article is the first to examine whether direct exposure to work-related violence is associated with purchases of 3 types of psychotropics (antidepressants, anxiolytics, hypnotics), by use of a unique cross-occupational sample of Danish employees ($n = 15,246$) with individual-level exposure data. In this article, we examine the effects of work-related violence defined dichotomously and whether more frequent exposure is associated with greater risk.

MATERIALS AND METHODS

Study design and population

This article presents results from a Danish project synthesizing data from 3 previous studies and merging these data with the Danish Register of Medicinal Product Statistics. The
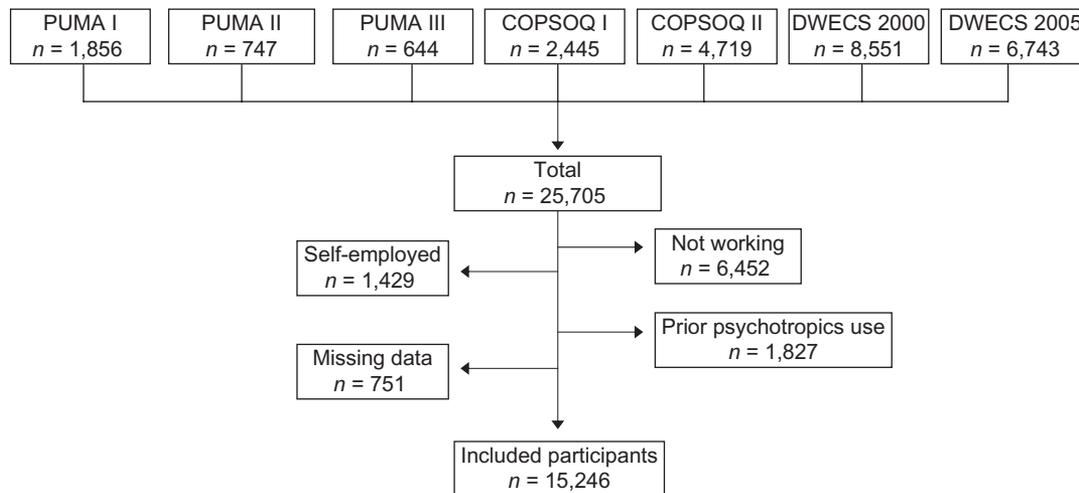
Figure 1. Selection of study population and exclusions from PUMA I–III, COPSOQ I and II, and DWECS 2000 and 2005, Denmark, 1997–2005. COPSOQ, Copenhagen Psychosocial Questionnaire Study; DWECS, Danish Work Environment Cohort Study; PUMA, Project on Burnout, Motivation, and Job Satisfaction.

3 original studies are 1) the Project on Burnout, Motivation, and Job Satisfaction (3 waves: PUMA I, PUMA II, PUMA III) (8); 2) the Copenhagen Psychosocial Questionnaire Study (2 waves: COPSOQ I, COPSOQ II) (9, 10); and 3) the Danish Work Environment Cohort Study (2 waves: DWECS 2000, DWECS 2005) (11, 12). All studies were designed to examine the associations between work environment and health, and they contain comprehensive self-reported work environment data. Whereas populations for COPSOQ and DWECS were drawn randomly from the working-aged Danish population, PUMA was workplace based, recruiting employees from 7 human service organizations. The studies were open cohort studies conducted during the years 1997–2005, and they had response rates between 60% (COPSOQ II) and 80% (PUMA I). Details of the studies are published elsewhere (8–12). This article uses all first-time responses from these studies to increase statistical power and merges them with data from the Register of Medicinal Products Statistics—a national Danish registry containing data on all purchases of prescription medications at Danish pharmacies since January 1, 1995 (13).

Violence

Following the World Health Organization's definition of violence, which includes actual and threatened use of physical force (14), we measured work-related violence with 2 items: "Have you been exposed to threats of violence at your workplace during the last 12 months?" and "Have you been exposed to physical violence at your workplace during the last 12 months?". The items measured direct exposure (i.e., being the target of the act), and the response options were yes and no. We defined exposure to work-related violence as responding yes to either question. Furthermore, some studies recorded the number of violent episodes (available from

PUMA I–III, COPSOQ I, and DWECS 2000), and we categorized exposure frequency as 0, 1–2, and 3 or more times.

Covariates

Gender, age, education, occupational group, and disposable income (individual income after tax) were assessed through registry data, as were migration and death during follow-up. The occupational group was coded according to the Danish version of the International Standard Classification of Occupations approved in 1988 (ISCO-88), which classifies jobs on the basis of the skills needed to perform them (15). For the present article, we combined "agricultural and fishery workers" with "craft and related trades workers" because of the few respondents in agricultural and fishery occupations. The resulting groups were as follows: "armed forces," "legislators, senior officials, and managers," "professionals," "clerks," "service workers and shop and market sales workers," "skilled agricultural and fishery workers and craft and related trades workers," "plant and machine operators and assemblers," and "elementary occupations."

Furthermore, we included self-reported information on the following covariates: cohabitation (living with a partner or spouse, yes/no), social support from colleagues, social support from supervisor, work-related influence (3-item scale), and quantitative demands (3-item scale). We selected these covariates because they have been related to mental disorders (16–20) and may be associated with work-related violence. All self-reported covariates were measured by items from the validated COPSOQ questionnaire (9). The specific items were chosen for commonality among the original studies.

Social support from colleagues was measured by the item: "How often do you get help and support from your colleagues?". Social support from the supervisor was measured by the item: "How often do you get help and support from

Table 1. Characteristics of Participants and Incident Use of Psychotropics, Denmark, 1996–2008

	Participants		Antidepressants		Antidepressants and Anxiolytics		Anxiolytics		Hypnotics	
	No.	Mean (SD)	No. of Cases	%	No. of Cases	%	No. of Cases	%	No. of Cases	%
No.	15,246		617	4.1	156	1.0	410	2.7	403	2.6
Work-related violence										
Yes	1,447		82	5.7	25	1.7	41	2.8	39	2.7
No	13,799		535	3.9	131	1.0	369	2.7	364	2.6
Sex										
Men	6,832		215	3.2	49	0.7	131	1.9	153	2.2
Women	8,414		402	4.8	107	1.3	279	3.3	250	3.0
Living arrangements										
Noncohabiting	3,246		157	4.8	36	1.1	91	2.8	91	2.8
Cohabiting	12,000		460	3.8	120	1.0	319	2.7	312	2.6
Age, years		41.3 (10.6)								
<30	2,558		99	3.9	20	0.8	36	1.4	33	1.3
30–39	4,525		190	4.2	45	1.0	103	2.3	99	2.2
40–49	4,377		183	4.2	42	1.0	137	3.1	120	2.7
≥50	3,786		145	3.8	49	1.3	134	3.5	151	4.0
Education, years		13.01 (2.48)								
6–11	3,363		176	5.2	43	1.3	108	3.2	92	2.7
12–13	5,045		189	3.8	59	1.2	137	2.7	133	2.6
14	2,643		89	3.4	20	0.8	66	2.5	62	2.4
15–20	4,195		163	3.9	34	0.8	99	2.4	116	2.8
Disposable income, US dollars/year by quartile		32,319.8 (16,103.3)								
1 (<24,895)	3,811		167	4.4	55	1.4	108	2.8	91	2.4
2 (24,895–30,285)	3,812		167	4.4	38	1.0	118	3.1	93	2.4
3 (30,286–37,163)	3,811		148	3.9	43	1.1	97	2.6	97	2.6
4 (>37,163)	3,812		135	3.5	20	0.5	87	2.3	122	3.2

Table continues

your immediate superior?''. The response options for the social support items were always, often, sometimes, seldom, never/hardly ever, and not applicable. Two studies, however, applied no ''not applicable'' option and showed high levels of missing values in these items. To retain respondents in the analyses, we categorized missing values in these studies as not applicable and collapsed this category with seldom and never/hardly ever as the lowest level of support.

Influence at work was measured by the 3 items: ''Do you have a large degree of influence concerning your work?'', ''Can you influence the amount of work assigned to you?'', and ''Do you have any influence on what you do at work?''. Quantitative demands at work were measured by the 3 items: ''Do you have to work very fast?'', ''Is your work unevenly distributed so it piles up?'', and ''How often do you not have time to complete all your work tasks?''.

Because antidepressants are prescribed as pain management (21), we also included self-reported information on regular use of pain medications (monthly or more frequently) as an indicator of chronic pain (not available for DWECS).

Follow-up

Following the World Health Organization-developed Anatomical Therapeutic Chemical (ATC) Classification System (22), psychotropics were identified in the registry as medications with codes N06a (antidepressants), N05b (anxiolytics), and N05c (hypnotics).

The baseline for follow-up was set at 365 days before the survey date, as exposure to violence was assessed retrospectively within the past 12 months. We assessed prior use of psychotropics during 1.9 years (700 days) before baseline and followed purchases of psychotropics for 3.6 years (1,325 days) after baseline. These time periods were chosen because they were the longest available for all studies.

Figure 1 shows the selection of participants. Of the 25,705 first-time respondents, we excluded individuals not working (n = 6,452) and individuals self-employed (n = 1,429), as one study did not obtain exposure data for the self-employed. Additionally, we excluded 1,827 respondents who had purchased any psychotropic medication within 1.9 years before

Table 1. Continued

	Participants		Antidepressants		Antidepressants and Anxiolytics		Anxiolytics		Hypnotics	
	No.	Mean (SD)	No. of Cases	%	No. of Cases	%	No. of Cases	%	No. of Cases	%
Social support from colleagues										
4 (always)	3,387		128	3.8	37	1.1	87	2.6	87	2.6
3 (often)	5,724		216	3.8	52	0.9	161	2.8	145	2.5
2 (sometimes)	4,133		188	4.6	43	1.0	111	2.7	117	2.8
1 (seldom, never/ hardly ever, not applicable)	2,002		85	4.3	24	1.2	51	2.6	54	2.7
Social support from manager										
4 (always)	3,070		116	3.8	33	1.1	81	2.6	84	2.7
3 (often)	4,107		150	3.7	40	1.0	119	2.9	93	2.3
2 (sometimes)	4,209		167	4.0	38	0.9	121	2.9	113	2.7
1 (seldom, never/ hardly ever, not applicable)	3,860		184	4.8	45	1.2	89	2.3	113	2.9
Quantitative demands at work by quartile		48.0 (19.8)								
4 (highest)	5,734		245	4.3	58	1.0	151	2.6	162	2.8
3	2,592		97	3.7	26	1.0	76	2.9	67	2.6
2	4,362		166	3.8	40	0.9	114	2.6	112	2.6
1 (lowest)	2,558		109	4.3	32	1.3	69	2.7	62	2.4
Influence at work by quartile		54.2 (24.2)								
4 (highest)	2,285		77	3.4	18	0.8	59	2.6	55	2.4
3	5,727		196	3.4	52	0.9	142	2.5	151	2.6
2	3,440		168	4.9	43	1.3	102	3.0	89	2.6
1 (lowest)	3,794		176	4.6	43	1.1	107	2.8	107	2.8

Abbreviation: SD, standard deviation.

baseline. Finally, we excluded 751 respondents with missing data, yielding a study population of 15,246 employees. For the included participants, we followed purchases of psychotropics from baseline (365 days before the survey date) until migration, death, or end of follow-up, whichever came first.

We examined 4 mutually exclusive types of use of psychotropics (caseness), defined a priori as purchasing 1) antidepressants, 2) antidepressants and anxiolytics, 3) anxiolytics, or 4) hypnotics only. Because sleep disturbance is a symptom of depressive and anxiety disorders (23), we did not define separate types of caseness for use of antidepressants and use of anxiolytics with and without use of hypnotics. Hence, antidepressant cases are participants who purchased antidepressant medications, regardless of any purchases of hypnotics, if they did not also purchase anxiolytics. Anxiolytic caseness was defined similarly, whereas hypnotics-only cases were defined by purchasing only hypnotics. We applied full follow-up information in defining caseness; that is, individuals were classified as combined antidepressant-anxiolytic cases if they purchased both types of medication during follow up, although

not necessarily simultaneously. The first purchase of any psychotropic medication was used as the caseness date.

Statistical analysis

Using Cox regression analysis, we examined the rates of the 4 types of caseness for participants exposed to work-related violence compared with unexposed participants. Because the types of cases were mutually exclusive, they were competing risk outcomes (24). As we aimed to study etiology, we calculated cause-specific hazard ratios for each type of caseness, treating the other types as censorings, as recommended by Lau et al. (24). Further, we tested whether the effects of work-related violence were similar across outcomes, as described by Putter et al. (25). Hazard ratios were adjusted for gender, age, cohabitation, education, income, social support from colleagues, social support from supervisor, influence at work, and quantitative demands at work. We adjusted for differences between the original studies by stratifying models for the original study and method of data collection (questionnaire, telephonic interview, face-to-face interview). This approach

also deals with clustering within the original studies, assuming a fixed effect of exposure across studies (26). We did not stratify analyses by gender, as an interaction term between gender and violence was statistically nonsignificant, indicating no effect modification by gender.

The proportional hazards assumption was assessed visually by inspecting the log-log hazard plots. Because this inspection revealed possible time dependency for anxiolytic caseness, with hazards crossing at 900 days, we fitted an additional extended model for this outcome, allowing for different effects before and after 900 days. The functional form of covariates was tested by log likelihood, comparing models with covariates entered as categorical, ordinal, or continuous variables.

Further, we conducted 4 types of sensitivity analyses: 1) adjusting for occupational group, 2) adjusting for regular use of pain medication, 3) examining the separate effects of physical assault and threats, and 4) applying the survey date as baseline.

Adjustment for occupational group was as sensitivity analysis only, as work-related violence is strongly related to occupational group (6, 27), and occupational group has been used as a proxy measure for work-related violence (6). Hence, adjusting for occupational group could be problematic because of collinearity between the factors.

The adjustment for regular use of pain medication was to examine whether the association with antidepressant use was independent of chronic pain. This analysis excluded data from DWECS, as this information was unavailable.

The separate effects of physical assault and threats were examined by defining 3 categories of exposure: 1) unexposed to threats and physical assault (referent), 2) exposed to threats only, and 3) exposed to physical assault. This analysis was done to reduce possible response bias caused by depressive symptoms' affecting the experience of others' behavior as threatening, which is plausible as depression affects recognition of emotional expressions (28).

We also examined whether the risk of using psychotropics increased with the frequency of violent episodes, excluding data from COPSOQ II and DWECS 2005 where these data were unavailable. On the basis of the distribution of participants, we categorized the number of episodes into 0, 1–2, and 3 or more and used the log-rank test for trend to test if risk increased with frequency.

The study was approved by the Danish Data Protection Agency (29). All statistical tests were 2 sided, used a statistical significance level of $P < 0.05$, and were conducted with SAS, version 9.1, software (SAS Institute, Inc., Cary, North Carolina).

RESULTS

Table 1 shows the characteristics of participants and numbers of cases. The majority of the population were female (55%), and most were cohabiting (79%). The mean age was 41 years. Exposure to work-related violence was reported by 1,447 participants (9%). Of the exposed participants, 841 (58%) were exposed to threats but not to physical assault (data not shown in table).

The most frequent type of caseness was antidepressant use (617 participants, 4%), and the least frequent type was combined use of antidepressants and anxiolytics (156 participants, 1%). Just over 400 participants (3%) entered treatment with either anxiolytics or hypnotics only.

The crude analyses showed higher risk of entering treatment with antidepressants alone or combined with anxiolytics for participants exposed to work-related violence (6% and 2%, respectively) compared with nonexposed participants (4% and 1%, respectively). For use of anxiolytics and hypnotics, the risks were similar for exposed and nonexposed participants.

Table 2 shows the modeled cause-specific hazard ratios for use of psychotropics in relation to work-related violence and the covariates gender, age, cohabitation, education, income, social support from colleagues, social support from supervisor, influence at work, and quantitative demands at work. In this multivariable model, work-related violence was associated with increased risk of entering use of antidepressants alone (hazard ratio (HR) = 1.38, 95% confidence interval (CI): 1.09, 1.75) or in combination with anxiolytics (HR = 1.74, 95% CI: 1.13, 2.70). However, there was no association for anxiolytics alone (HR = 1.05, 95% CI: 0.76, 1.45) or hypnotics only (HR = 1.05, 95% CI: 0.75, 1.46). The effects of work-related violence were statistically significantly different across the outcomes ($P = 0.02$, data not shown in tables). The extended analysis with a time-dependent effect of work-related violence on use of anxiolytic medications also showed no association. Respective hazard ratios before and after 900 days were 1.11 (95% CI: 0.76, 1.63) and 0.91 (95% CI: 0.49, 1.70) (data not shown in tables).

Sensitivity analyses

None of the sensitivity analyses substantially changed results (data not shown in tables). When adjusted for occupational group, the hazard ratio for antidepressant use was 1.36 (95% CI: 1.07, 1.73). When adjusting antidepressant use for regular use of pain medications, we found that the use of pain medications was associated with antidepressants (HR = 1.75, 95% CI: 1.38, 2.22) but that the hazard ratio for work-related violence was unchanged (HR = 1.51, 95% CI: 1.12, 2.04). Regarding the separate effects of physical assault and threats, the risk estimates were largely similar for the 2 types of exposure. The hazard ratios for antidepressant use were 1.45 (95% CI: 1.08, 1.95) for threats and 1.29 (95% CI: 0.91, 1.83) for physical assault, and for antidepressants and anxiolytics, the hazard ratios were 1.62 (95% CI: 0.91, 2.89) for threats and 1.90 (95% CI: 1.04, 3.46) for physical assault. Findings were also largely unchanged by using the survey date as the baseline: The hazard ratios for antidepressant use alone and combined with anxiolytics were 1.22 (95% CI: 0.92, 1.62) and 2.21 (95% CI: 1.32, 3.68), respectively.

Frequency of violent episodes

Table 3 shows use of psychotropic medications in relation to frequency of violent episodes in the subsample with these data ($n = 8,593$). One or 2 episodes were reported by 480 participants (6%), and 352 participants (4%) experienced 3 or more violent episodes. Neither the crude nor the multivariable analysis indicated a relation between number of episodes and use of psychotropics. For anxiolytic medications, though,

Table 2. Cause-specific Hazard Ratios for Use of Psychotropics in Association With Work-related Violence and Covariates, Denmark, 1996–2008

	Antidepressants		Antidepressants and Anxiolytics		Anxiolytics		Hypnotics Only	
	HR[a]	95% CI	HR[a]	95% CI	HR[a]	95% CI	HR[a]	95% CI
Work-related violence (yes vs. no)	1.38	1.09, 1.75	1.74	1.13, 2.70	1.05	0.76, 1.45	1.05	0.75, 1.46
Women vs. men	1.41	1.18, 1.68	1.56	1.09, 2.22	1.73	1.39, 2.16	1.45	1.17, 1.79
Age per 5-year increase	1.01	0.98, 1.06	1.09	1.00, 1.17	1.16	1.10, 1.22	1.21	1.15, 1.27
Cohabitation (yes vs. no)	0.81	0.67, 0.97	0.89	0.61, 1.29	0.86	0.68, 1.09	0.82	0.64, 1.03
Education per SD increase	0.88	0.81, 0.96	0.86	0.73, 1.02	0.97	0.87, 1.07	1.04	0.94, 1.15
Income per quartile increase	0.91	0.83, 0.99	0.78	0.65, 0.93	0.97	0.87, 1.09	1.06	0.94, 1.18
Social support from colleagues per unit increase	0.95	0.87, 1.05	0.93	0.78, 1.12	0.97	0.87, 1.09	1.00	0.89, 1.12
Social support from supervisor per unit increase	0.95	0.87, 1.03	1.00	0.85, 1.18	1.05	0.95, 1.16	0.97	0.87, 1.07
Influence per unit increase	0.93	0.86, 1.02	0.95	0.81, 1.12	0.96	0.87, 1.05	0.94	0.85, 1.04
Quantitative demands per SD increase	1.02	0.94, 1.11	1.04	0.88, 1.22	0.97	0.88, 1.08	0.99	0.89, 1.10

Abbreviations: CI, confidence interval; HR, hazard ratio; SD, standard deviation.

[a] Statistical model includes the following: work-related violence, gender, age, cohabitation, education, income, social support from colleagues, social support from supervisor, influence at work, and quantitative demands at work.

the risk estimates tended to increase with episodes, but the log-rank test for trend was statistically nonsignificant ($P = 0.35$) (data not shown in tables).

DISCUSSION

With a large cross-occupational sample of Danish employees, this article shows that exposure to work-related violence is associated with increased risk of entering treatment with antidepressants but not treatment with anxiolytics or hypnotics only. This association was independent from occupational group and use of pain medications. More frequent exposure was not associated with greater risk of use of psychotropics.

Our results are in line with those of smaller occupation-specific studies linking work-related violence with self-reported mental health outcomes, such as depressed mood and sleep problems (4, 5). Our findings also correspond to an ecologic study (6) that showed that employment in occupations highly exposed to work-related violence was associated with hospitalization for depression and anxiety. Our findings contrast, though, with a previous null finding on work-related violence and antidepressant use (17). However, because this previous study used a subsample of the present study, with only 4,958 participants, we believe that the null finding was due to lack of statistical power.

A previous study among home-care workers showed increasing risk of depression with greater severity of the violent episode (5). Our results, however, do not indicate that more episodes of work-related violence are associated with greater risk of mental health problems. This seeming discrepancy may be because severity better measures the emotional impact of the episode, compared with frequency of exposure. Furthermore, qualitative research indicates that frequent work-related exposure to violence may cause habituation (30), possibly counteracting a relation between number of episodes and use of psychotropics. Alternatively, the lack of association

could be explained by healthy worker effects, as employees may leave jobs with frequent exposure to violence if they are experiencing distress (31).

A causal effect of work-related violence on mental disorder is plausible, given substantial evidence concerning the effects of domestic violence (1, 2). The mechanism by which work-related violence may affect mental health possibly involves the emotional reactions of helplessness, which can be triggered by violent acts (32) and have been related to the etiology of mental disorder (33).

A number of strengths and weaknesses of this study should be noted. Because the outcome was assessed through registry data, the loss to follow-up was limited to individuals who died or migrated, who were censored at date. This comprehensive follow-up strengthens the study as it precludes differential attrition of participants potentially biasing results toward the null (7). Moreover, because the purchase of psychotropic medications requires a prescription, this outcome measure is based on a medical assessment that treatment with psychotropics is needed. Consequently, it likely has high validity for measuring clinically pertinent mental health problems.

However, the use of purchases of medications as an outcome measure leaves a problem of what specific mental health problem is measured, as antidepressants are treatments for a range of conditions, including depressive disorders (34), anxiety disorders (35), and post-traumatic stress disorder (36). Hence, this study cannot determine whether work-related violence is associated with several of these disorders or is specific to one. In light of a previous study (6) that found associations with hospitalization for both depressive and anxiety disorders, the exposure likely affects these disorders broadly rather than specifically. Notably, though, we found no association with anxiolytics-only and hypnotics-only treatment. This lack of association may suggest that work-related violence is associated with mental health problems requiring longer-term treatment rather than acute psychological crises— the only situation for which treatment by anxiolytics is

Table 3.   Frequency of Work-related Violence and Use of Psychotropics in the Subpopulation, Number of Cases, and Cause-specific Hazard Ratios, Denmark, 1996–2008

	No.	Antidepressants				Antidepressants and Anxiolytics				Anxiolytics				Hypnotics Only			
		No. of Cases	%	HR[a]	95% CI	No. of Cases	%	HR[a]	95% CI	No. of Cases	%	HR[a]	95% CI	No. of Cases	%	HR[a]	95% CI
No.	8,593	325				97				260				229			
Violent episodes																	
0	7,661	284	3.7	1	Referent	85	1.1	1	Referent	231	3.0	1	Referent	203	2.6	1	Referent
1–2	480	26	5.4	1.38	0.92, 2.07	10	2.1	1.95	1.00, 3.81	16	3.3	1.17	0.70, 1.96	11	2.3	0.95	0.52, 1.76
≥3	352	15	4.3	1.00	0.60, 1.69	2	0.6	0.49	0.12, 1.99	13	3.7	1.29	0.74, 2.27	15	4.3	1.81	1.06, 3.08

Abbreviations: CI, confidence interval; HR, hazard ratio.

[a] Adjusted for gender, age, cohabitation, education, income, social support from colleagues, social support from supervisor, influence at work, and quantitative demands at work.

recommended in Denmark (37). However, as we did not examine the length of treatment course and as the indication for treatment was unavailable, further research is needed to establish the specific mental health consequences of work-related violence.

Because the outcome measure was based on pharmaceutical treatment, this study is limited to recognized and pharmaceutically treated mental disorders. This is of methodological concern, because most mental disorders are untreated (38), and treatments also include nonpharmaceutical options such as psychotherapy (38). Furthermore, psychotropics can be used to treat physical health problems (21). Results could be biased if exposure was related to treatment-seeking behaviors and the type of treatment entered, possibly through occupational group. The robustness of the results to adjustment for occupational group and the specificity of the associations to antidepressant treatment suggest that bias by treatment-seeking behaviors may be minor. Nonetheless, when interpreting the results, one should keep in mind that use of psychotropics does not measure mental disorder but pharmaceutical treatment.

Our study population was cross-occupational. It was, however, not representative of the Danish work force, as one study (PUMA) encompassed only human service professionals. As these professions are highly exposed to work-related violence (6), the prevalence estimates in this paper are not representative of Danish employees. The nonrepresentative study population may also have biased our results toward the null if employees become habituated to work-related violence, as suggested previously (30). The overrepresentation of human service professionals was more pronounced in the sample with frequency data, and potential underestimation may particularly pertain to the results from this subsample.

Another methodological issue is the retrospective assessment of exposure, which could result in response bias if cases were more likely than noncases to report exposure. The exposure operationalization is likely to be relatively unbiased, as it probably does not require extensive cognitive and emotional processing of the respondent. However, as depression reduces recognition of emotional facial expressions (28), individuals with depressive symptoms may experience others as more threatening, possibly causing response bias. As we consider the reporting of physical assault less sensitive to such bias, we did sensitivity analyses examining the effect of physical assault only. These analyses showed similar results, suggesting that response bias does not substantially influence our results. Nonetheless, future studies should use more frequent exposure assessment to minimize length of recall and assess timing of exposure more accurately.

Further, the study is limited by possible residual confounding by unmeasured variables related to mental health, including exposure to violence outside the workplace. Were these factors unequally distributed between exposed and unexposed participants, they could have biased results, despite adjustment for confounders including gender, age, cohabitation, education, income, and work-related social support, influence, and quantitative demands. Following this line, it should be noted that work-related violence is highly related to occupation. The consequences of this association are 2-fold. First, respondents exposed to work-related violence are more likely to witness work-related violence against others, possibly affecting mental

health negatively (39). Hence, our results may be biased away from the null by contextual effects of witnessing violence. Second, selection into occupation could cause preexisting differences between employees exposed and unexposed to work-related violence. Although we tried to account for such differences by adjusting for occupational group, residual confounding may remain, as we could apply only the major groupings of ISCO-88. Exclusion of respondents purchasing psychotropic medications within 700 days before baseline also aimed to reduce potential reverse causality, but future studies should include more comprehensive measures of mental health status before exposure to substantiate a causal effect of work-related violence.

In summary, this paper finds that work-related violence is associated with increased risk of entering treatment with antidepressants. These findings extend existing occupation-specific research and substantiate an effect of work-related violence on clinically pertinent mental health problems. Reducing levels of workplace violence may thus help to prevent clinically pertinent mental health problems, a source of substantial public health costs and disability worldwide (40).

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