

# BMJ Open Prevalence and individual and work-related factors associated with suicidal thoughts and behaviours among veterinarians in Norway: a cross-sectional, nationwide survey-based study (the NORVET study)

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## ABSTRACT

**Objectives** Several studies have shown increased suicide rates among veterinarians. We investigated the self-reported prevalence of suicidal thoughts and behaviours and contributing and independent factors associated with suicidal thoughts and behaviours among veterinarians in Norway.

**Design** Cross-sectional, nationwide survey.

**Participants** 2596 veterinarians in Norway (response rate: 75%).

**Main outcome measure** Paykel's five-item questionnaire.

**Results** In total, 27% (n=682/2567) of veterinarians in Norway felt that life was not worth living during the last year, 5% (n=139/2562) had serious suicidal thoughts, and 0.2% (n=6/2537) had attempted suicide. Female veterinarians reported significantly higher prevalence of suicidal feelings and thoughts than males. For serious suicidal thoughts, women had nearly twice the prevalence as their male colleagues (6.2% (n=108/1754) vs 3.6% (n=28/766),  $\chi^2$ : 6.5, p=0.011). Independent factors associated with serious suicidal thoughts were being single (OR 1.76, 95% CI 1.13 to 2.72, p<0.05), negative life events (OR=1.43, 95% CI 1.22 to 1.68, p<0.001) and the presence of mental distress (OR 2.75, 95% CI 2.14 to 3.52, p<0.001). The veterinarians related their serious suicidal thoughts to work and personal problems, and a lesser degree to family, social and other problems. Nearly twice as many women (53%, n=57/108) as men (28%, n=7/25) reported work problems as the most important contributing factor to their serious suicidal thoughts ( $\chi^2$ : 4.99, p=0.03). 4% (n=6/139) reported work problems as the only factor of importance.

**Conclusions** Veterinarians in Norway have relatively high prevalence of suicidal feelings and thoughts, including serious suicidal thoughts. In multivariable analyses, the individual factors were more important than work-related ones, while work problems were the most reported contributing factor to serious suicidal thoughts by the veterinarians themselves. The role of gender and specific work-related factors should be further investigated to better understand the complexity of suicidal behaviour among veterinarians.

## Strengths and limitations of this study

- A major strength of our study is the high response rate (75%), incorporating all authorised veterinarians nationwide, in all main fields of work.
- An extensive questionnaire was used, making multi-variable analysis feasible.
- This is a cross-sectional study, which limits any conclusions regarding causality.
- The study possibly has limited generalisability, due to differences in organisation of work life in other countries.

## INTRODUCTION

Several studies have shown increased suicide rates among veterinarians. A review from 2010 found elevated suicide rates in all but 1 of the 15 studies published at the time. The suicide rate among veterinarians in the UK was three times that of the general population.<sup>1</sup> Recent studies have also indicated increased suicide rates in the profession.<sup>2-4</sup> Furthermore, three recent studies found a higher prevalence of suicidal ideation among veterinarians than the general population.<sup>5-7</sup>

There is little knowledge about the contribution of individual and work-related factors to suicidal behaviour in veterinarians. In a systematic review from 2012, which included 52 papers, the authors highlighted the paucity of research that investigated the factors that contribute to suicide among veterinarians, and that many of the studies were of poor quality.<sup>8</sup> An interview study found that patient issues, responsibility and poor work/life balance contributed to suicidal ideation among veterinarians.<sup>9</sup> It has been suggested that suicidal ideation among veterinarians is linked to the demanding nature of

their work.<sup>10</sup> Dealing with bereaved clients (ie, animal owners) has been shown to impact the mental health of veterinarians,<sup>11</sup> and attachment loss and trauma can contribute to both depression and suicidality.<sup>12</sup> Preoccupation, self-doubt, conflicting responsibilities (care of animals/human clients/financial demands) and insufficient support were important factors of job stress among veterinarians in a qualitative study.<sup>13</sup> When searching for independent work-related factors associated with suicidal thoughts and behaviour, it is important to control for known individual factors. These include having no partner,<sup>14 15</sup> negative life events,<sup>16</sup> anxiety symptoms, depressive symptoms,<sup>15 17</sup> personality problems<sup>18 19</sup> and the problematic use of alcohol.<sup>17</sup>

The gender balance among veterinarians has changed significantly over the past decades, from 66% male veterinary students in Norway in 1980 to only 16% in 2020 (personal communication, Ann Kristin Egeli, Norwegian University of Life Sciences, 22 June 2021). As of June 2021, 69% of veterinarians holding authorisation in Norway were women (personal communication, Bente N. Reve, The Norwegian Food Safety Authority, 12 July 2021). The gender shift in the profession corresponds to that in several other countries.<sup>20–22</sup> Studies have shown that being female and of younger age increases the risk of serious psychological distress as a veterinarian.<sup>7 8 11</sup> The prevalence of psychological distress, such as anxiety symptoms and depressive symptoms, is also higher among female veterinarians compared with that among male veterinarians.<sup>5 11 23</sup>

Furthermore, there is substantial evidence that certain personality traits may increase the risk of suicide.<sup>19 24</sup> Reality weakness is a deviant personality trait including chronic illusions, paranoid traits, identity-insecurity and relational problems.<sup>25</sup> This trait has demonstrated predictive validity in Norwegian medical doctors regarding the aggravation of suicidal ideation.<sup>18</sup> It is a significant predictor of serious suicidal ideation in other occupational groups as well.<sup>26 27</sup>

Over the last decades, the veterinary profession has turned from agriculture and food-producing animal medicine to an increasing proportion working with companion animals. Two US studies have found a higher suicide rate among companion animal practitioners compared with other specialisations,<sup>3 28</sup> and it has been shown that veterinarians in this field more often reported suicidal thoughts than other veterinarians.<sup>29</sup> Thus, attention is required in the different fields of veterinary medicine.

Few studies have investigated the direct association and contribution of individual and work-related factors to suicidal thoughts and behaviour. Therefore, we investigated the following questions:

1. What is the prevalence of suicidal thoughts and behaviour among veterinarians in Norway, and are there any gender differences?
2. What do veterinarians in Norway regard as contributing factors to their serious suicidal thoughts?

3. What are the independent individual and work-related predictors for serious suicidal thoughts?

## METHODS

### Sample

The sample included all veterinarians in Norway, holding valid authorisation as of May 2020 (n=4256), according to information retrieved from the Norwegian Food Safety Authority. We excluded veterinarians for the following reasons: no residential address in Norway (n=527), current address unknown (n=196), those working abroad (n=62) and those who were deceased (n=7). This resulted in an eligible sample of 3464 veterinarians.

### Questionnaire

A 12-page questionnaire, an information sheet and a prepaid postage envelope were distributed by mail in November 2020. The information sheet included contact information of a psychiatrist in the research group and the colleague-support network of the Norwegian Veterinary Association. Two reminders were sent in January and February 2021, respectively. Five gift cards from a sports shop were placed in a drawing for respondents as incentives to increase the response rate. An external company managed both the data collection and prize awards. Respondents returned their questionnaires in a sealed envelope, and the identities of the respondents were unknown to the researchers throughout. The complete questionnaire in Norwegian can be found as online supplemental file 1—Full questionnaire NORVET.pdf.

### Instruments: dependent variable

Paykel's questionnaire about suicidal thoughts and attempts was the dependent variable in this study.<sup>30</sup> It is a five-item instrument developed to study suicidal feelings in the general population. The items represent increasing severity, from unspecific suicidal feelings to actual suicide attempt. Previous studies on several professions in Norway have validated this instrument.<sup>14 15 26 27 31</sup> The five items have the following wording: (1) 'Have you ever felt that life was not worth living?' (2) 'Have you ever wished you were dead—for instance, that you could go to sleep and not wake up?' (3) 'Have you ever thought of taking your life, even if you would not really do it?' (4) 'Have you ever reached the point where you seriously considered taking your life, or perhaps made plans how you would go about doing it?' and (5) 'Have you ever made an attempt to take your life?' Question four was slightly altered in the Norwegian translation, to: '... and even made plans...', reinforcing the seriousness in this statement.<sup>15</sup> The responses to each question were never, hardly ever, sometimes or often. Responses were dichotomised into never (0) and any frequency (1) according to Paykel's original work. The preceding year's suicidal thoughts and attempts were investigated in this study. For questions 4 and 5, an additional question was asked: 'To what extent do you think the following factors contributed to your consideration of taking your life', with the following factors: (1) Personal

problems, (2) Family problems, (3) Social problems, (4) Work problems and (5) Other problems. Each of the factors had five response categories from 'not at all' (1) to 'very much' (5). For the regression analyses, Paykel item number four was used (serious suicidal thoughts) as the outcome variable, dichotomised as specified above.

### Independent variables: individual factors

The personality trait reality weakness was measured using the nine-item reality weakness dimension of Torgersen's Basic Character Inventory (BCI).<sup>32</sup> Each item had a dichotomous ('agree'/'do not agree') response, with a total sum score from 0 to 9. BCI-Reality weakness is an original, deviant trait related to perceptions and ideations on the borderline between reality and fantasy; this dimension also measures chronic illusions, paranoid traits, and traits related to severe personality disorders.<sup>25 33</sup> Examples of items are: 'I feel lonely most of the time' and 'Sometimes I feel I am not myself'. This measure has previously been validated to predict emotional disturbance, such as serious suicidal thoughts, severe depression, and lack of help-seeking among physicians.<sup>33</sup>

The Norwegian Centre for Research Data claimed the use of age intervals to keep the data as unidentifiable as possible. Therefore, age was reported in the following intervals: 20–25, 26–30 (...) up to 66–70 and >70 years. In this study, marital status was dichotomised into married/cohabitant and single/divorced/separated/widow(er) (coded 0 and 1, respectively).

Life events during the last 12 months was measured by 17 items, previously used by among others, Tyssen *et al*<sup>15 34</sup> and adapted to veterinarians. The adaptations were mainly linguistic and included the removal of items specific to physicians. Examples of life events were 'serious disease or accident', 'death of a relative/close friend' and 'serious economic problems'. All items were coded as 0 or 1, and the variable comprised the sum score of all items. To test the effects on serious suicidal thoughts, we used the weighted total score of all items significantly associated with such thoughts.

Mental distress (anxiety symptoms and depressive symptoms) in the last 14 days was measured using SCL-5, a five-item version of the Symptom Check List-25.<sup>35</sup> This five-item version is based on a factor analysis by Tambs and Moum,<sup>36</sup> and contains questions about how much one is bothered by the following: (1) 'Feeling fearful', (2) 'Nervousness or shakiness inside', (3) 'Feeling hopeless about the future', (4) 'Feeling blue' and (5) 'Worrying too much about things'. Each item was measured on a scale from 1 to 5 from 'not at all' to 'very much'. The sum score is used to indicate the level of mental distress. This version has been validated in medical students and physicians in Norway.<sup>37 38</sup>

Alcohol to cope was measured by a single item originally used in national surveys in the USA.<sup>39</sup> The item is: 'When you feel worried, tense, or nervous, do you ever drink alcoholic beverages to help you handle things?' The alternatives were 'never', 'seldom', 'now and then' and

'often'. In the analyses, responses were dichotomised into 0 'Never' and 1 'Any frequency', as validated in previous Norwegian studies.<sup>40–42</sup> The reason for dichotomising the response was for cultural purposes and we wanted a clear distinction between drinking to cope with tension or not, as accounted for in detail elsewhere.<sup>40</sup>

### Independent variables: work-related factors

The main fields of work were reported as 'companion animal practice', 'production animal practice', 'mixed clinical practice', 'equine practice', 'aquaculture', 'public administration', 'academia/researcher', 'pensioners' and 'others'. Those who classified themselves as pensioners were excluded from the logistic regression analyses, because work-related factors were included in the model.

Job stress was measured by a modified version of Cooper's Job Stress Questionnaire,<sup>43 44</sup> with minor adaptations to veterinarians' work conditions. These adaptations were mainly linguistic, but some items specific to the veterinary profession were added (as 'cross pressure between economy/animal welfare/ethics'). The veterinarians were asked how much different situations/factors made them stressed, with the response alternatives being reported by a five-point Likert type rating scale ranging from no stress at all (1) to a source of extreme stress (5). A factor analysis (principal component with varimax rotation, including scree plot evaluation) identified three job stress factors: emotional demands, work/life balance and fear of complaints/criticism. The first factor, emotional demands (Cronbach's alpha=0.87), contained six items: (1) 'Daily contact with dying and critically ill animals', (2) 'Taking care of terminally ill animals and their owners', (3) 'Taking care of suffering animals', (4) 'Requests about animals from friends and family', (5) 'Requests about animals from relatives' and (6) 'Emotional involvement with patients'. The second factor, work/life balance (Cronbach's alpha=0.86), consisted of five items: (1) 'Work affects family life', (2) 'Managing a balance between work and personal life', (3) 'Work affects social life', (4) 'Time pressure' and (5) 'Interruptions and nagging at work'. The third factor, fear of complaints/criticism (Cronbach's alpha=0.88), consisted of three items: (1) 'Worries about complaints from animal owners/customers', (2) 'Animal owners/customers do not appreciate your work' and (3) 'Dealing with challenging animal owners/customers'.

### Statistical analysis

SPSS V.27 and StataSE V.16 were used for the statistical analyses. Table analyses and the  $\chi^2$  test were used to test for gender differences. Controlled effects were reported as ORs, analysed through hierarchical logistic regression. The following variables were examined as possible predictors of serious suicidal thoughts: gender, age, civil status, negative life events, mental distress, reality weakness, use of alcohol to cope, main field of work and job stress. Initially, all independent variables were analysed bivariously with the dependent variable (crude ORs). In the adjusted model, all independent variables were entered

simultaneously in a logistic regression (adjusted ORs). In order to study possible mediating or confounding effects of mental distress and reality weakness, we performed an additional multivariable regression leaving out the variables mental distress and reality weakness. A  $p < 0.05$  was considered statistically significant for all analyses. To investigate gender-specific effects, we entered two-way interaction terms between gender and the other independent variables in separate analyses with the main effect included in the equations. Missing values were coded as 'system missing'.

### Patient and public involvement

The Norwegian Veterinary Association appointed a reference group for this project consisting of seven veterinarians from each of the professional subgroups: Small Animal, Equine, Production Animal and Aquaculture Veterinary Association, the Association of Veterinarians in Public Health Medicine, the Veterinary Students' Association and the Pensioners' Association. These veterinarians contributed with valuable input both to the design of the questionnaire, hypotheses and aims of this study.

## RESULTS

### Demographics

Of the 3464 eligible participants, we received 2596 responses, resulting in a response rate of 75%.

The most frequently reported age category was 41–45 years of age. The age varied between genders, with a higher proportion of younger women, and the majority of men were older than 50 years. In total, 69% were female and 31% male (table 1), which is an accurate reflection of the actual gender distribution of veterinarians in Norway.

### Prevalence of suicidal thoughts and behaviour during the last year

Twenty-seven per cent of the veterinarians reported that they felt that life was not worth living, and 20% had thought of suicide, even though they knew that they would not do it. Five per cent reported that they had serious suicidal thoughts, and six persons (0.2%) had attempted suicide (table 2). Female veterinarians reported significantly higher prevalence of suicidal feelings and thoughts than male colleagues did. This gender difference remained throughout all items; for serious suicidal thoughts; women had nearly twice the prevalence as their male colleagues (6.2% vs 3.6%,  $\chi^2$ : 6.5,  $p = 0.011$ ). Economic problems (OR=10.88, 95% CI 5.20 to 22.78,  $p < 0.001$ ) were the most significant negative life event for veterinarians. Descriptive statistics for the veterinarians with serious suicidal thoughts is included as online supplemental file 2—Descriptives for veterinarians with serious suicidal thoughts.

### Self-reported factors contributing to serious suicidal thoughts

Among the veterinarians reporting serious suicidal thoughts ( $n = 139$ ), work problems were the most

**Table 1** Description of study population

	Range of values	Frequency (%)	Mean (SD)
<b>Gender</b>			
Female		1776 (69.6)	
Male		776 (30.4)	
<b>Age</b>			
20–30		274 (10.8)	
31–40		697 (27.4)	
41–50		667 (26.2)	
51–60		432 (16.9)	
61–70		318 (12.5)	
>70		159 (6.2)	
<b>Marital status</b>			
Married/cohabiting		1962 (78)	
Single/divorced/widow(er)		552 (22)	
Life events	0–9		0.54 (0.89)
SCL-5	1–5		2.00 (0.98)
Reality weakness	0–9		1.38 (1.85)
<b>Alcohol to cope</b>			
Never		1769 (71)	
Any frequency		722 (29)	
<b>Main field of work</b>			
Companion animal practice		802 (31.8)	
Public administration		402 (15.9)	
Mixed clinical practice		268 (10.6)	
Academia/research		202 (8.0)	
Production animal practice		177 (7.0)	
Aquaculture		121 (4.8)	
Equine practice		102 (4.0)	
Other		250 (9.9)	
Pensioner		198 (7.9)	
<b>Job stress</b>			
Emotional demands	1–5		1.98 (0.79)
Work/life balance	1–5		2.67 (0.97)
Fear of complaints	1–5		3.06 (1.17)

Continued

**Table 1** Continued

	Range of values	Frequency (%)	Mean (SD)
Connection to work–life			
Employed		1561 (63.0)	
Self-employed		573 (23.1)	
Other		217 (8.8)	
Two or more connections to work life		127 (5.1)	
Position type			
Permanent position		2023 (88.1)	
Temporary position		70 (3)	
Temporary educational position		50 (2.2)	
Other		153 (6.7)	
Working full time		1922 (81.1)	
Frequency of working overtime (weekly or biweekly)		1550 (67.9)	

SCL-5, Symptom Check List-5.

frequently reported contributing factor (48%), followed by personal problems (37%) (table 3). The only significant gender difference was regarding work problems, with nearly twice as many women (53%) as men (28%) reporting work problems as the most important contributing factor to their serious suicidal thoughts ( $\chi^2$ : 4.99,  $p=0.03$ , Fisher's exact) and 4.3% reported work problems as the only factor of importance.

### Predictors of serious suicidal thoughts

Being single, negative life events, mental distress, reality weakness, use of alcohol to cope and the three job stress factors were significant unadjusted (crude) predictors

(table 4). In the adjusted model, the significant predictors were being single, negative life events and mental distress. There was no gender effect. No significant effect was found within the different fields of work or any of the three job stress factors in the adjusted model (table 4).

Post hoc, and in order to investigate any confounding or mediating effect of mental distress and reality weakness on the job stress-variables, we conducted an additional multivariable analysis. When processing the individual and work-related factors without the two variables of reality weakness and mental distress, the significant predictors were: being single, negative life events, use of alcohol to cope with tension and all three job stress factors. The results from the additional analysis can be found in online supplemental file 3—Additional analysis predictor model.

We found significant interactions between gender and negative life events (OR 0.65, 95% CI 0.46 to 0.92,  $p=0.015$ ), with clearly steeper gradients for females. There was also an interaction between gender and work/life balance (OR 1.11, 95% CI 1.01 to 1.22,  $p=0.026$ ), and the increase in suicidal thoughts with higher work/life imbalance was stronger among males than among females. A figure illustrating the interaction analysis can be found as online supplemental files 4-1, 4-2.

### DISCUSSION

A main finding of this study was that 27% of the veterinarians in Norway felt that life was not worth living during the last year, 5% had serious suicidal thoughts, and 0.2% had attempted suicide. Female veterinarians reported significantly more suicidal feelings and thoughts than their male colleagues. The veterinarians considered their serious suicidal thoughts mainly as related to work and personal problems, and to a lesser degree, family, social and other problems. Independent factors associated with serious suicidal thoughts were: being single, negative life events and mental distress.

Furthermore, veterinarians reported both suicidal feelings and serious suicidal thoughts more frequently (26.6% and 5.4%, respectively) than physicians (16.6% and 2.6%, respectively),<sup>14</sup> and police (8.9% and 1.7%, respectively)<sup>26</sup> in Norway. Furthermore, veterinarians, especially females, regarded work problems as the most

**Table 2** Prevalence of suicidal feelings and thoughts among veterinarians in Norway according to gender

	All	Men	Women	Total N for each item	$\chi^2$ and p-value
1. Felt life was not worth living	682 (26.6%)	148 (19.3%)	522 (29.7%)	2567	29.4, <0.001
2. Wished you were dead	498 (19.4%)	96 (12.5%)	394 (22.5%)	2565	33.6, <0.001
3. Thoughts of taking life	503 (19.6%)	102 (13.3%)	391 (22.3%)	2565	26.9, <0.001
4. Seriously considered taking your life	139 (5.4%)	28 (3.6%)	108 (6.2%)	2562	6.5, 0.011
5. Made a suicide attempt	6 (0.2%)	1 (0.1%)	5 (0.3%)	2537	NA

Not all veterinarians reported gender (n=2554). This leads to a difference in total sum for men+women compared with 'all.' NA, not available.

**Table 3** Self-reported contributing factors to serious suicidal thoughts among veterinarians in Norway

	Not at all+a little+somewhat			Quite a bit+very much			
	N (%)			N (%)			
	Total	Men	Women	Total	Men	Women	Total, n
Personal problems	84 (63.2%)	17 (65.4%)	67 (63.8%)	49 (36.8%)	9 (34.6%)	38 (36.2%)	133
Family problems	91 (68.4%)	19 (79.2%)	72 (67.9%)	42 (31.6%)	5 (20.8%)	34 (32.1%)	133
Social problems	108 (81.2%)	21 (84.0%)	86 (81.1%)	25 (18.8%)	4 (16.0%)	20 (18.9%)	133
Work problems	70 (51.9%)	18 (72.0%)	51 (47.2%)	65 (48.1%)	7 (28.0%)	57 (52.8%)	135
Other problems	90 (72.6%)	20 (83.3%)	70 (71.4%)	34 (27.4%)	4 (16.7%)	28 (28.6%)	124

Item four of Paykel's questionnaire was answered by n=2562 veterinarians (men=766, women=1754). The question was answered positively by n=139 (see table 1).

important contributing factor to their suicidal thoughts. A previous study found that physicians most frequently regarded personal and family problems as the most important factors for serious suicidal thoughts,<sup>14</sup> which may suggest that self-reported work factors play a more important role in suicidal thoughts in veterinarians than in physicians. Regarding suicide attempts, veterinarians

had a prevalence (0.2%) comparable to those of physicians and police (0.3% and 0.1%, respectively).<sup>14 26</sup>

The relatively high prevalence of suicidal feelings and thoughts concurs with findings among veterinarians in other countries. Two studies used 'National Survey of Psychiatric Morbidity',<sup>5 45</sup> an item originally sourced from Paykel's instrument.<sup>30</sup> These items use the same

**Table 4** Predictors of serious suicidal thoughts among veterinarians in Norway

	Crude		Adjusted*	
	OR	95% CI	OR	95% CI
Female	1.55	0.999 to 2.401	0.88	0.49 to 1.57
Age	0.93	0.86 to 1.00	1.11	0.996 to 1.235
Single	2.38***	1.65 to 3.43	1.76**	1.13 to 2.72
Negative life events <sup>1</sup>	1.78***	1.55 to 2.04	1.43***	1.22 to 1.68
SCL-5	3.08***	2.61 to 3.64	2.75***	2.14 to 3.52
Reality weakness <sup>2</sup>	1.47***	1.37 to 1.59	1.10	0.99 to 1.22
Alcohol to cope	2.14***	1.51 to 3.04	1.09	0.72 to 1.67
Main field of work (ref. category=mixed clinical practice)				
Companion animals	1.38	0.74 to 2.57	1.01	0.50 to 2.06
Production animals	1.28	0.56 to 2.94	1.97	0.77 to 5.05
Equine practice	1.21	0.45 to 3.28	1.02	0.32 to 3.26
Aquaculture	1.01	0.37 to 2.73	1.07	0.32 to 3.61
Public administration	1.08	0.53 to 2.20	1.15	0.49 to 2.71
Academia/research	1.12	0.49 to 2.56	1.07	0.39 to 2.99
Other	0.82	0.35 to 1.91	0.70	0.24 to 2.02
Job stress				
Emotional demands	1.12***	1.08 to 1.16	1.02	0.97 to 1.07
Work/life balance	1.13***	1.09 to 1.17	1.00	0.95 to 1.05
Fear of complaints	1.18***	1.11 to 1.25	1.01	0.93 to 1.09

\*\*P<0.05.

\*\*\*P<0.001

<sup>1</sup>The variable life events was entered into the model as a weighted variable ('Negative life events'), comprising the sum score of life events that was significant in a univariate model with the dependent variable.

<sup>2</sup>There was a high correlation between SCL-5 and reality weakness (Pearson's R=0.6). x Mark as

\*In the adjusted model, all listed variables were simultaneously entered in the model, that is, gender, age, civil status, negative life events, SCL-5, reality weakness, use of alcohol to cope, main field of work and the three job stress factors.  
SCL-5, Symptom Check List-5.

wording for items one and three, which makes comparison possible. The prevalence of suicidal feelings in the past year among veterinarians in Norway was slightly higher (26.6%) than among those in the UK (23.0%)<sup>45</sup> and Canada (17.9%),<sup>5</sup> whereas suicidal thoughts in the past year were at the same level (19.6%, 21.3%, and 19.4%, respectively). However, veterinarians in Canada reported higher prevalence (17.0%) of serious suicidal thoughts than in Norway (5.4%), which is probably due to the reporting period for serious suicidal thoughts in the Canadian survey being 'since the start of veterinary education', while in this study, the reporting period was the preceding year.

Moreover, like female physicians,<sup>14</sup> female veterinarians had higher levels of suicidal feelings and thoughts than their male colleagues. Gender differences were also present in the self-reported contributing factors, as female veterinarians reported work problems more frequently than men. According to our own results and those of others,<sup>14</sup> work problems are more often considered a contributing factor to suicidal thoughts by veterinarians than by physicians. The perceived impact of work factors on serious suicidal thoughts may be partly influenced by the fact that veterinarians in Norway have less undergraduate training in communication, psychology and coping skills, and experience more professional isolation. Additionally, animal healthcare poses a cost issue (in Norway, human healthcare costs are funded by tax revenues), resulting in cross pressure for veterinarians at the intersection of animal welfare, costs and ethics. Conflicting responsibilities in the veterinary profession may be an overarching theme contributing to significant stress among veterinarians.<sup>13</sup>

Today, approximately 70% of veterinarians in Norway are female, and this proportion is expected to increase. There was no significant effect of gender in the adjusted model. This may be because age was highly correlated with the female gender. Being single and experiencing negative life events predicted serious suicidal thoughts in this study (76% and 43% higher odds, respectively). These findings are consistent with studies on physicians and others.<sup>14 15 18</sup> In contrast to physicians, where family and relationship issues were the most significant negative life events,<sup>14</sup> economic problems were the most significant negative life event for veterinarians. This also supports the hypothesis that there are other factors associated with suicidal thoughts among veterinarians than with physicians and that economic concerns are more important with veterinarians. In an Australian qualitative study, veterinarians were asked what they would do if they could change something in the profession, and the most common response was to remove money from the decision-making process.<sup>13</sup> Contrary to the findings in a recent review,<sup>16</sup> experiencing negative life events had a greater impact on serious suicidal thoughts among women than among men. Furthermore, work/life balance had a greater impact on serious suicidal thoughts among men than among women. These findings warrant further research.

Bivariately, drinking to cope was a significant predictor for serious suicidal thoughts, but not in the multivariable model. Previous research indicates that alcohol use is a risk factor for suicidal behaviour.<sup>17</sup> Research on veterinarians and alcohol use is scarce.<sup>8 46</sup> In a study examining drug-caused deaths in Australia, veterinarians were the group with the highest prevalence of alcohol detected in postmortem examinations.<sup>47</sup> Another study found that veterinarians who turned to alcohol to cope with their work-related stress were more likely to have suicidal thoughts.<sup>10</sup> In a recent study examining different occupational groups in the US Army, there was no significant difference in problem drinking in veterinarians, physicians and dentists.<sup>48</sup> The impact of alcohol regarding to mental health among veterinarians warrants further research.

There was no significant effect on serious suicidal thoughts regarding the main field of work, neither in the bivariate nor in the adjusted model. Subsequently, all job stress factors were significantly associated with serious suicidal thoughts bivariately, but not in the adjusted model. However, in the additional analyses, the use of alcohol to cope with tension and all three job stress factors remained significant without reality weakness and mental distress included in the model. The findings of emotional demands, work/life balance and fear of complaints/criticism as important job stress factors concur with previous research.<sup>8 10 49</sup> Although previous studies have suggested that work-related stress influences suicide risk in veterinarians,<sup>50</sup> longitudinal research design may further elaborate on the role of mediating and confounding effects.

Contrary to previous research,<sup>18 26 27</sup> the personality trait reality weakness, was not significant in the adjusted model. This may be explained by the high correlation between mental distress and reality weakness. The impact of mental distress on suicidal thoughts was high, with a nearly three times increase in odds for each step on the 1–5 scale. The direction of causality obtaining between job stress and mental health in this study cannot be unequivocally assessed. On the assumption that job stress actually is an effect of mental distress and reality weakness, our results would indicate that the effect of job stress factors probably was confounded by mental distress and reality weakness. However, if job stress is defined as the underlying causal factor, as posited above, our results would indicate that mental distress and reality weakness mediate the effect of job stress. Previous studies have found that psychosocial factors in the workplace may play a role for mental health,<sup>51</sup> and that individual factors such as stress are related to the way people perceive their jobs.<sup>52</sup> The importance of mental distress with respect to suicidal ideation is consistent with other research, both among medical doctors and others.<sup>15 17</sup> A previous study among junior physicians during internship found that the effect of work stress on suicidal thoughts and behaviour was absorbed by mental distress, in keeping with our finding.<sup>15</sup> First, our study emphasises the importance of using multivariable models when studying single factors



and self-report measures, in order to identify independent and more objective effects. Second, it is in keeping with previous research, that emphasises the complexity in predicting suicidal thoughts and behaviour, there may be both direct and indirect effects of several individual and contextual predictors.<sup>53 54</sup> Third, there may be specific work-related factors of importance for veterinarians with serious suicidal thoughts that we have not captured by our variables in the regression model. Altogether, this explains the apparent discrepancy in our study with regard to the role of work-related factors in serious suicidal thoughts.

To our knowledge, this is the only nationwide study of suicidal behaviour in veterinarians, incorporating all authorised veterinarians, in all main fields of work. A major strength was the high response rate (75%), making multi-variable analyses feasible, and reducing the effect of selection and response biases. Additionally, the questionnaire was quite extensive, allowing the use of a comprehensive predictor model and controlling for several variables. An important limitation is the cross-sectional design, which restricts conclusions about causality. Another limitation is the disparity in referred time span measured by serious suicidal ideation (last 12 months) and mental distress (past 2 weeks), this can lead to more recall bias with respect to suicidal ideation, and a relative overestimation of mental distress. The generalisability of the results may also be limited due to differences in the organisation of work life, including workload in other countries. Nevertheless, we believe the findings are representative of veterinarians in Northern Europe. The study was conducted during the COVID-19-pandemic, which may have affected the results. The survey was planned before the pandemic, and any potential effects of COVID-19 (eg, redundancy and economic effects in the practices) were not accounted for.

## CONCLUSION

In summary, the level of suicidal behaviour among veterinarians in Norway is relatively high, and both individual and work-related factors contribute to serious suicidal thoughts. In the multivariable analyses, the individual factors, and particularly mental distress, played a more important role than the work-related factors, while veterinarians themselves regarded work problems as the most contributing factor to their suicidal thoughts. The roles of gender and specific work-related factors should be further investigated to better understand the complexity of suicidal behaviour among veterinarians.

**Correction notice** This article has been corrected since it was first published. Table 4 footnote has been updated.

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