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What is This?

Defining subgroups of low socioeconomic status women at risk for depressive symptoms: The importance of perceived stress and cumulative risks

Judith EB van der Waerden[1,2,3], Cees Hoefnagels[2,3,4], Clemens MH Hosman[2,3,5] and Maria WJ Jansen[2,3,6]

Abstract

Background: Most disadvantaged women are exposed to risk factors for depression, but not all necessarily have an identical risk for this mental health problem. A better prediction of which low socioeconomic status (SES) women are most at risk for depressive symptoms can help target preventive interventions at high-risk subgroups most in need of support.
Aims: Exploring which demographic, socioeconomic and psychological risk factors are associated with self-reported depressive symptoms in a sample of low-SES women and whether the number of risk factors might expose them to an accumulated risk.
Methods: Between April 2005 and November 2007, 519 disadvantaged women from urban neighbourhoods in Maastricht, a southern Dutch city, participated in a cross-sectional survey on stress and depressive symptoms.
Results: Lower education levels, no current employment and lower net monthly family incomes were socioeconomic risk factors associated with higher scores for depressive symptoms. The psychological risk factor 'perceived stress' had the highest explained variance and was most strongly associated with depressive symptoms. Women exposed to multiple risk factors across domains had a cumulated risk for depressive symptomatology.
Conclusion: Low-SES women who seem most eligible for targeted preventive action are those with cumulative risks. Depression prevention strategies for this population may benefit from focusing on perceived stress since this is an important modifiable risk factor.

Introduction

In the past few decades, most Western countries, including the Netherlands, have increasingly recognized socioeconomic health inequalities as an important public-health issue (Mackenbach, 2012). Major depression is one psychological disorder for which prevalence rates are higher in low socioeconomic status (SES) populations (Lorant et al., 2003). An especially vulnerable group with high risk for depression is women with low SES (Belle & Doucet, 2003; Muntaner, Eaton, Miech, & O'Campo, 2004). Among disadvantaged women, onset of depression is reported to be at least two to five times higher (odds ratios (ORs) between 2.7 and 5.4) when compared to women in the general population (Bassuk, Buckner, Perloff, & Bassuk, 1998; Kahn, Wise, Kennedy, & Kawachi, 2000).

Specific life conditions often concomitant with low-SES status (i.e. lower levels of education, unemployment, low income and financial strain and living in disadvantaged neighbourhoods) have been found to be major risk factors for depression (Araya, Lewis, Rojas, & Fritsch, 2003; Klose & Jacobi, 2004). In women, lower

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educational levels are correlated with higher levels of depressive symptom at any given time over the life course (Almeida-Filho et al., 2004). Educational level interacts with current employment status and income, together constituting a substantial social disadvantage (Fryers, Melzer, & Jenkins, 2003). Low-SES women are more often unemployed or have routine, poorly paid and unfulfilling jobs with low decision latitude and higher job stress (Sjögren, Kristenson, & Linquest group, 2006; Ross & Mirowsky, 2006). Low household income and financial strain may cause women to live in poorer settings or may perpetuate their living in such areas (Belle & Doucet, 2003; Santiago, Wadsworth, & Stump, 2011). In neighbourhoods of concentrated poverty, high levels of social disorder and threats to physical safety are often present. Neighbourhood disorder has been found to influence depressive symptoms, independent of household income (Schulz et al., 2006).

Previous research indicates that stress exposure and vulnerability mediate the link between socioeconomic disadvantage and depressive symptoms (Ennis, Hobfoll, & Schroder, 2000; Grzywacz, Almeida, Neupert, & Ettner, 2004; Katerndahl & Parchman, 2002). Personal and social resources, such as coping strategies, self-esteem, a sense of personal control or mastery over one's life and social support, moderate the relationship of individual SES variables to stressors and mental health outcomes (Grote, Bledsoe, Larkin, Lemay, & Brown, 2007; Kiviruusu, Huurre, Haukkala, & Aro, 2013). These social and personal characteristics providing resilience to stress are less available to lower-status individuals, although they still vary within these disadvantaged samples (Denton, Prus, & Walters, 2004; Elliott, 2001; Piccinelli & Wilkinson, 2000).

Interventions to enhance resilience and reduce vulnerability to depression among low-SES women have been found effective and are acceptable to this population (Levy & O'Hara, 2010; Nadeem, Lange, & Miranda, 2008). Ideally, one would want to select people at high risk for depression and deliver targeted interventions that address existing needs (Almeida et al., 2011). However, a particular challenge exists when the risk factors that may be useful in selecting groups for participation are almost universally present, as is the case in high-risk populations such as low-SES women. While previous studies consistently show higher levels of depressive symptoms among low-SES women, not all disadvantaged women manifest this risk. Some of them are successfully adapting to the demands or distresses associated with the adverse circumstances they live in and are not in need of preventive interventions or treatment (Weinreb, Perloff, Goldberg, Lessard, & Hosmer, 2006). It is conceivable that low-SES women exposed to an accumulation of risk factors are the ones most at risk of adverse outcomes. A strong relationship has been found between the number of risk factors and depressive symptoms in adolescents (Bond,

Toumbourou, Thomas, Catalano, & Patton, 2005), and adults (Almeida et al., 2011). In addition, previous research has shown that especially single mothers experiencing financial hardships seem to have a higher rate of onset of depression, particularly when other proximal risk factors were present (Brown & Moran, 1997). This illustrates that risk in apparently high-risk groups such as disadvantaged women may still vary. To understand such heterogeneity, factors associated with variation in risk among low-SES women need to be explained further. This may help to identify subgroups that are at an especially high-risk level of developing depression.

Our aim was to examine which demographic, socioeconomic and psychological risk factors are associated with self-reported depressive symptoms in an already high-risk population of low-SES women. We also wanted to explore whether perceived stress mediates the relationship between the demographic or socioeconomic variables and depressive symptoms, and whether the number of risk factors present in the lives of these women might pose an accumulated risk for them. Refining the risk indicators for depressive symptoms in low-SES women makes it possible to target high-risk subgroups that are especially susceptible to mental health problems for preventive interventions (Muñoz, Cuijpers, Smit, Barrera, & Leykin, 2010).

Method

Study design

A cross-sectional survey was conducted as part of a study on the effect of a preventive intervention aimed at reducing stress and depressive symptoms in low-SES women. Approval for conducting this study was provided by the Medical Ethics Committee of Maastricht University, the Netherlands. Between April 2005 and November 2007, community-based epidemiological data on self-reported stress and depressive symptoms were collected in adult women (aged 20–55 years) living in or near the socioeconomically deprived neighbourhoods of Maastricht, a southern Dutch city.

A total of 2,701 women received an invitation from their general practitioner to participate in a telephone screening or were referred by social work and debt repayment services, the district mental health centre and Public Health Service. Those replying to local media campaigns were also eligible for screening. All women recruited through one of these methods were screened for stress and depressive symptoms in a 10-minute telephone interview conducted by trained lay interviewers. Of the 1,410 women who were reached for the telephone screening, 1,383 (98.1%) completed it. More details on the recruitment and retention process have been described elsewhere (Van der Waerden, Hoefnagels, Jansen, & Hosman, 2010).

Since our aim for this particular study was to explore risk factors for depressive symptoms among low-SES women, we selected a subsample by using years of formal education as a single estimate of SES. Duration of formal education is seen to be a good indicator of long-term economic position since it often precedes and influences employment, work, earnings and income, thus acting as a key to positioning in the stratification system (Ross & Mirowsky, 2006). Furthermore, it appears that educational level is a better predictor of depression in women than in men (Van de Velde, Bracke, & Levecque, 2010) and is most strongly linked to mental well-being and common mental disorders (Araya et al., 2003). Women with less than 10 years of formal education were considered low SES, leading to a final sample of 519 women (CBS, 2010).

Measures

The screening interview included questions about the women's demographic and ascertained socioeconomic characteristics. These included age, nationality, marital status, number of children living at home, educational attainment, current occupational situation and net monthly family income and neighbourhood of residence.

Neighbourhood deprivation is based on a bi-annual community questionnaire, which the town of Maastricht uses to determine overall neighbourhood deprivation for each of its districts (Theunissen & Nijsten, 2007). The neighbourhood deprivation score takes into account aspects of population composition, housing conditions, facilities, safety, social cohesion and neighbourhood problems. The mean neighbourhood score for Maastricht is 10 (range = 0–21), with more deprived neighbourhoods having lower scores.

In addition, women completed the Dutch version of a 10-item version of Cohen's Perceived Stress Scale (PSS) (Cohen & Williamson, 1988). The scale assesses the frequency of stress-inducing situations and feelings of stress over the last month, and was designed for use in the general community (Cohen, Kamarck, & Mermelstein, 1983). The PSS has an adequate internal and test–retest reliability (Cohen et al., 1983). Scores range from 0 to 40. For screening purposes, we used a cut-off of 14 and higher, based on mean PSS scores for women in the general population (Cohen & Williamson, 1988). In the current sample, the test had a Cronbach's alpha of .91.

Finally, depressive symptoms in the past week were assessed with the Center for Epidemiological Studies Depression–Short Form (CESD-SF). This briefer 10-item version has a reliability and validity comparable to that reported for the original CESD Sensitivity is high (0.85), but specificity is low (0.37) (Cheng & Chan, 2005). Scores range between 0 and 30, with a cut-off score of 10 for high risk of clinical depression (Andresen, Malmgren, Carter, & Patrick, 1994). In this study, Cronbach's alpha for the total CESD-SF was .91.

Data analysis

First, the unadjusted associations between demographic, socioeconomic and psychological variables with depressive symptoms were examined using Pearson and Spearman correlations. We then performed stepwise linear multiple regression techniques to assess the contribution of several variables to depressive symptoms in our sample. The first model included the demographic variables age, nationality, marital status and number of children living at home. The second model included a community-level SES variable, the neighbourhood deprivation score. The third model added individual SES variables: educational attainment, current occupational situation and net monthly family income. The fourth and final model added a psychological variable, perceived stress. Before entering the regression, the initially discrete variables marital status and current occupational status were converted into sets of dichotomous variables by dummy coding. 'Being married or cohabitating' was used as the reference group in the analysis in the case of marital status and 'employed' in the case of current occupational status. All other discrete variables were treated as continuous.

Second, mediation was assessed, by making a distinction between various effects and their corresponding weights. The total effect (weight c) of the independent variable (IV) on the dependent variable (DV) is composed of a direct effect (weight c) of the IV on the DV and an indirect effect (weight a*b) of the IV on the DV through a proposed mediator (M). Weight a represents the effects of the IV on the M, whereas weight b is the effect of the M on the DV, partialling out the effect of the IV. Depressive symptoms were used as the DV, perceived stress was used as the M and each of the demographic and socioeconomic factors was alternatively chosen as the IV, while the remaining variables were treated as covariates. All variables were coded in the same way as in the regression analyses. We used a nonparametric bootstrapping approach designed to assess the indirect effect. According to Preacher and Hayes (Hayes, 2009; Preacher & Hayes, 2008) and Shrout and Bolger (2002), this bootstrapping procedure is superior to the product of coefficients approach or the Sobel test and the commonly used Baron and Kenny (1986) causal steps approach in terms of statistical power while maintaining reasonable control over Type I error. In this procedure, many samples ($N = 5,000$) are drawn with replacement from the full data set. Based on the mean of the 5,000 estimates, a point estimate of the indirect effect and its 95% percentile-based confidence interval are calculated. Mediation is significant if the 95% bias corrected and accelerated confidence intervals for the indirect effect do not include zero. The proportion mediated to the total intervention effect (ab/c) was estimated, wherein the indirect effect (a*b) is divided by the total intervention effect (c).

Third, to establish whether an accumulation of risk factors might create an especially high risk for low-SES women for depressive symptoms, we determined a risk profile for each individual woman based on risk factors found from previous research. To this effect, demographic, socioeconomic and psychological variables were dichotomized in high versus low risk. High risk was defined as non-Dutch nationality; single, divorced or widowed; ≥2 children living at home; no education, primary school or lower vocational level; housewife, unemployed or disabled; net monthly family income ≤€1,100; neighbourhood deprivation score <10; PSS score ≥17 (median score). To assess the impact of exposure to multiple risk factors across the different domains, the number of risk factors for which a respondent scored affirmatively was calculated (possible range = 0–8). Since much smaller percentages of women endorsed six (8.1%), seven (0.2%) or eight (0.2%) risk factors, these categories were collapsed into one category (six or more risk factors).

This cumulative risk score was entered in a logistic regression model to determine the chance for the different groups to score above the 10-point cut-off for the CESD-SF 10. We then plotted the probability that women would score above the cut-point of the CESD-SF 10 based on their cumulative risk score. All analyses were performed using SPSS Statistics version 17.0.

Results

Characteristics of the sample are shown in Table 1. Compared to the total screened population ($n = 864$), the women included in our sample ($n = 519$) generally had more depressive symptoms ($t(892.95) = -9.39$, $p = .000$) and perceived stress ($t(961.31) = -7.32$ $p = .000$), were more often divorced ($\chi^2(1,408, 1) = 8.37$, $p = .004$), less in paid employment ($\chi^2(1,408, 1) = 148.71$, $p = .000$), had lower net family incomes ($t(1,164.25) = 10.50$, $p = .000$) and lived in more deprived neighbourhoods ($t(1,378) = 10.65$, $p = .000$). Their mean CESD-SF score was 10.33 (range = 0–30; $SD = 8.43$), and 227 women (43.7%) scored above the cut-off score of 10 points, indicating a high risk of clinical depression. Most women were of Dutch nationality and married or cohabiting, 81% of the sample had completed at least lower vocational education and just over 41% were currently employed. One-third of the women had a net monthly family income of €1,100 or less, and most women lived in moderately deprived neighbourhoods. Their mean perceived stress score was 17.19 (range = 0–40; $SD = 9.53$), with 296 (56.7%) of the women scoring above the cut-off of 14 points. Table 2 presents the correlation coefficients of the variables analysed in this study.

Four models were subsequently examined by multiple linear regression analysis. In the first model, demographic factors explained 2.2% of the variance ($F(6, 502) = 2.86$, p

< .01). Being single or divorced was a significant predictor for higher depressive symptom levels. In the next step, a community SES factor, that is, neighbourhood deprivation, was added. This increased the explained variance slightly to 3.4% ($F(7, 501) = 3.53$, $p < .001$). Being single or divorced, and living in a neighbourhood with more deprivation were significant predictors. Adding individual SES variables in the third model led to a significant increase ($F(12, 496) = 10.95$, $p < .001$) in explained variance (19%). Educational level, employment status and net monthly family income were significant factors to explain increased depressive symptom levels. When a psychological variable level was added, perceived stress significantly increased the explained variance to 71.8% ($F(13, 495) = 100.44$, $p < .001$). In this final model, the individual SES variables 'housewife' or 'disabled' remained significant, and along with 'perceived stress', explained increased levels of depressive symptoms (Table 3).

Mediation analyses based on 5,000 bootstrapped samples indicated that community-level SES or demographic factors showed no total or direct effects, or any indirect mediating effects of perceived stress (see Table 4). Perceived stress was found to have significantly mediated the associations between depressive symptoms and educational level (proportion mediated 74%), unemployment (proportion mediated 79%) and net monthly family income (proportion mediated 85%).

For the individual SES factors, perceived stress only partially mediated (proportion mediated 68%) the relation between disabled and depressive symptom scores. Being a housewife remained the only individual-level SES factor that was not mediated by perceived stress and had a unique direct association with depressive symptom levels.

The risk profile showed that low-SES women had on average 3.92 risk factors ($SD = 1.28$, range = 1–8). Compared to the total screened population ($M = 2.83$, $SD = 1.40$, range = 1–8), the number of risk factors was significantly higher ($t(910, 73) = -6.47$, $p = .000$). Figure 1 depicts the probability of scoring above cut-off for high risk of clinical depression in relation to the number of risk factors present. The respondents' probability to score above CESD-SF cut-off increases continuously for the women, starting at 12.5% for one risk factor and reaching 71% with six or more risk factors present.

Discussion

Low-SES women in general are often considered as a high-risk population for depressive symptoms. However, approximately 56% of our sample living in urban neighbourhoods scored below the cut-off score on a depression-screening instrument.

This indicates that not all disadvantaged women necessarily are at an equally high risk of depressive symptoms. Especially perceived stress is a factor associated with this

Table 1. Demographic and socioeconomic characteristics and perceived stress in a sample of low-SES women.

	% or means (SD), LSES (n = 519)	% or means (SD), general population (n = 864)	Probability difference
CESD-SF score	10.33 (8.43)	6.30 (6.53)	.000
CESD-SF < 10	56.3	72.1	
CESD-SF ≥ 10	43.7	27.9	
Age	43.89 (9.29)	40.22 (9.07)	.000
Nationality (% Dutch)	93.6	93.8	.798
Marital status			
Single	19.1	24.6	.004
Married/cohabitation	72.1	70.4	
Divorced	6.6	3.4	
Widowed	2.3	1.6	
Number of children living at home	.94 (1.03)	.98 (1.02)	.461
Educational level (%)			
No education	2.9	–	–
Primary school	16.4	–	
Lower vocational	51.8	–	
Lower secondary	28.8	–	
Employment status			
Employed	41.4	74.3	.000
Student	.0	4.3	
Housewife	28.5	8.8	
Unemployed	11.0	6.6	
Disabled	19.1	6.0	
Net family income per month			
€0–500	2.3	2.7	.000
€500–835	12.7	5.6	
€835–1100	17.7	8.6	
€1100–1665	39.3	28.0	
€1665–2500	19.3	24.5	
≥€2500	8.7	30.5	
Neighbourhood deprivation score	7.10 (4.50)	9.89 (4.80)	.000
PSS score	17.19 (9.53)	13.54 (8.10)	.000

SD: standard deviation; LSES: lower socioeconomic status; CESD-SF: Center for Epidemiological Studies Depression–Short Form; PSS: Perceived Stress Scale.

variation in risk as it not only contributes directly to increased level of depressive symptoms but it also mediates some of the individual-level SES factors that are associated with increased depressive symptoms. Probably one of the most important findings is that risk factors have a cumulative effect on the chance of depressive symptoms in this population. Together, these outcomes indicate that low-SES women can be considered a heterogeneous risk group, and it might help to explain why certain low-SES women experience fewer mental health problems than others.

This study supported existing evidence for a range of demographic, socioeconomic and a single psychological risk factor associated with self-reported symptoms of depression in this high-risk group. Our findings largely corroborate previously reported outcomes on the marginal association of demographic factors with depressive symptoms in low-SES populations (Fleischer, Fernald, &

Hubbard, 2007; Hamad, Fernald, Karlan, & Zinman, 2008; Heneghan, Silver, Bauman, Westbrook, & Stein, 1998). Contrary to some studies (e.g. Sperlich, Arnhold-Kerri, & Geyer, 2011), we did not find an association between number of children and maternal depressive symptoms. However, the impact of family size on increased depression risk has been inconsistent (Walters, McDonough, & Strohschein, 2002) and may depend on the children's age (Brown & Harris, 1978; Sperlich et al., 2011).

We did find a statistically significant association between community-level SES and depressive symptoms, but this effect disappeared when individual-level SES factors were taken into account. In the literature, the role of neighbourhood characteristics in depression remains inconsistent, with some studies finding no contribution of adverse neighbourhood circumstance to depression above and beyond the effects of SES individual factors (Henderson et al., 2005), while others do (Bassett &

Table 2. Pearson and Spearman correlations between CESD-SF scores and demographic and socioeconomic variables and perceived stress (n = 519).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. CESD-SF	—															
2. Age	.024	—														
3. Nationality	-.077	.146**	—													
4. Single	.111*	-.160	.006	—												
5. Married/cohabiting	-.183**	.081	.014	-.780**	—											
6. Divorced	.132**	.033	-.027	-.129**	-.425**	—										
7. Widowed	.039	.116**	-.012	-.075	-.247**	-.041	—									
8. No. of children living at home	-.048	-.306**	-.187**	-.137**	.136**	-.025	-.004	—								
9. Educational level	-.177**	-.035	.033	-.035	.118**	-.143**	-.066	.010	—							
10. Employed	-.348**	-.131**	.059	-.120**	.175**	-.065	-.103*	.004	.162**	—						
11. Housewife	-.004	.143**	-.098*	-.176**	.146**	-.064	.130*	.095*	-.108*	-.531**	—					
12. Unemployed	.137**	-.104**	.066	.190**	-.193**	.056	-.013	.020		-.295**	-.222**	—				
13. Disabled	.332**	.089*	-.014	.201**	-.233**	.109*	-.009	-.167**	-.096*	-.408**	-.307**	-.171**	—			
14. Net family income per month	-.293**	.039	.148**	-.481**	.576**	-.276**	.006	.106*	.174*	.362**	-.086*	-.183**	-.200**	—		
15. Neighbourhood deprivation score	-.147**	.054	.108*	-.127**	.180**	-.139**	.013	-.038	.298**	.222**	-.123**	-.006	-.137**	.255**	—	
16. PSS score	.841**	-.012	-.075*	.113**	-.192**	.117**	.044	-.069	-.163**	-.275**	-.079*	.168**	.302**	-.286**	-.146**	—

CESD-SF: Center for Epidemiological Studies Depression–Short Form; PSS: Perceived Stress Scale.
*p < .05, two-tailed; **p < .01, two-tailed.

Moore, 2013; Matheson et al., 2006). Our findings concerning the individual-level socioeconomic correlates of depressive symptoms confirmed outcomes of previous research among low-income adults (Araya et al., 2003; Hamad et al., 2008). Although most low-SES women in this sample have characteristics known to be associated with depressive symptoms, we found that especially those with the lowest education levels, no current employment and lower net monthly family incomes showed high depressive symptom scores.

Psychological risk factors such as perceived stress are generally the variables most strongly associated with depressive symptoms (Fleischer et al., 2007; Heneghan et al., 1998). While perceiving oneself as distressed may lead to a negative affective experience or reaction, this association depends on individual differences in stress appraisals as well as available resources and ability to manage stress (Gallo et al., 2013). Compared to women in the general population, low-SES women are generally exposed to higher levels of stress (e.g. Ennis et al., 2000), and at the same time, they have fewer material, social and personal resources at their disposal to cope with the damaging effects of sustained levels of stress (Aneshensel, 2009; Pearlin, 1999; Thoits, 2010). In the context of our sample, perceived stress contributed the most to the explained variance for depressive symptoms and also mediated the effects of some individual-level SES factors. Women with lower educational levels, who are unemployed or disabled or have lower monthly family income are more likely to experience feelings of stress, which in turn is associated with more depressive symptoms. Perceived stress may reflect the chronic stressful conditions in the lives of most disadvantaged women. The PSS and CESD-SF scales showed a strong mutual correlation. One interpretation might be that there is some overlap between the two respective constructs as being measured by both instruments, since perception of stress may be a symptom of depression. However, Cohen et al. (1983) have indicated that in spite of its high correlation with the CESD scale, the PSS is able to prospectively predict psychological symptoms when taking this common relation into account. This outcome has been supported by other studies (Lavoie & Douglas, 2012), indicating that high scores on the PSS place people at risk for future distress (Cohen & Williamson, 1988; Hewitt, Flett, & Mosher, 1992).

The individual-level SES factors of being a housewife and disabled working status remained significant in the final model. It might be that disabled status was not completely mediated by perceived stress as it can be seen as a proxy indicator for poor physical health or chronic conditions, both of which are strongly associated with depressive symptoms as well (Cassem, 1995). Being a housewife was the only individual-level SES factor

Table 3. Multivariate regression model: CESD-SF depressive symptoms (*n* = 519).

	Model 1: demographic factors	Model 2: community-level SES factors	Model 3: individual SES factors	Model 4: Psychological factors
	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)
Age	0.03 (−0.05 to 0.11)	0.03 (−0.05 to 0.11)	−0.01 (−0.09 to 0.06)	0.02 (−.003 to 0.06)
Nationality (Dutch = 0)	−2.06 (−5.09 to 0.98)	−1.66 (−4.69 to 1.38)	−0.70 (−3.54 to 2.14)	0.65 (−1.03 to 2.32)
Marital status				
Single	2.53 (0.61 to 4.44)*	2.14 (0.21 to 4.06)*	−1.77 (−3.91 to 0.38)	−0.31 (−1.58 to 0.95)
Divorced	4.38 (1.36 to 7.43)**	3.73 (0.66 to 6.79)*	−0.04 (−3.11 to 3.03)	−0.03 (−1.84 to 1.79)
Widowed	2.55 (−2.25 to 7.35)	2.52 (−2.25 to 7.29)	1.02 (−3.39 to 5.43)	−0.75 (−3.36 to 1.85)
No. of children living at home	−0.26 (−1.01 to 0.49)	−0.30 (−1.05 to 0.45)	−0.09 (−0.79 to 0.60)	0.16 (−0.26 to 0.57)
Neighbourhood deprivation score		−0.22 (−0.39 to −0.06)*	−0.04 (−0.19 to 0.12)	0.01 (−0.08 to 0.11)
Educational level			−1.14 (−2.08 to −0.19)*	−0.29 (−0.85 to 0.27)
Employment status				
Housewife			2.04 (0.29 to 3.79)*	1.77 (0.74 to 2.81)**
Unemployed			5.71 (3.36 to 8.06)**	1.21 (−0.21 to 2.63)
Disabled			7.81 (5.84 to 9.79)**	2.54 (1.33 to 3.76)**
Net family income per month			−1.18 (−1.92 to −0.43)**	−0.18 (−0.62 to 0.27)
PSS score				0.70 (0.66 to 0.75)**
Constant	10.39 (5.50 to 15.28)**	11.72 (6.77 to 16.67)**	17.53 (11.61 to 23.46)**	−2.82 (−6.55 to 0.91)
Adjusted R^2	.022	.034	.19	.72
F	2.86 (6, 502)**	3.53 (7, 501)***	10.95 (12, 496)***	100.44 (13, 495)***

CESD-SF: Center for Epidemiological Studies Depression–Short Form; SES: socioeconomic status; CI: confidence interval; PSS: Perceived Stress Scale.
*p < .05; **p < .01, ***p < .001.

Table 4. Summary of mediation analyses between demographic and socioeconomic variables, perceived stress and depressive symptoms (5,000 bootstraps).

IV	M	DV	Effect of IV on M	Effect of M on DV	Direct effect	Indirect effect		Total effect
			a (SE)	b (SE)	c' (SE)	a × b (SE)	95% CI	c (SE)
Age	PSS	CESD-SF	−0.04 (0.05)	0.70 (0.02)**	0.02 (0.02)	−0.03 (0.03)	−0.09 to 0.04	−0.01 (0.04)
Nationality			−1.79 (1.65)	0.70 (0.02)**	0.63 (0.85)	−1.26 (0.99)	−3.07 to 0.84	−0.63 (1.44)
Single			−2.02 (1.25)	0.70 (0.02)**	−0.31 (0.65)	−1.42 (0.89)	−3.22 to 0.28	−1.73 (1.09)
Divorced			−0.01 (1.79)	0.70 (0.02)**	−0.03 (0.92)	−0.00 (1.13)	−2.24 to 2.28	−0.03 (1.56)
Widowed			2.52 (2.58)	0.70 (0.02)**	−0.76 (1.33)	1.77 (1.86)	−2.17 to 5.34	1.01 (2.24)
No. of children living at home			−0.24 (0.44)	0.70 (0.02)**	0.18 (0.23)	−0.17 (0.29)	−0.74 to 0.42	0.01 (0.38)
Educational level			−1.21 (.55)*	0.70 (0.02)**	−0.29 (.28)	−0.85 (0.37)	−1.58 to −0.13	−1.14 (0.48)*
Neighbourhood deprivation score			−0.07 (.09)	0.70 (.02)**	0.01 (0.05)	−0.05 (0.06)	−0.17 to 0.08	−.04 (0.08)
Housewife			0.33 (1.02)	0.70 (0.02)**	1.78 (0.53)**	0.23 (0.74)	−1.16 to 1.71	2.01 (0.89)*
Unemployed			6.36 (1.37)**	0.70 (0.02)**	1.20 (0.72)	4.47 (1.01)	2.40 to 6.38	5.68 (1.19)**
Disabled			7.50 (1.15)**	0.70 (0.02)**	2.55 (0.62)**	5.28 (0.83)	3.69 to 6.89	7.83 (1.00)**
Net family income			−1.43 (.44)**	0.70 (0.02)**	−0.18 (0.23)	−1.00 (0.29)	−1.54 to −0.41	−1.18 (0.38)**

IV: independent variable; M: mediator; DV: dependent variable; SE: standard error; CI: confidence interval; PSS: Perceived Stress Scale; CESD-SF: Center for Epidemiological Studies Depression–Short Form.
*p < .05. **p < .01.

whose association with depressive symptom levels was not mediated by perceived stress. While several studies have shown that housewives generally experience more depressive symptoms (Fall, Goulet, & Vézina, 2013; Klose & Jacobi, 2004), the mechanisms which influence this association remain unclear. A possible pathway may

be that the relative social isolation of housewives leads to higher depression scores (Fleischer et al., 2007). In addition, it is possible that low-SES women with depressive symptoms do not seek or maintain employment (Kalil, Born, Kunz, & Caudill, 2001; Lennon, Blome, & English, 2002) and are thus classified as housewives.
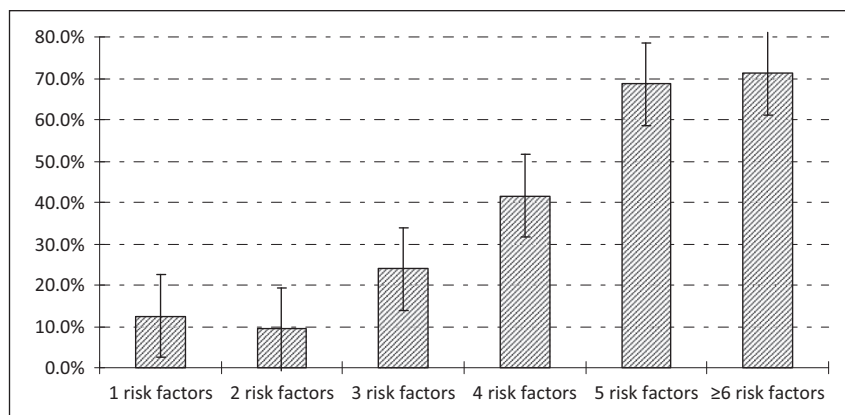
Figure 1. Predicted probability of CESD-SF scores ≥10 (% and CI) and its relation to the presence of risk factors in low-SES women. *n* = 519.

While most disadvantaged women have characteristics known to be associated with mental health problems, not all women necessarily have an identical risk. The findings that some low-SES women experienced fewer depressive symptoms than others might be explained by the cumulative influence of risk factors on depressive symptoms. Especially women with an accumulation of psychological and socioeconomic risk factors were most at risk for depressive symptoms. For instance, having a low educational level does not necessarily lead to depression, but if a woman is simultaneously unemployed and has to manage a low family income her risk for depressive symptoms increases.

The primary limitation of this study is its cross-sectional nature which limits the possibility to make causal inferences linking depressive symptoms to the presence of risk factors or to test the direction of the effects. Furthermore, we used years of formal education as a single estimate to determine the SES of our study population. It may have been possible that by using this measure we could have excluded those women with a high educational level, but who are unemployed or have low monthly incomes. Repeating our analyses with net monthly family income as proxy indicator of low SES (data not shown) showed outcomes consistent with presented findings, increasing the validity of our results. Another limitation is that depressive symptoms were self-reported with the CESD and not assessed with a diagnostic instrument. While the CESD-SF has good reliability and validity for measuring depressive symptoms, it is not able to make clinical diagnoses of depression. As a result, conclusions in this study are limited to depressive symptoms, but not major depressive disorder. However, the presence of symptoms of depression that fall below the clinical threshold is associated with previous and future severe depression, and subthreshold symptoms are associated with functional or psychosocial impairment (Cuijpers & Smit, 2004; Judd, Schettler, & Akiskal, 2002).

Also, while we did include a wide array of potential risk factors for depressive symptoms, some important additional risk factors that have not been examined are past history of depression, lack of social support or chronic health conditions (Aro, Nyberg, Absetz, Hendriksson, & Lönnqvist, 2001; Fleischer et al., 2007; Kessler, 2003). These factors could have acted as confounder in the relations examined in our mediation analyses and should be included in future research efforts. Furthermore, omitted variables could possibly have added to our understanding of some of the outcomes, such as the contribution of the assumed social isolation among housewives to the risk of depression. Finally, the risk profile found in this research cannot be automatically applied to other low-SES populations. For instance, ethnic minorities are relatively underrepresented in Maastricht and thus in our sample. The risk profile for a more ethnically diverse population could be different from the profile presented in this study. For example, while African Americans are often exposed to greater social disadvantages than Whites, they experience a lower burden of stress-related psychopathology (Mezuk et al., 2010). In contrast, they engage more in poor health behaviours as a stress-coping strategy, resulting in a higher prevalence of physical health problems (Jackson, Knight, & Rafferty, 2010).

Despite these constraints, we can conclude that this study contributes to a better awareness of factors related to depressive symptoms in disadvantaged women, generally considered a high-risk population. In this group, we have indicated risk factors that were the strongest predictors of self-reported depressive symptoms, making it possible to identify those low-SES women who are especially at risk.

These outcomes can guide future screening and prevention efforts. Previous studies (e.g. Baas et al., 2009) have shown that screening general high-risk groups in general practice populations leads to the detection of a limited number of persons with elevated complaints. Targeting low-SES women with an elevated number of sociodemographic risk

factors will probably increase screening success rates. Especially, screening for perceived stress may then be an efficient way to identify women in psychological need. Perceived stress contributes not only directly to increased level of depressive symptoms, but also mediates the association between several individual-level SES indicators and depressive symptoms. Moreover, perceived stress is a risk factor whose adverse effects on mental health can be ameliorated via psychological interventions. Depression prevention strategies for low-SES women may benefit from focusing on stress management or emotion regulation techniques. To our knowledge, only a few interventions (e.g. Hauenstein, 1996; Peden, Rayens, Hall, & Grant, 2005) designed specifically to focus on stress management for low-SES groups are currently available. At the same time, macro-level interventions and policies that target poverty, unemployment, school attendance or neighbourhood disadvantage still need our attention, since many of the important risk factors for depressive symptoms among disadvantaged women result from structural inequalities.

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