



# Differences in Coping Self-efficacy, Social Relations and Depression Among HIV-infected Ethnic Danes and Non-ethnic Danes in Denmark: A Cross-sectional Study

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**Abstract:** Health-related quality of life is lower in people living with HIV compared to the general population, particularly because of higher levels of depression. Little is known about the differences between HIV-infected ethnic Danes and HIV-infected non-ethnic Danes at risk of depression. This study aimed to explore coping styles and social relations among HIV-infected ethnic Danes and non-ethnic Danes in two outpatient clinics. HIV-infected individuals from two out-patients clinics were included in a questionnaire-based study. The Beck Depression Inventory II (BDI-II) was used to assess the prevalence and severity of depressive symptoms. Coping was measured using the Coping Self-Efficacy scale (CSE) and social relations factors were marital status, loneliness, disclosure of HIV status and satisfaction with support from family and friends. Among 442 HIV-infected individuals, 21% were in risk of depression assessed by The Beck Depression Inventory II (BDI-II  $\geq 20$ ) and higher among non-ethnic Danes. The difference in mean Coping self-efficacy (CSE) between those at risk of depression and those not at risk was -78.95 95%CI (-89.10; -68.81). Non-ethnic Danes had higher scores on two CSE subscales, compared with ethnic Danish HIV-infected individuals. No ethnic difference was found in the subscale social support. Reduced logistic regression model showed that loneliness, satisfaction with support from family and friends and marital status was associated with risk of depression. Improvement of CSE and social relations seems to be important to resilience to depression among HIV-infected individuals. Lack of social support might be a barrier for HIV-infected achieving resilience to depression, despite ethnicity.

**Keywords:** HIV, Coping, Depression, Social Relations, Ethnicity

## 1. Introduction

Today, human immunodeficiency virus (HIV) is no longer a fatal disease due to effective treatment [1]. Despite advances in HIV treatment, living with HIV today is as much a psychological and social phenomenon as a physiological and medical concern. Depression is the most frequent mental health disorder among people living with HIV with at a global prevalence of 39.1% [2]. Depression is associated with a lower degree of adherence, which can lead to a higher risk of HIV transmission and development of medical resistance [2, 3].

Increased focus on mental health in HIV care and treatment by systematic screening for depression and treatment might improve health-related quality of life [4-6]. The association between depression and HIV is complex and bi-directional, with several components that may lead to depression. These components can be divided into two categories; 1) components caused by the disease such as neurobiological changes and side effects of antiviral therapy, and 2) psychosocial components such as coping strategies and social relations [3, 7].

Coping self-efficacy (CSE) is a measure of individuals confidence in their own ability to perform a coping behavior,

this confidence is shown to be essential to effectively use adaptive coping in the presence of stress [8, 9]. A study among Danish HIV-infected individuals revealed that individuals with high coping self-efficacy are less likely to report depressive symptoms [10]. It has been shown that dysfunctional coping strategies such as disengagement and avoidance are associated with a higher risk of depression [11, 12].

Research focusing on social relations shows that well-functioning social support, especially emotional support, reduces the risk of depression among people living with HIV [13-15], and that non-disclosure of HIV status is a potential barrier to obtaining social support [13]. It has been shown that social support satisfaction decreases following an HIV diagnosis [15]. Furthermore, it was found that a supportive relationship such as a marriage serves as a buffer against depressive symptoms, in HIV-infected individuals [14, 15].

Immigrants living with HIV have a higher prevalence of depression, compared with indigenous Dutch people living with HIV [16]. In 2016, 42% of all new HIV cases in Denmark were found among immigrants (primarily from Africa) [17]. A study indicates that immigrants are less likely to adhere to treatment for HIV compared to HIV-infected ethnic Danes even though the immigrants are treated in the Danish health services, characterized by offering equal access to treatment [18].

Studies about HIV infected immigrants' social relations, coping strategies and mental health are scarce [19, 20].

This study investigates the difference in level of coping self-efficacy, and social relation factors in HIV-infected individuals at risk of depression compared to HIV-infected individuals not at risk of depression. Furthermore, to explore if there are some ethnical differences in this comparison.

## 2. Method

### 2.1. Study Population

Participants were enrolled among HIV-infected individuals treated at the Departments of Infectious Diseases at Aarhus University Hospital and Odense University Hospital in Denmark (22% of the total HIV population in Denmark). Eligibility criteria were; diagnosed with HIV, 18 years of age or older and able to read and write in Danish.

### 2.2. Ethics

All participants filled in a written informed consent form prior to participation. The study was approved by the regional committees on health research ethics and the Danish Data Protection Agency, serial number: 1-16-02-222-11.

### 2.3. The Questionnaire

Data was collected from a self-administered questionnaire. The questionnaire contained questions about sociodemographic, HIV disease and treatment, social network, sexuality and lifestyle. In addition, the questionnaire included individual measures of depression and coping self-efficacy. Development of the questionnaire is described in previous studies [5, 21, 22]. The questionnaire

was forwarded by mail to the participants and returned in a pre-paid response envelope.

### 2.4. Measurement of Depression

The Beck Depression Inventory (BDI-II) was used to assess the prevalence and severity of depressive symptoms [23-25]. The scale has been translated into Danish and validated for use in a Danish setting [24]. The scale consists of 21 items; the respondent ranks each item from 0 to 3, according to how they have felt during the previous two weeks. Scores between 0-13 indicated a minimal risk of depression, 14-19 a mild risk of depression, 20-28 a moderate risk of depression and 29-63 a major risk of depression. A category cut off was set at the value of 20; participants with a score  $\geq 20$  were categorized as at risk of depression. All patients with a BDI score of 20 or above were offered a clinical interview by a consultant psychiatrist.

### 2.5. Coping Self-Efficacy (CSE) Scale Measurement

The CSE scale contains 26 items that measure an individual's confidence in his or her ability to cope effectively. The participants were asked, 'when things aren't going well for you, or when you are having problems, how confident or certain are you that you can do the following?'. The respondents rank each item on a scale from 0-10, 0 meaning 'cannot do at all', 5 meaning 'moderately certain can do' and 10 meaning 'certain can do', resulting in a maximum score of 260 points [26]. The CSE scale has been translated into Danish and face validated; the Danish version was used in this study [10].

The CSE scale also contains three subscales; *problem-focused coping*, *emotion-focused coping* and *social support*. These subscales give a more detailed description of an individual's confidence in his/her ability to cope. The subscales are validated using 13 items of the CSE scale 1) *problem-focused coping*, (6 items,  $\alpha = 0,91$ ), 2) *emotion-focused coping* (4 items,  $\alpha = 0,91$ ) and 3) *social support* (3 items  $\alpha = 0,81$ ) [26].

### 2.6. Measurement of Social Relations

Social relations were measured by questions concerning the structure of the participant's social relations 1) marital status, 2) loneliness and 3) disclosure, and by the function of their social relations, satisfaction with the support from 4) family and 5) friends.

Satisfaction with support from friends and family were measured on a 5-point scale with the following options; very satisfied, little satisfied, neutrally satisfied, little unsatisfied and very unsatisfied. Disclosure of HIV status was measured on a three-point scale: living openly (being open about their HIV status, disclosing their status to others), living partly openly (disclosing their status to more than two people), and living secretly (disclosing status to two people or fewer).

### 2.7. Ethnicity

The participants' ethnicity was recorded according to continent of birth, and options were 'Denmark', 'Another European country', 'Africa', 'Asia', 'North America', 'South

America/Central America' and 'Australia/New Zealand'. Continent of birth was dichotomized into 'ethnic Danes' and 'non-ethnic Danes'.

## 2.8. Statistical Methods

The statistical analyses were performed using Stata 15 (Stata Corp, College Station, TX, USA).

This study consisted of two analyses 1) the association between CSE and depression, 2) a sub analysis of depression associated with social relation factors.

- 1) CSE and the three subscales were investigated using multiple linear regression, to find differences in mean CSE and the subscales in individuals at risk of depression  $\text{BDI-II} \geq 20$  versus not at risk of depression  $\text{BDI-II} < 20$ . Furthermore, analyses were performed to determine whether the CSE and the subscales among those at risk of depression, differed by ethnicity. These analyses were adjusted for age group, gender, further education  $< 2$  or  $> 2$  years and perception of economic situation.
- 2) The association between risk of depression  $\text{BDI-II} \geq 20$  and social relations was investigated using multiple logistic regression to find an odds ratio (OR) in each of the five social relations factors. A logistic regression was

also preformed to show, whether social relations in those at risk of depression varied by ethnicity, these analyses were adjusted for age group and gender. Explanatory variables were checked for mutual interaction.

- 3) An interaction analysis was performed between the variables depression and ethnicity in the analysis of the subscales *problem-focused coping* and *emotion-focused coping*.

Confounder variables were chosen a priori. Statistically significance was defined as a p-value  $< 0.05$ .

## 3. Results

In a population of 934 eligible patients (96 were excluded as they were unable to read and write in Danish), 341 (37%) did not respond, 53 (6%) declined to participate and 98 (10%) were excluded because of incomplete BDI-II score, CSE score and missing response to questions about confounding variables. This resulted in a study population of 442 (47%) HIV-infected individuals (Table 1). After adjustment for gender and age group, the statistically significant OR for being at risk of depression were highest among unemployed individuals and those who perceived their economy as hopeless.

**Table 1.** Demographic information and risk of depression in 442 HIV-infected individuals.

	Total	At risk of depression BDI-II ≥ 20				
	N = 442 (%)	n = 92 (%)	Unadjusted risk of depression		Adjusted* risk of depression	
			OR (95%CI)	P -value	OR (95%CI)	P -value
Gender**						
Female	115 (26)	29 (25)	1.41 (0.85; 2.34)	0.18	1.27 (0.76; 2.13)	0.36
Male	327 (74)	63 (19)	1 (ref.)		1 (ref.)	
Age***						
23-42	120 (27)	33 (28)	2.71 (1.34; 5.49)	0.01	2.57 (1.26; 5.25)	0.01
43-50	116 (26)	22 (19)	1.67 (0.80; 3.52)	0.17	1.59 (0.75; 3.38)	0.23
51-58	100 (23)	24 (24)	2.26 (1.08; 4.73)	0.03	2.21 (1.05; 4.63)	0.04
59-81	106 (24)	13 (12)	1 (ref.)		1 (ref.)	
Ethnicity						
Danish ethnicity	343 (78)	64 (19)	1 (ref.)		1 (ref.)	
Not Danish ethnicity	99 (22)	28 (28)	1.72 (1.03; 2.88)	0.04	1.42 (0.80; 2.53)	0.23
Europe <sup>a</sup>	26 (6)	7 (27)	1.61 (0.65; 3.98)	0.31	1.52 (0.61; 3.82)	0.37
Africa <sup>a</sup>	49 (11)	12 (24)	1.41 (0.70; 2.86)	0.34	1.10 (0.48; 2.49)	0.82
Asia <sup>a</sup>	18 (4)	7 (39)	2.77 (1.04; 7.43)	0.04	2.03 (0.71; 5.81)	0.19
America <sup>a</sup>	6 (1)	2 (33)	2.18 (0.39; 12.16)	0.37	1.72 (0.30; 9.70)	0.54
Further education <sup>b</sup>						
Below 2 years or non	174 (39)	47 (27)	1.83 (1.15; 2.91)	0.01	1.58 (0.97; 2.55)	0.06
Above 2 years	268 (61)	45 (17)	1 (ref.)		1 (ref.)	
Employment						
Employed	243 (55)	32 (13)	1 (ref.)		1 (ref.)	
Unemployed	191 (43)	59 (31)	2.95 (1.82; 4.77)	< 0.01	3.58 (2.15; 5.95)	< 0.01
Unknown	8 (2)	1 (13)	-		-	
Hopeless economy						
yes	29 (7)	19 (66)	8.85 (3.95; 19.82)	< 0.01	8.24 (3.63; 18.74)	< 0.01
no	413 (93)	73 (18)	1 (ref.)		1 (ref.)	
Time with HIV						
0-10 years	219 (50)	45 (21)	1 (ref.)		1 (ref.)	
11-31 years	208 (47)	45 (22)	1.06 (0.67; 1.70)	0.78	1.31 (0.79; 2.17)	0.30
Unknown	15 (3)	2 (13)	-		-	
Sexual orientation						
Homosexual	184 (42)	37 (20)	1 (ref.)		1 (ref.)	
Heterosexual	209 (47)	42 (20)	1.00 (0.61; 1.64)	0.997	0.79 (0.42; 1.50)	0.48
Bisexual	26 (6)	6 (23)	1.19 (0.45; 3.18)	0.73	1.28 (0.47; 3.51)	0.63
Unknown	23 (5)	7 (30)	-		-	

\*Adjusted for gender and age group, \*\* only adjusted for age group, \*\*\* only adjusted for gender, <sup>a</sup>=Subgroups of 'not Danish ethnicity' <sup>b</sup>= Education beyond primary school or high school

Demographic information on HIV-infected individuals at risk of depression (Table 2) shows that there is a statistically significant OR between the distribution of gender in the two groups, with a higher proportion of females in the group of non-ethnic Danes compared to ethnic Danes. There is a difference in level of further education where ethnic Danes

were more likely to have more than two years of further education compared to non-ethnic Danes. However, this difference was not statistically significant when adjusted for gender and age group. Differences in distribution of sexuality between non-ethnic and ethnic Danes are annulled by adjusting for gender and age group.

**Table 2.** Demographic information in 92 HIV-infected individuals at risk of depression.

	Ethnic Danes	Non-ethnic Danes			
	n=64	n = 28	Unadjusted non-ethnic Danes	Adjusted* non-ethnic Danes	
Gender**	n (%)	n (%)	OR (95%CI)	P -value	OR (95%CI) P -value
Female	14 (22)	15 (54)	4.12 (1.59; 10.66)	< 0.01	3.24 (1.21; 8.68) 0.02
Male	50 (78)	13 (46)	1 (ref.)		1 (ref.)
Age***					
23-42	19 (30)	14 (50)	1.79 (0.58; 5.48)	0.31	1.50 (0.47; 4.80) 0.50
43-50	15 (23)	7 (25)	1.13 (0.32; 3.98)	0.85	0.98 (0.27; 3.64) 0.98
51-58	17 (27)	7 (25)	1 (ref.)		1 (ref.)
59-81	13 (20)	0 (0)	-		-
Further education <sup>b</sup>					
Below 2 years or non	26 (41)	21 (75)	4.38 (1.63; 11.80)	< 0.01	2.74 (0.93; 8.09) 0.07
Above 2 years	38 (59)	7 (25)	1 (ref.)		1 (ref.)
Hopeless economy					
yes	12 (19)	7 (25)	1.44 (0.50; 4.17)	0.50	1.36 (0.43; 4.28) 0.60
no	52 (81)	21 (75)	1 (ref.)		1 (ref.)
Sexuality					
Homosexual	31 (48)	6 (22)	1 (ref.)		1 (ref.)
Heterosexual	24 (38)	18 (64)	3.88 (1.33; 11.26)	0.01	2.39 (0.61; 9.34) 0.21
Bisexual	6 (9)	0 (0)			
Unknown	3 (5)	4 (14)			

\*Adjusted for gender and age group, \*\* only adjusted for age group, \*\*\* only adjusted for gender, <sup>b</sup>= Education beyond primary school or high school

### 3.1. Analysis of CSE and Subscales

Results of the analysis of differences in mean CSE scale and subscales comparing those at risk of depression and those not at risk of depression are shown in Table 3. Results show a statistically significant difference in level of CSE and subscales between the two groups of HIV-infected individuals. With a range of 0-260, those at risk of depression

had a mean score of -78.95 95%CI (-89.10; -68.81) below those not at risk of depression. This is almost a difference of one third of the scale range, adjusted for gender, age group, further education and perception of economy. Likewise, there were also statistically significant differences in mean in the three subscales when comparing those at risk of depression and those not at risk.

**Table 3.** Differences in mean level of Coping Self-Efficacy (CSE) and risk of depression among 442 HIV-infected individuals.

	N (%)	Mean (SD**)	Unadjusted	Adjusted*
Overall CSE				
Not at risk BDI-II < 20	350 (79)	179.91 (41.6)	ref	ref
At risk BDI-II ≥ 20	92 (21)	97.14 (43.0)	-82.77 (-92.42; -73.11) a	-78.95 (-89.10; -68.81) a
Problem-focused coping				
Not at risk BDI-II < 20	350 (79)	44.21 (10.7)	ref	ref
At risk BDI-II ≥ 20	92 (21)	24.13 (11.3)	-20.08 (-22.57; -17.59) a	-18.83 (-21.43; -16.23) a
Social support				
Not at risk BDI-II < 20	350 (79)	20.97 (6.7)	ref	ref
At risk BDI-II ≥ 20	92 (21)	10.43 (7.9)	-10.53 (-12.13; -8.94) a	-10.16 (-11.84; -8.47) a
Emotion-focused coping				
Not at risk BDI-II < 20	350 (79)	28.39 (8.1)	ref	ref
At risk BDI-II ≥ 20	92 (21)	13.84 (9.2)	-14.56 (-16.47; -12.64) a	-13.59 (-15.59; -11.59) a

\*Adjusted for gender, age group, further education, perception of economy, \*\*SD = standard deviation, a = p-value < 0.0001

Table 4 shows differences in mean CSE and subscales between HIV-infected ethnic Danes at risk of depression and HIV infected non-ethnic Danes at risk of depression. While HIV-infected non-ethnic Danes have a higher mean CSE score, 20.92 (-0.13; 41.97), compared to HIV-infected ethnic Danes, it is not a statistically significantly higher score. On

the two subscales *problem-* and *emotion- focused coping*, HIV-infected non-ethnic Danes have a statistically significantly higher mean score; *problem-focused coping* 5.66 (0.21; 11.12) and *emotion-focused coping* 5.50 (1.18; 9.82) compared to HIV-infected ethnic Danes.

**Table 4.** Difference in mean level of Coping Self-Efficacy (CSE) and ethnicity among 92 HIV-infected individuals at risk of depression.

	n (%)	Mean (SD**)	Unadjusted	P-value	Adjusted*	P-value
Overall CSE						
Ethnic Danes	64 (70)	91.47 (42.8)	ref		ref	
Non-ethnic Danes	28 (30)	110.11 (41.4)	18.63 (-0.43; 37.71)	0.055	20.92 (-0.13; 41.97)	0.051
Problem-focused coping						
Ethnic Danes	64 (70)	22.81 (11.3)	ref		ref	
Non-ethnic Danes	28 (30)	27.14 (10.8)	4.33 (-0.68; 9.34)	0.090	5.66 (0.21; 11.12)	0.042
Social Support						
Ethnic Danes	64 (70)	10.23 (7.7)	ref		ref	
Non-ethnic Danes	28 (30)	10.89 (8.4)	0.66 (-2.92; 4.23)	0.715	-0.46 (-4.49; 3.57)	0.821
Emotion-focused coping						
Ethnic Danes	64 (70)	12.42 (8.6)	ref		ref	
Non-ethnic Danes	28 (30)	17.07 (9.7)	4.65 (0.62; 8.68)	0.024	5.50 (1.18; 9.82)	0.013

\*Adjusted for gender, age group, further education, perception of economy, \*\*SD = standard deviation

An interaction analysis showed a statistically significant interaction between the variables depression and ethnicity in the analysis of the subscales *problem-focused coping* and *emotion-focused coping* (data not shown). Mean values of the two subscales those at risk of depression and those not at risk, differed significantly by ethnicity; *problem-focused coping* p-value was 0.018 for interaction and *emotion-focused coping* p-value was 0.027. There was no difference in ethnicity among those not at risk of depression, but a statistically significant difference in ethnicity among those at risk of depression in the two subscales.

### 3.2. Subanalysis of Risk of Depression and Social Relations

A subanalysis was made to explore the association between depression in HIV-infected individuals and social relations. Only 366 of the original 442 participants provided

full data on the five social relation factors. An analysis of the 76 missing participants, showed no differences in distribution of depression, gender, age group, ethnicity and further education compared to the 366 included in the analysis of social relations.

Table 5 shows that there was a statistically significant association with risk of depression for HIV-infected individuals in four of the five social relations factors. Factors that increased the risk of depression were little or very unsatisfied with support from family, OR 5.27 95%CI (2.43; 11.46), little or very unsatisfied with support from friends, OR 10.20 95%CI (4.05; 25.69), not being married or in a registered partnership, OR 2.40 95%CI (1.36; 4.25), feeling moderately lonely or very lonely, OR 21.99 OR (11.11; 43.52).

**Table 5.** Risk of depression associated with social relation factors among 366 HIV-infected Individuals.

	Not at risk of depression (BDI-II < 20) n (%) 291 (80)	At risk of depression (BDI-II ≥ 20) n (%) 75 (20)	OR for risk of depression (BDI-II ≥ 20)	Adjusted* OR for risk of depression (BDI-II ≥ 20)
Support from family				
Satisfying (very or moderate or little)	275 (94.5)	59 (79)	1 (ref.)	1 (ref.)
Unsatisfying (little or very)	16 (5.5)	16 (21)	4.66 (2.21; 9.85) a	5.27 (2.43; 11.46) a
Support from friends				
Satisfying (very or moderate or little)	283 (97)	59 (79)	1 (ref.)	1 (ref.)
Unsatisfying (little or very)	8 (3)	16 (21)	9.59 (3.92; 23.45) a	10.20 (4.05; 25.69) a
Marital status				
Married**	136 (47)	21 (28)	1 (ref.)	1 (ref.)
Not married	155 (53)	54 (72)	2.26 (1.30; 3.93) b	2.40 (1.36; 4.25) b
Loneliness				
Not or little	267 (92)	29 (39)	1 (ref.)	1 (ref.)
Moderate or very	24 (8)	46 (61)	17.65 (9.45; 32.96) a	21.99 (11.11; 43.52) a
Disclosure of HIV status				
Living openly or partly openly	218 (75)	56 (75)	1 (ref.)	1 (ref.)
Living secretly	73 (25)	19 (25)	1.01 (0.57; 1.82)	1.14 (0.63; 2.07)

\*Adjusted for gender and age group, \*\* also includes registered partnership, a = p-value < 0.0001, b = p-value < 0.05

Differences in the social relation factors comparing HIV-infected ethnic Danes at risk of depression with HIV-infected non-ethnic Danes at risk of depression were also examined (data not shown). This analysis showed no significant differences.

## 4. Discussion

We found that HIV-infected individuals at risk of depression had a significantly lower degree of CSE,

compared to those not at risk. The difference is nearly one third of the range of the CSE scale, which indicates that improvement of coping self-efficacy might prevent depression in HIV-infected individuals. The findings are in agreement with our previous study of CSE and depression [10] and is supported by Gore-Felton *et al.* and Simoni & Ng who found that a higher use of maladaptive or avoidance coping is related to depression [27, 28]. Furthermore, unemployment and perception of a hopeless economy were strong predictors for risk of depression. These factors are components of socioeconomic and thus evidently related to depression [29, 30].

In the subanalysis, social relation factors indicated that loneliness, not being married or in a registered partnership and being unsatisfied with support from friends and family were associated with risk of depression. Other studies also found that social support, especially emotional support, was related to resilience to depression in both women and men [13, 15, 31]. Hinnen *et al.* found that being in a relationship similar to a marriage was related to resilience to depression, though partly mediated by the social support within the marriage [14].

The World Health Organization (WHO) states that patients, who receive appropriate support from their family show increased resiliency and experience less psychological problems [32]. Social relations contribute to improve the health of the individuals, prevent health problems and protect the individual from negative effects of stress by strengthening coping mechanism, thus providing better health results and positively acting against the depressive symptoms [32].

The association between loneliness and depression has been demonstrated earlier in HIV-infected individuals above 50 years of age [33]. Loneliness is also related to poor physical health such as coronary heart disease [34], and loneliness is also found to increase mortality [35].

HIV-infected non-ethnic Danes at risk of depression had higher levels in the CSE subscales *problem-* and *emotion-focused coping* compared to HIV-infected ethnic Danes. Even though the difference is statistically significant the difference is small and might not be clinically relevant. No ethnic difference was found in the subscale *social support*, which covers getting emotional support and help with things you need from friends and family. Despite this advantage in having self-efficacy or confidence in *problem-* and *emotion-focused coping*, HIV-infected non-ethnic Danes might be at risk of depression because they cannot apply their coping resources due to lack of social support, given that functional social relations can be beneficial in improving individuals' ability to cope. Our findings are in accordance with a study of HIV-infected immigrants in Canada. They found that coping and social support were mediators of the relationship between 'HIV symptom distress' and depression [19]. This study did not compare the findings to HIV-infected non-immigrants [19]. A study of refugees in the U.S similar to the Canadian study found that HIV-infected refugees (mainly from Africa) had psychosocial difficulties especially in social

support and disclosure of HIV status compared to U.S.-born HIV-infected individuals, but not in relation to depression [20].

The WHO and UNAIDS have the ambition called the "90-90-90" in 2020. In year 2020, 90% of all people living with HIV should be diagnosed, 90% of people diagnosed with HIV should be medically treated and that 90% of all HIV-infected individuals who are on treatment should be virally suppressed [36]. Lazarus *et al.* argue that to reach this ambitious goal, they propose adding a 'fourth 90' to the strategy ensuring that 90% of people with a viral load suppression also have a good health-related quality of life [4].

Therefore it is important to identify factors that can facilitate improved coping skills and increase health-related quality of life and take this into account when developing targeted interventions to reduce the risk of depression among HIV-infected individuals, regardless of ethnicity. Social support may be experienced differently across cultures. Further assessing depression in different ethnic populations might be important to coping and social relations as they share distinct cultural practices and health beliefs [37]. Nevertheless, differences between individuals' baseline coping resources are present regardless of ethnicity. Evidence of effects of culturally adapted mental health interventions is still unclear [38].

This study has some limitations. First, this study is based on 47% of the eligible individuals, and the sub analysis of social relation on 37%, and there is thus risk of selection bias. Lack of participation might be from those at highest and lowest risk of depression, those who felt well because of lack of interest, and those who were depressed because of denial of condition or answering would be too overwhelming.

Secondly, the group of HIV-infected non-ethnic Danes was limited to individuals who were literate in Danish, as the questionnaire was in Danish. This may have excluded those who were less resourceful or had a low level of education. Further it might have excluded a higher percentage of less resourceful HIV-infected non-ethnic Danes compared to less resourceful HIV-infected ethnic Danes. This selection bias might lead to an overestimation of difference in CSE between ethnicities.

Finally, the group of HIV-infected non-ethnic Danes is heterogeneous in relation to ethnicity, religion, culture and underlying cause of migration. Ethnicity was measured by birth continent, but individuals born in Africa represent 49% of this group. Therefore, the generalizability of this study is limited. Despite these limitations, this study is the first study that investigate differences in coping strategies and social relations among HIV-infected individuals at risk of depression across cultures in Denmark.

## 5. Conclusion

We conclude that improvement of CSE and social relations factors seems to be important to resilience in relation to depression among HIV-infected individuals. Lack of social

support might be a barrier for HIV-infected concerning resilience to depression, despite ethnicity.

Thus, treatment of HIV-infected calls for a holistic approach, we suggest that increased focus on the individual's social relations and coping strategies should be a part of standard HIV care. Future studies need to investigate cultural differences in relation to depression, coping strategies and social relations in a larger population of HIV-infected individuals, in order to develop targeted interventions to decrease depression and thereby increase health-related quality of life.

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## Conflict of Interest

All the authors do not have any possible conflicts of interest.

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