

## Research Article

# The Prevalence of Distress and Depression in a Large Danish Late Midlife Community Sample: Sex Differences and Associations with Socioeconomic Positions

Cathrine Lawaetz Wimmelmann<sup>1,2,\*</sup>, Erik Lykke Mortensen<sup>1,2,4</sup>, Trine Flensburg-Madsen<sup>1,2</sup>, Ulla Christensen<sup>1</sup>, Merete Osler<sup>1,2,3,4</sup> and Rikke Lund<sup>1,2,4</sup>

<sup>1</sup>Department of Public Health, University of Copenhagen, Denmark

<sup>2</sup>Center for Healthy Aging, University of Copenhagen, Denmark

<sup>3</sup>Research Center for Prevention and Health, Glostrup Hospital, Capital Region of Denmark, Denmark

<sup>4</sup>Danish Aging Research Center, Universities of Aarhus, Southern Denmark and Copenhagen, Denmark

\*Correspondence to: Cathrine Lawaetz Wimmelmann, Department of Public Health, Medical Psychology Unit, University of Copenhagen, Øster Farimagsgade 5 A, DK-1353 Copenhagen K, Denmark; Tel: +45 30134515; Email: calw@sund.ku.dk

Received: September 14, 2017; Accepted: September 29, 2017; Published: October 02, 2017;

## Abstract

**Objective:** To describe the prevalence of mental distress and depression and to analyze the pattern of associations of mental distress and depression with socioeconomic position and demographic factors among men and women in a large Danish community sample.

**Method:** The study sample comprised 5334 49-63 year old participants in the Copenhagen Aging and Midlife Biobank (CAMB) with information on the Symptom Check List 90 (SCL-90) and the Major Depression Inventory (MDI), in addition to information on demographic factors and indicators of socioeconomic position. Logistic regression was used to evaluate associations with age, sex, school education, vocational training, and social class.

**Results:** In the CAMB sample the prevalence of mental distress (SCL-90) case status was relatively low (6.8%), while the prevalence of depression (MDI) was comparable to a previous Danish population study (3.6%). Women reported higher mean scores than men on all investigated distress and depression scales, but in unadjusted analyses men had higher risk of clinical relevant symptoms of distress defined by the Danish SCL-90 cut-offs compared with women. Among indicators of socioeconomic position, social class was the most consistent predictor of mental distress and depression with particular high prevalence among individuals receiving transfer income.

**Conclusion:** The study demonstrated a wide range of associations of mental distress and depression with socioeconomic position and demographic factors. Associations with sex varied to some extent between SCL-90 and MDI questioning the applicability of the Danish SCL-90 case status cut-offs.

**Key Words:** SCL-90, MDI, mental distress, depression, demographic factors, socioeconomic position

## Introduction

Many studies have found evidence of sex and age differences in mental distress and depression [1, 2], and associations between low socio-economic position and higher risk of depression have repeatedly been found in population studies. [3, 4] However, relatively few population studies have systematically investigated associations of mental distress with age and sex while also taking factors, such as education and social class into account. In a Danish age stratified random population sample, Olsen et al. [5] analyzed the Symptom Check List 90 (SCL-90) and found that mental distress was associated with an index of socioeconomic position including school education, professional education and yearly income while age and sex were weaker predictors of SCL-90 scores. The same study showed that major depression as assessed by the Major Depression Inventory (MDI) [6] was in fact statistically unrelated to age, education, and occupation. Furthermore, while most studies have found higher prevalence in

women than in men, Olsen et al. [6] did not observe a sex difference with respect to major depression, but observed a 2: 1 ratio for mild depression. Thus, there is some evidence that associations of mental distress with sex depend on the severity of symptoms.

There is some evidence that the prevalence of mental distress increases through early adulthood, peaks in midlife and late midlife and declines in the elderly. [7, 8] Other studies have, however, reported a j- or u-shaped relation between age and mental distress indicating less distress in the middle-aged. [9, 10] Inconsistent findings may reflect differences in the studied populations, in the assessment of mental distress, including depression, or in the measurements of socio-economic position. [11] Furthermore, it is possible that the effects of socioeconomic position and gender on mental distress vary across agegroups. Few studies have investigated effects of these variables on mental distress in late midlife. A large study [8] investigated associations of psychological distress with

household income among 100,457 community dwelling individuals and found that the prevalence of psychological distress and diagnoses increased with age until early midlife with a subsequent decline. However, increased midlife prevalence rates of distress only existed in individuals in low-income households. In accordance, Landin et al. [12] reported that among 22,777 individuals aged 50-104 years, the risk of depression was approximately twice as high among individuals with less than high school education compared with those who had longer education. This suggests that interventions targeting individuals in the most vulnerable socioeconomic groups may be useful in addressing the potential midlife increase in mental distress, but obviously more research is needed.

The Copenhagen Aging and Midlife Biobank (CAMB) is a late midlife follow-up assessment of more than 5,000 individuals from three Danish cohorts which have been intensely investigated. [13] The follow-up assessment included completion of the MDI and the SCL-90. Thus, the CAMB database offers an opportunity to analyze associations among mental distress and depression in a large midlife community sample with detailed information on education and social class.

The primary aim of the present study was to describe the prevalence of mental distress and depression in a large late midlife community sample and to analyze the pattern of associations of mental symptoms with sex and socioeconomic position.

## Methods

### Study sample

As described by Avlund et al. [13], CAMB is based on a late midlife follow-up of members from three established cohorts: The Metropolitan Cohort (MP, men born in Copenhagen in 1953 [14]), The Copenhagen Perinatal Birth Cohort (CPC, men and women born at the National University Hospital in Copenhagen in 1959-61 [15]) and the Danish Longitudinal Study on Work, Unemployment and Health (DALWUH, a random sample of men and women, born 1949 and 1959 [16]). Among the 5576 participants in the CAMB health examination, complete data on cognitive ability, sex, age, school education, post-school vocational training and education, and occupational social class were available for 5417 participants [17]. When participants with missing data on mental distress and depression were excluded the present study sample comprised 5310 participants (Table 1). In total, 2365 participants were from the MP cohort, 1650 from the CPC cohort and 1295 from the DALWUH cohort.

### Measures

**Mental distress:** The Symptom Check List 90 was used to assess mental distress. [18, 19] The CAMB participants completed the somatization, the depression, and the anxiety symptom scales from the SCL-90. These scales comprise 12, 13, and 10 items respectively, presented in the order in which they are presented in the full SCL-90. Danish cut-off values for SCL-90 case status [5] were used in the present study for the three selected symptom scales. For the Global Severity Index (GSI) we employed cut-offs calculated as the mean item score of the included 35 items [20]. The items are scored in a 0-4 Likert format,

and the cut-offs for case status corresponding to a T-score of 63 were 1.01 for men and 1.29 for women.

**Depression:** The Major Depression Inventory (MDI) was used to assess depression. [6] The MDI comprises 10 items corresponding to criteria for diagnosing ICD-10 depression. All items are answered in a 0-5 Likert format, resulting in a score range of 0-50 for the 10-item sum score. The MDI differs from other depression inventories by consisting of items describing the ICD-10 and DSM-IV symptom criteria for depression. This makes it possible to categorize depression using the diagnostic criteria of ICD-10 and DSM-IV (Olsen et al. [6]). The MDI was developed in Danish, but an English translation was published by Olsen et al. [6] who also presented estimated depression prevalence based on a population study. Sensitivity and specificity analyses have shown strong diagnostic validity of the MDI. [21] In the present analyses, MDI ICD-10 light, moderate and severe depression were combined and ICD-10 depression was analyzed as a binary variable.

### Demographic variables

**Age:** Since all members of the MP cohort were born in 1953, and all members of the CPC cohort were born in 1959-61, only the participants from the DALWUH cohort show substantial variance in age. The age range for the total sample was 49-63 and it was decided to construct a binary age variable indicating the two subsamples: A subsample based on the DALWUH and the CPC cohorts aged 49-53 years and a subsample based on the MP and the DALWUH cohorts aged 56-63 years.

**Sex:** The MP cohort consists of men only, while about 42-43 percent of the participants from the two other cohorts were men. As a result, the total sample consists of about two thirds of men and one third of women.

### Socioeconomic position

**School education:** The highest exam in primary and secondary school was recorded in 8 categories, but was reduced to 3 school education categories: High school exam, other exam, and no exam (Mortensen et al. [17]).

**Vocational Training:** Data were collected on post-school vocational training and education in seven categories, but the seven categories were reduced to three categories of vocational training and education: High (university or other long education), mid level (college) and low (apprenticeship based short education) [17].

**Occupational social class:** Social class was classified by occupation and coded into six social classes according to the standards of the Danish occupational social class classification described by Christensen et al. [22]. According to this classification, social classes I-V encompass economically active individuals ranging from positions requiring top level educational attainment, management control of big organizations or owners of large-scale companies in social class I to unskilled occupation in social class V. The last social class represents people on transfer income, including sickness benefits and disability pension. Two supplementary groups include a) individuals who are economically active but without sufficient job information (n = 7) as

well as b) students and housewives (n = 28). For the present study, the two supplementary groups were combined to a mixed “other” category.

**Cohort:** Since the CAMB database consists of three cohorts, analyses of potential differences among the cohorts are a necessary element in the analysis of CAMB.

### Data analysis

For the total sample, basic distributional characteristics, coefficient alpha and Spearman correlations were calculated for both SCL-90-R and MDI. For all scales, measures of skewness and kurtosis showed substantial non-normality and positively skewed distributions. In a population sample such as the CAMB sample, this suggests that variation within the normal range is of less importance than the distinction between the normal range and clearly deviant symptom scores. Consequently, the described Danish cut-offs were used to define SCL-90 case status while MDI was scored according to ICD-10 diagnostic algorithms.

The main analyses consisted of uni- and multivariate logistic regression analyses of socioeconomic position and the demographic variables as predictors of SCL-90 case status (mental distress) and MDI depression status. Univariate analyses were conducted of each variable, while cohort, age, sex, school education, vocational training, and socioeconomic status were all included as categorical variables in the multivariate models.

### Results

Table 1 shows distributions on the selected demographic variables and indicators of socioeconomic position within the three cohorts and for the total sample. By design, the cohorts differed with respect to sex and age. The cohorts also differed with respect to education and occupational social class, as the MP cohort had the largest proportion without school exam, but also the highest proportion with a university education together with the CPC cohort. With the exception of age, there were few notable differences between the DALWUH cohort and the CPC cohort, although a smaller part of the CPC cohort had mid-level and a larger part low level vocational training.

**Table 1.** Demographic characteristics and socioeconomic position in the three CAMB cohorts and in the total sample

Variable	MP Cohort	DALWUH Cohort	CPC Cohort	Total Sample
Number of Participants	2365	1295	1650	5310
Men (%)*	100	42	43	68
Age 49-53 (%)*	0	48	100	43
Age (mean, SD)*	56.7 (0.5)	55.8 (4.9)	49.9 (0.7)	54.4 (4.0)
<b>School Education* (%)<sup>2</sup></b>				
High School	31	29	31	30
Other Exam	30	38	36	34

Variable	MP Cohort	DALWUH Cohort	CPC Cohort	Total Sample
No Exam	39	33	33	36
<b>Vocational training* (%)</b>				
High Level (University)	20	14	15	17
Mid level (College)	33	42	38	37
Low level (Apprenticeship)	47	44	47	46
<b>Social class*(%)</b>				
Class I	19	13	13	16
Class II	25	28	26	26
Class III	22	24	24	23
Class IV	15	18	18	17
Class V	8	9	9	8
Transfer Income	10	8	9	9
Other	<1	<1	1	1
<sup>1</sup> Significant differences between the three cohorts are indicated by * <sup>2</sup> High School only includes Danish ‘studentereksamen’, Other Exam includes Danish ‘real/mellemskole, HF, HH, HHX, HTX’ and lower level includes 8, 9 or 10 years of ‘Folkeskole’ with or without ‘afgangsprøve’				

Table 2 shows basic distributional characteristics for the SCL-90 and MDI inventories. For all scales, the standard deviation was as large as or larger than the mean. This is reflected in the positive skewness and quite extreme kurtosis which make the use of normal distribution statistics problematic. Coefficient alpha was quite high for all scales in spite of the relatively few items, suggesting high reliability and internal consistency for measures of distress and mental symptoms, including depression. Table 2 also shows the Spearman intercorrelations among the SCL-90 scales and the MDI. The ranges of these correlations were 0.50-0.91, and they were all significant.

Table 3 presents means and standard deviations on the four SCL-90 scales and on MDI ICD-10 depression separately for men and women. Compared with men, women displayed higher scores on all the assessed mental distress and depression scales.

Table 4 presents prevalence of SCL-90 case status and MDI depression for the total sample. For the SCL-90 scale the range was from 5.7% (SCL-90 Depression) to 7.1% (SCL-90 somatization), while the prevalence was 3.6% for ICD depression defined by the MDI. The table also presents associations of demographic factors with mental distress and depression; none of the SCL-90 scales were associated with age in the unadjusted analyses, and depression as assessed by the MDI was negatively associated with age. However, in the adjusted analyses, age was negatively associated with all SCL-90 scales and MDI ICD-10 depression. The GSI scale of the SCL-90 showed significantly increased risk of SCL-90 case status for men compared with women before adjusting for confounders. In contrast, women showed a marginally significant increased risk of MDI ICD-10 depression compared

with men. Generally, the two education variables showed higher risk of SCL-90 case status in low education categories. For school education, the adjusted associations remained significant except for SCL-90 depression, while the adjusted ORs all became insignificant for vocational training. For occupational social class, there is some trend towards increasing risk of case status in lower social classes, but most notable is the dramatically increased risk of case status in the

transfer income category. Depending on the inventory, the prevalence of case status varies between 17 percent (MDI ICD-10 depression) and 28.9 percent (SCL-90 somatization). Unadjusted logistic analyses showed a trend towards cohort differences for all scales except SCL-90 depression, and these differences in OR remained marginally significant in the adjusted analyses.

**Table 2.** Basic distributional characteristics and correlations<sup>1</sup> for mental distress and Major Depression Inventory in the total CAMB sample

Variable	Mean	SD	Range	Skewness	Kurtosis	Alfa	SCL-90 Somatiz.	SCL-90 Depres.	SCL-90 Anxiety	SCL-90 GSI
<b>Mental distress (SCL-90)</b>										
Somatization	0.38	0.42	0 - 3.33	2.04	5.64	0.82	-----			
Depression	0.43	0.50	0 - 3.62	2.21	6.17	0.89	0.59	-----		
Anxiety	0.36	0.41	0 - 3.40	2.26	7.19	0.83	0.55	0.71	-----	
Short GSI	0.40	0.40	0 - 3.00	2.17	6.29	0.93	0.81	0.91	0.84	-----
<b>Major Depression Inventory</b>										
Sum score	7.10	7.12	0 - 48	2.06	5.13	0.89	0.5	0.69	0.59	0.69

<sup>1</sup> Spearman rank correlations which all are significant at < 0.001

**Table 3.** SCL-90 somatization, depression, anxiety, and GSI, and MDI ICD-10 depression for men and women. Means and standard deviations are shown

	Somatization M(SD)	Depression M(SD)	Anxiety M(SD)	Short GSI M(SD)	ICD-10 depression M(SD)
<b>Men</b>	0.35 (0.40)	0.40 (0.48)	0.35 (0.39)	0.36 (0.38)	6.67 (6.78)
<b>Women</b>	0.47 (0.46)	0.52 (0.54)	0.40 (0.45)	0.47 (0.44)	8.01 (7.72)

**Table 4.** Logistic regression analyses of the association between mental distress (four subscales of the SCL-90) and depression (MDI) respectively, and demographic characteristics and socioeconomic position. Crude and mutually adjusted odds ratios (OR) (95% CI)

Variable	SCL-90 Somatization			SCL-90 Depression			SCL-90 Anxiety			SCL-90 GSI			MDI ICD-10 depression		
	%	OR	adj. OR	%	OR	adj. OR	%	OR	adj. OR	%	OR	adj. OR	%	OR	adj. OR
<b>Total sample</b>	7.1	---	---	5.7	---	---	7.0	---	---	6.8	---	---	3.6	---	---
<b>Age</b>															
Age 49-53	7.0	---	---	6.3	---	---	6.6	---	---	6.4	---	---	4.2	---	---
Age 56-65	7.2	1.1	0.5	5.3	0.8	0.5	7.3	1.1	0.7	7.1	1.2	0.5	3.1	0.7	0.4
P value <sup>1</sup>		0.687	0.004		<0.127	0.005		0.340	0.208		<0.350	0.003		0.024	0.006
<b>Sex</b>															
Men	7.4	---	---	5.8	---	---	7.1	---	---	7.4	---	---	3.2	---	---
Women	6.5	0.9	1.0	5.4	0.9	0.8	6.7	0.9	1.1	5.5	0.7	0.8	4.3	1.3	1.4
P value <sup>1</sup>		0.218	0.975		<0.473	0.201		0.527	0.445		0.008	0.213		0.056	0.090
<b>School Education</b>															
High School	4.0	---	---	4.4	---	---	6.0	---	---	4.0	---	---	1.9	---	---
Other Exam	5.0	1.3	1.0	4.8	1.2	0.9	5.2	0.9	0.7	5.8	1.3	1.1	2.7	1.4	1.0
No Exam	11.8	3.2	1.9	7.7	1.8	1.1	9.5	1.7	1.1	10.8	2.9	1.8	5.8	3.1	1.7

Variable	SCL-90 Somatization			SCL-90 Depression			SCL-90 Anxiety			SCL-90 GSI			MDI ICD-10 depression		
	%	OR	adj. OR	%	OR	adj. OR	%	OR	adj. OR	%	OR	adj. OR	%	OR	adj. OR
P value <sup>1</sup>		<0.001	<0.001		<0.001	0.273		<0.001	0.010		<0.001	<0.001		<0.001	0.012
<b>Vocational Training</b>															
High level (University)	3.5	---	---	3.2	---	---	4.5	---	---	3.6	---	---	1.2	---	---
Mid level (College)	5.1	1.5	1.3	5.3	1.7	1.2	6.4	1.4	1.4	5.2	1.5	1.3	3.0	2.4	1.5
Low level (Apprenticeship)	10.0	3.1	1.4	6.9	2.3	1.0	8.3	1.9	1.3	9.2	2.7	1.3	4.9	4.1	1.4
P value <sup>1</sup>		<0.001	0.542		<0.001	0.682		<0.001	0.476		<0.001	0.682		<0.001	0.599
<b>Social class</b>															
Class I	3.3	---	---	2.2	---	---	4.0	---	---	3.4	---	---	0.8	---	---
Class II	2.9	0.9	0.7	3.3	1.6	1.5	4.6	1.2	1.0	3.2	0.9	0.7	1.4	1.7	1.1
Class III	5.3	1.7	1.1	4.8	2.3	2.2	5.9	1.5	1.3	5.2	1.6	1.1	3.0	3.6	2.2
Class IV	5.6	1.8	1.0	4.6	2.2	2.2	5.0	1.3	1.1	5.0	1.5	1.0	2.6	3.2	1.8
Class V	10.3	3.4	1.8	5.8	2.8	2.6	7.4	1.9	1.5	9.6	3.0	1.8	3.6	4.3	2.3
Transfer Income	28.9	12.1	7.0	21.6	12.4	11.9	24.0	7.6	6.1	26.3	10.2	6.6	17.0	24.0	13.9
Other	11.4	3.8	3.0	8.6	4.2	4.2	8.6	2.3	2.0	11.4	3.7	3.3	0.0	---	---
P value <sup>1</sup>		<0.001	<0.001		<0.001	<0.001		<0.001	<0.001		<0.001	<0.001		<0.001	<0.001
<b>Cohort</b>															
MP	7.9	---	---	5.8	---	---	7.9	---	---	7.9	---	---	3.4	---	---
DALWUH	6.1	0.8	0.6	4.8	0.8	0.6	5.8	0.7	0.6	5.4	0.7	0.5	3.0	0.9	0.5
CPC	6.7	0.8	0.4	6.2	1.1	0.6	6.7	0.8	0.6	6.2	0.8	0.4	4.2	1.3	0.4
P value <sup>1</sup>		0.086	0.014		0.220	0.165		0.050	0.063		0.008	0.010		0.069	0.059

<sup>1</sup> P value for chi-square tests of no significant differences between the respective categories

Adjusted OR was controlled for all the investigated factors including cohort, age, sex, school education, vocational training, and socioeconomic status

## Discussion

This large community study showed a 5.7-7.1 percent prevalence of SCL-90 case status and a 3.6 percent prevalence of depression as assessed by the MDI. The statistical analyses revealed significant unadjusted and adjusted associations of school education, and social class with mental distress and depression. Vocational training showed substantial unadjusted associations, but these associations became non-significant in the adjusted analyses. Unadjusted analyses also showed some significant differences between the three CAMB cohorts, and these differences did not change considerably when adjusted for the other demographic variables. Age and sex did not show marked associations with mental distress or depression. Unadjusted associations with age were significant for MDI ICD-10 depression only, but in the adjusted analyses associations with age became significant for all SCL-90 scales except for anxiety. Sex was significantly associated with the GSI in the unadjusted analyses, but no sex differences were found after including age, school education,

vocational training and social class though a tendency towards higher risk of MDI ICD-10 depression among women remained.

In the Danish standardization sample, Olsen et al. [6] did not observe significant sex differences with respect to major depression, however, women had a higher risk of mild depression. This finding was corroborated by Andersen et al. [23] for the larger DALWUH sample. In accordance, in the present study women displayed higher mean scores on all SCL-90 scales and on MDI depression (Table 3), but the effect of sex on clinical relevant mental distress and depression was limited. Thus, while the mean SCL-90 and MDI ICD-10 depression scores were higher among women, unadjusted OR showed that men had higher risk of GSI case status reflecting the lower case status score for men (1.01 for men vs. 1.29 for women). For MDI depression the opposite was found with a tendency towards higher risk of depression among women. These results may question the applicability of the sex specific Danish SCL-90 cut off scores.

For the three individual SCL-90 symptom scales, coefficient alpha was slightly lower than the coefficients reported by Olsen et al. [20]. This may be related to smaller variance in the CAMB sample since the standard deviations for both the SCL-90 scales and the MDI sum score were smaller than those reported for the Danish standardization sample. [5, 6] Still, the high correlations among the SCL-90 scales were close to those reported by Olsen et al. [24], and correlations of similar size were obtained between the MDI sum score and the SCL-90 scales. High correlations can be expected for self-report measures of distress and depression, but the SCL-90 scales suggested a relatively low symptom load in the CAMB sample, while this was not the case for the MDI. It is an open question whether this relates to differences in instructions to the respondent (symptoms within the last week for the SCL-90 or the last two weeks for the MDI) or differences in item content (cut-off for endorsing MDI items may be higher if they more clearly refer to pathological states).

The mean SCL-90 scores in Table 2 are substantially lower than the means of 0.49, 0.59, and 0.44 reported for the standardization sample by Olsen et al. [6], while the mean MDI sum score was similar for the two samples (7.1 and 7.2). Since SCL-90 scores were associated with demographic factors, the lower CAMB SCL-90 scores compared with the standardization sample may reflect differences in demographic composition between the two samples. Thus, the CAMB sample comprises a relatively larger proportion of men which might partly explain the lower SCL-90 scores. However, in spite of the sex specific cut-offs used to define SCL-90 case status [6], the lower prevalence of SCL-90 case status was observed within each sex, and consequently, other factors seem to be involved.

The point prevalence of MDI depression was 3.6% according to ICD-10. Thus, the percentage of MDI depression cases were remarkably close to the prevalence reported for the same standardization sample [24] and also to the prevalence reported for more than 9000 members of the DALWUH cohort. [23] The latter data were collected in year 2000, and a longitudinal follow-up in 2006 suggested an increase in depression. [25] The increase in depression was not corroborated by our results for the full CAMB sample or for the DALWUH participants in the CAMB, but this may be related to the relatively low participation rate in the CAMB study which should also be considered when comparing the CAMB prevalence estimates with the higher prevalence of depression observed in a number of studies. [26]

According to Waraich et al. [27] prevalence rates for depression seem fairly stable through age 18-64 years. We did not observe any significant differences in SCL-90 case status between the two age groups, although the prevalence of MDI depression was significantly higher in the younger 49-53 age group. However, when adjusting for socioeconomic position the risk of mental distress and depression was significantly lower in the older 56-65 age category. This is partly in accordance with the Danish standardization sample, which showed lower prevalence of case status and depression for the 50-64 year age group than for the 35-49 year age group. [5, 6] For the youngest age group in the standardization sample (19-34 years old), higher prevalence of SCL-90 case status was observed, and the age composition of the CAMB sample may to some extent explain the lower prevalence of case status in this sample.

Olsen et al. [5, 6] did not report the educational level of the standardization sample, but Andersen et al. [23] observed an association between low education and increased depression in unadjusted analyses, although not in analyses adjusting for employment and income. In the CAMB data, low education was associated with increased risk of case status in all unadjusted analyses, while all adjusted associations with vocational training were non-significant. For school education, the adjusted associations remained significant except for SCL-90 depression. There is a large literature on associations between educational level and risk of depression [11], and a few studies have also assessed risk of anxiety symptoms. [28] In consideration of this literature, the most remarkable findings in our study may be the relatively weak adjusted associations. However, when interpreting the findings for the two educational measures, the intercorrelation (0.62) and the substantial correlations with social class should be borne in mind (0.47 and 0.62 for school education and vocational training, respectively). It was decided to include all three variables because the primary aim was to present fully adjusted associations with socioeconomic position. However, the high intercorrelations explain the sometimes substantial differences between the unadjusted and adjusted analyses, and in fact make the remaining significant effects of education and social class even more remarkable. In contrast to vocational training, the associations with school education remained significant in the adjusted analyses. This is another remarkable finding because in this late midlife study sample school education was completed 35 – 40 years ago, and it suggests that the association with late midlife mental distress reflects mental traits that influence or are associated with school education and are stable across the adult life course. Cognitive ability is an obvious factor, but non-cognitive factors influencing school education may also contribute to this relation.

Consistent patterns of associations between social class and the measures of mental distress and depression were observed. There is some evidence of higher risk of case status in the lower social classes, but the substantially increased risk in the transfer income category is obviously the most remarkable result. Thus, the prevalence of both SCL-90 case status and MDI depression had a range from 17 to 29 percent in this category. Social gradients in mental health have often been described [29] and are corroborated by the large CAMB sample.

In conclusion, we have demonstrated significant associations between socioeconomic position, demographic variables and measures of mental distress and depression in a large late midlife community sample. Women reported higher scores than men on all investigated SCL-90 symptom scales and on the MDI depression scale. However, when Danish SCL-90 cut-off values were applied, men had higher risk of clinical relevant symptoms of distress compared with women. Although, the sex differences were only significant in unadjusted analyses, the pattern of results indicated that observed sex differences in mental distress and depression to some extent depends on the measures used to assess these mental symptoms and that sex-specific cut-off scores for case status should be carefully evaluated. These findings should be taken into consideration in community studies of mental symptoms, including analyses of the CAMB database. Future

studies should further analyze the mechanisms underlying the strong associations between social class and mental distress especially with regard to individuals on transfer income.

## Acknowledgements and funding

The Copenhagen Aging and Midlife Biobank has been supported by a generous grant from the VELUX FOUNDATION. Authors thank the staff at Institute of Public Health and the National Research Center for the Working Environment who undertook the data collection. Further thanks to Kirsten Avlund, Helle Bruunsgaard, Nils- Erik Fiehn, Åse Marie Hansen, Poul Holm-Pedersen, Rikke Lund, Erik Lykke Mortensen and Merete Osler who initiated and established the Copenhagen Aging and Midlife Biobank from 2009–2011. The authors acknowledge the crucial role of the initiators and steering groups of the Metropolit Cohort, The Copenhagen Perinatal Cohort and The Danish Longitudinal Study on Work Unemployment and Health. Also, the authors of the current study thank Drude Molbo for her help with data administration.

## Ethics, consent, and permissions

The cohorts included in CAMB have all been approved by the local committees for research ethics. Likewise, the local committee for research ethics has approved CAMB as a combined database for the three cohorts. Furthermore, participants in the CAMB study received both oral and written information on the study before assessment, and all participants were required to give both oral and written consent to participate.

## Competing interests

The authors declare that they have no competing interests.

## References

1. Parker G, Brotchie H (2010) Gender differences in depression. *Int Rev Psychiatry* 22: 429–436. [crossref]
2. González HM, Tarraf W, Whitfield KE, Vega WA (2010) The epidemiology of major depression and ethnicity in the United States. *J Psychiatr Res* 44: 1043–1051. [crossref]
3. Everson SA, Maty SC, Lynch JW, Kaplan GA (2002) Epidemiologic evidence for the relation between socioeconomic status and depression, obesity, and diabetes. *J Psychosom Res* 53: 891–895. [crossref]
4. Melchior M, Chastang JF, Head J, Goldberg M, Zins M, et al. (2013) Socioeconomic position predicts long-term depression trajectory: a 13-year follow-up of the GAZEL cohort study. *Mol Psychiatry* 18: 112–121. [crossref]
5. Olsen LR, Mortensen EL, Bech P (2006) Mental distress in the Danish general population *Acta Psychiatr Scand* 113: 477–484. [crossref]
6. Olsen LR, Mortensen EL, Bech P (2004) Prevalence of major depression and stress indicators in the Danish general population. *Acta Psychiatr Scand* 109: 96–103. [crossref]
7. Ferraro KF, Wilkinson LR. (2013) Age, Aging, and Mental Health. In: CS Aneshensel et al. (eds), *Handbook of the Sociology of Mental Health*. 2<sup>nd</sup> (edn), 183 *Handbooks of Sociology and Social Research* Springer, Germany.
8. Lang IA, Llewellyn DJ, Hubbard RE, Langa KM, Melzer D (2011) Income and the midlife peak in common mental disorder prevalence. *Psychol Med* 41: 1365–1372. [crossref]
9. Ross CE, Mirowsky J (2008) Age and the balance of emotions. *Soc Sci Med* 66: 2391–2400. [crossref]
10. Schieman S, Van Gundy K, Taylor J (2001) Status, role, and resource explanations for age patterns in psychological distress. *J Health Soc Behav* 42: 80–96. [crossref]
11. Lorant V, Deliège D, Eaton W, Robert A, Philippot P, et al. (2003) Socioeconomic inequalities in depression: a meta-analysis. *Am J Epidemiol* 157: 98–112. [crossref]
12. Ladin K (2008) Risk of Late-Life Depression Across 10 European Union Countries Deconstructing the Education Effect. *J Aging Health* 20: 653–670. [crossref]
13. Avlund K, Osler M, Mortensen EL, Christensen U, Bruunsgaard H, et al. (2014) Copenhagen Aging and Midlife Biobank (CAMB): an introduction. *J Aging Health* 26: 5–20. [crossref]
14. Osler M, Lund R, Kriegbaum M, Christensen U, Andersen AM (2006) Cohort profile: the Metropolit 1953 Danish male birth cohort. *Int J Epidemiol* 35: 541–545. [crossref]
15. Zachau-Christiansen B (1972) *Development during the First Year of Life*. Elsinore, Poul Andersens Forlag, Denmark.
16. Christensen U, Lund R, Damsgaard MT, Holstein BE, Ditlevsen S, et al. (2004) Cynical hostility, socioeconomic position, health behaviors and symptom load: a cross-sectional analysis in a Danish population-based study. *Psychosom Med* 66: 572–577. [crossref]
17. Mortensen EL, Flensburg-Madsen T, Molbo D, et al. (2014) The relationship between cognitive ability and demographic background variables in late midlife. *J Aging Health* 26: 37–53.
18. Derogatis LR. (1994) *SCL-90-R: Symptom Checklist-90-R. Administration, scoring and procedures manual*, 3<sup>rd</sup> (edn), Minnesota: National computer systems, USA.
19. Derogatis LR. *SCL-90-R. (2007) Symptom Checklist-90-R*. Copenhagen: Psykologisk Forlag A/S, Denmark.
20. Olsen LR, Mortensen EL, Bech P (2007) Documentation for the Danish version of SCL-90-R, SCL-90 og SCL-92. In: Derogatis LR: *SCL-90-R. Symptom Checklist-90-R*. Copenhagen: Psykologisk Forlag A/S; 51–73.
21. Bech P, Rasmussen NA., Raabæk Olsen L. et al. The sensitivity and specificity of the Major Depression Inventory using the present state examination as the index of diagnostic validity. *J Affect Disord* 2001; 66:159–164.
22. Christensen U, Krølner R, Nilsson C, Lyngbye PW, Hougaard CØ, et al. (2014) Addressing social inequality in aging by the Danish Occupational Social Class measurement. *J Aging Health* 26: 106–127. [crossref]
23. Andersen I, Thielen K, Nygaard E, Diderichsen F (2009) Social inequality in the prevalence of depressive disorders. *J Epidemiol Community Health* 63: 575–581. [crossref]
24. Olsen LR, Mortensen EL, Bech P (2004) The SCL-90 and SCL-90R versions validated by item response models in a Danish community sample. *Acta Psychiatr Scand* 110: 225–229. [crossref]
25. Andersen I, Thielen K, Bech P, Nygaard E, Diderichsen F (2011) Increasing prevalence of depression from 2000 to 2006. *Scand J Public Health* 39: 857–863. [crossref]
26. Beekman AT, Copeland JR, Prince MJ (1999) Review of community prevalence of depression in later life. *Br J Psychiatry* 174: 307–311. [crossref]
27. Waraich P, Goldner EM, Somers JM, Hsu L (2004) Prevalence and incidence studies of mood disorders: a systematic review of the literature. *Can J Psychiatry* 49: 124–138. [crossref]
28. Bjelland I, Krokstad S, Mykletun A, Dahl AA, Tell GS, et al. (2008) Does a higher educational level protect against anxiety and depression? The HUNT study. *Soc Sci Med* 66: 1334–1345. [crossref]
29. Fryers T, Melzer D, Jenkins R (2003) Social inequalities and the common mental disorders: a systematic review of the evidence. *Soc Psychiatry Psychiatr Epidemiol* 38: 229–237. [crossref]

### Citation:

Cathrine Lawaetz Wimmelmann, Erik Lykke Mortensen, Trine Flensburg-Madsen, Ulla Christensen, Merete Osler and Rikke Lund (2017) The Prevalence of Distress and Depression in a Large Danish Late Midlife Community Sample: Sex Differences and Associations with Socioeconomic Positions. *Ageing Sci Ment Health Stud* Volume 1(1): 1–7