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Research paper

Psychosocial factors associated with symptoms of depression, anxiety and stress among single mothers with young children: A population-based study

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ABSTRACT

Background: Abundant evidence highlights single parenthood as a common risk factor for depression, anxiety and stress but few studies have comprehensively examined psychosocial factors (adversities), particularly during early parenting. We investigated symptom prevalence and potential risk factors among mothers with very young children.

Methods: Data stem from the 2015 National Psychosocial Burdens Prevalence Study (KiD 0–3). Mothers with children up to 3 years of age ($n = 6925$) were recruited from random probability-sampled paediatric clinics ($n = 271$) across Germany and reported on depression or anxiety, general and parenting stress using the Patient Health Questionnaire (PHQ-4), Perceived Stress Scale (PSS-4) and Parenting Stress Index (PSI). Multivariable logistic regression models determined risk factors and quantified potential mediation of psychosocial factors for all 3 outcomes.

Results: Approximately 30% of single mothers ($n = 517$) reported depressive or anxiety symptoms and 37% general stress, twice as high compared to partnered mothers ($n = 6408$; $p < 0.0001$). Parenting stress was also elevated ($p < 0.0001$). Adjusted regression models confirm that single mothers are twice as likely to report symptoms of depression or anxiety (OR 1.9, $CI_{95\%}$ 1.4–2.5). Risk factors for stress correspond to those for depression and anxiety. Inadequate social support and history of partner or childhood maltreatment were also consistent risk factors across all outcomes.

Limitations: The study design and self-reported symptoms are limitations to consider.

Conclusions: Single mothers with young children are more predisposed to mental health disorders than partnered mothers, especially when facing financial, social or distal adversities. Appropriate social support programs and screening measures are necessary to reduce further disparities.

1. Background

The trend of single parent households has increased substantially over the past few decades and is anticipated to rise (OECD, 2011). Approximately 20% of German families in 2013 with a dependent child were headed by a single parent compared to 14% in 1996, and over 90% of such households are fronted by mothers (Statistisches Bundesamt, 2013). Similar trends are also found in other neighbouring countries such as the United Kingdom and Scandinavia (Chzhen and Bradshaw, 2012). Poorer health outcomes among single parents compared to partnered parents have been demonstrated consistently in the literature, showing significantly increased risks for mental health disorders (Cairney et al., 2006; Targosz et al., 2003; Tobias et al., 2009) and even cardiovascular diseases and mortality (Grundy and Tomassini, 2010).

While many studies acknowledge marital status as a risk factor

Abbreviations: KiD 0–3, Children in Germany, National Psychosocial Burdens Study in Early Childhood; PAIRFAM, Panel Analysis of Intimate Relationships and Family Dynamics; EMKK, Investigation of Maternal Attitudes for Mothers of Infants and Toddlers; KINDEX, Konstanz Index; PHQ-4, Patient Health Questionnaire; PSS-4, Perceived Stress Scale; PSI, Parenting Stress Index

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alone for various health outcomes, some studies have focused predominantly on socio-demographic factors such as age, migrant background and number of dependent children to ascertain differences between partnered and single parents (Ballantyne et al., 2013; Berkman et al., 2015; Rodgers, 1991). Other studies have attributed social-structural factors to mental health disorders such as financial strain, welfare dependence, inadequate social support and care-giving strains as well as exposure to distal adversities such as childhood or partner maltreatment (Butterworth, 2004; Hope et al., 1999; Kim and Kim, 2012; Lancaster et al., 2010; Sperlich et al., 2011). Such factors as described in the latter seem to account for a greater proportion of depressive symptoms than mere socio-demographic factors (Crosier et al., 2007; Tobias et al., 2009). However, a common limitation among the literature is the lack of a comprehensive overview of all such factors including adversities on an epidemiological scale.

Previous works have suggested that caring for a minor-aged child as a single parent more often leads to depressive symptoms and poorer psychological well-being, but these conclusions mostly refer to post-partum stages or school-aged children or older (Beeghly et al., 2018; Dennis et al., 2018; Nomaguchi, 2012; Umberson et al., 2010). Another common hypothesis is that adults faced with stressful life events such as the challenge of parenthood are exposed to greater stresses, especially as a sole parent, which can then contribute to later onset of depression and anxiety (Flouri et al., 2018). Thus, when examining the pathway of risk factors for single parenthood and their association to mental health outcomes, one must also consider stress.

Sociological and psychological research in the last few decades have covered various theories describing single mothers' predisposition to stress eventuating in depression or anxiety. These include differential exposures (e.g. financial hardship), diathesis-stress models (e.g. vulnerability and coping capabilities) as well as self-selection into single parenthood (Avison et al., 2007; Lazarus, 1993; McLanahan, 1985). General stress is itself a risk factor for depression and, unsurprisingly, the risk factors appear to correspond closely to those for depression and anxiety (Turner et al., 1995). Parenting stress, a special form of stress associated with the experience of parenthood, is also known to be associated with single parenthood and low socio-economic status (Spinelli et al., 2013). Evidence of such social risk factors for various types of stresses is scarce, particularly for single parents. The need to identify potential factors predisposing these various stresses is especially important since accumulation may not only catalyse depression and anxiety (Pearlin et al., 1981), but also potentially lead to poorer parenting or social and health disadvantages later on in the child's life (Fergusson et al., 2007; Mikkonen et al., 2016; Stith et al., 2009; Weitoft et al., 2003).

Therefore it is of interest to investigate whether onset of depression and anxiety symptoms occur in the early stages of parenting and identify which psychosocial risk factors are relevant for onset of depression and/or anxiety. Of the few studies that have comprehensively investigated single parenthood and risk of depression and anxiety using a wide umbrella of psychosocial risk factors, few have delved into the early stages of parenting (Leigh and Milgrom, 2008; Mistry et al., 2007; Sperlich et al., 2011).

We hypothesise that certain psychosocial factors (social-structural and other adversities) can explain to a greater extent the predisposition to mental health disorders, perceived general stress as well as parental stress among single mothers than socio-demographics alone. We also suggest that a comprehensive examination of potential factors related to depression and anxiety and various stress types in the early stage of parenting is particularly important.

The first aim of this study is to determine whether prevalence for depression and/or anxiety, general stress and parenting stress is indeed higher among single mothers than among partnered mothers. Second, this study investigates to what extent the observed higher prevalence can be explained by the aforementioned psychosocial factors and whether these variables work equally well for all 3 outcomes. Third, this study investigates selected aspects of the relationship between single motherhood and the aforementioned variables; namely whether some are likely mediators of the apparent association between single motherhood and outcomes, and whether some predictors act as likely moderators upon the effect of single motherhood.

2. Methods

2.1. Data collection and study sample

Our analyses are based on the data from the 2015 German National Psychosocial Burdens Prevalence Study in Early Childhood, *Children in Germany* (KiD 0–3). This large cross-sectional study covers various dimensions of psychosocial risks among families with young children including family structure, child behaviour and indicators of parental mental health. It is regarded as the first nationally representative study for family psychosocial burdens, particularly for capturing at-risk subgroups and providing epidemiological data on adversity experiences. Target study participants comprised of parents (as primary caregivers) aged at least 15 years with at least one child aged up to approximately 3 years undergoing early detection screening examinations (U1–U7). These examinations are offered to all children in Germany and have a participation rate of above 90% for children under 3 years of age (Robert Koch-Institut and Bundeszentrale für gesundheitliche Aufklärung, 2008). For the recruitment of practices where these examinations take place, a random probability sample of registered paediatricians in Germany was drawn from a national physician registry (n = 271, 15% response rate at practice level, target size was 250–300), stratified by state, community size, and practice type. Participating paediatricians then each recruited up to 35 parents between April and September 2015 (sequence of all eligible examinations) and were remunerated for their efforts. Questionnaires were issued at the practice where recruitment took place and eligible parents completed and returned the forms within the same visit. A total of 8063 parents participated (73% response rate). Of the 8063 respondents aged between 15 and 61 years in the study, all fathers (n = 548), unclear cases (of parental gender or relationship to child, n = 42) and missing response to the question on relationship to child (n = 548) were excluded from the analyses leaving 6925 participants identifying as single or partnered mothers (mean age = 31.6, SD = 5.1). The proportion of single mothers with children under the age of 3 was identified as 7.5% (n = 517) compared to 92.5% of partnered mothers (n = 6408). The Medical Association of North Rhine granted ethical approval of the pilot study and the main study was publicly supported by the Federal Association of Paediatricians and the Federal Ministry of Family Affairs, Senior Citizens, Women and Youth (BMFSFJ).

2.2. Outcomes

2.2.1. Depression and anxiety

Indication of any depressive or anxiety symptoms including postnatal depression experienced in the previous two weeks was assessed using the validated 4-item screening tool *Patient Health Questionnaire* (PHQ-4), Cronbach's α = 0.82 (Kroenke et al., 2009). The 4-point Likert scale produces a maximum score of 12, with higher scores implying a greater degree of having the condition; normal (0–2), mild (3–5), moderate (6–8), and severe (9–12). The use of the cut-off point $\geq$6 for depression or anxiety has also been widely applied, however, a recent study demonstrated the cut-off value $\geq$4 performed better in sensitivity and specificity than $\geq$6 in a healthy German sub-population (Kerper et al., 2014). As we wanted to be able to screen for any possible mild or moderate signs of depression or anxiety, the less conservative cut-off point of $\geq$4 indicating mild depression and anxiety was used in our analyses. The effects using the cut-off point of $\geq$6 were examined in a sensitivity analysis.

2.2.2. General stress

General stress was assessed adopting the condensed 4-item *Perceived Stress Scale* (PSS-4) (Cohen et al., 1983). The PSS-4 is a validated and internally reliable tool (Cronbach's $\alpha = 0.72$) for capturing perceived general life stress experienced within the previous month and includes elements of self-confidence as well as coping. Using the 6-point Likert scale (maximum score of 20), an established method for determining a cut-off value (1 standard deviation (SD) above the sample mean) was applied. Using this method, a score ≥10 is suggestive of high perceived general stress.

2.2.3. Parenting stress

A shortened version of the German-translated *Parenting Stress Index* (PSI) (Abidin, 2012) measured parenting stress. Similar to the responses for the original validated 4-item sub-domains, this study employed a 5-point Likert scale. However, due to feasibility purposes and to avoid measure overlap, only 4 of 7 parenting sub-domains covering competence, social isolation, attachment to the child and role restriction were utilised. Since the condensed version has not been previously assessed, reliability and validity were assessed, showing good correlation and internal reliability (Cronbach's $\alpha = 0.85$) as well as only one underlying factor from the newly combined sub-domains, parenting stress. The maximum possible score of 80 was dichotomised according to the cut-off value 1 SD above the sample mean (≥47) in order to differentiate high and low parenting stress.

2.3. Social factors

2.3.1. Predictor variable

For our predictor variable on partner status, single motherhood was defined as mothers not cohabiting with any partner, as well as not receiving childcare assistance from the biological partner. A positive response to any question involving partnerships or shared childcare was classified as partnered parenthood.

2.3.2. Socio-demographics

In the German context, the youngest adult age group is often classified up to 25 years of age as family members still undergoing training or education are eligible for financial support until this age. We therefore dichotomised maternal age into young mothers (< 25 years) and older. Child age was dichotomised into newborn (< 12 months) and toddler (≥12 months). Education levels were defined as 'high', 'medium' and 'low' by ISCED-2011 standards respective to tertiary qualifications (university degree, technical master), upper secondary education (high school certificate, professional vocational training) and lower secondary education (basic education, no vocational training). Employment status was defined by several response options: 'employed', 'maternity allowance' 'maternity leave' as well as 'not in the workforce' and 'unemployed' . These were dichotomised to 'employed' and 'not employed' for regression analyses. Equivalised net monthly household income was categorised as low (< 1000 Euros) and sufficient (≥1000 Euros) based on 60% of the median household income threshold in 2012. The presence of other minor dependents aged 3–18 years old and migrant background (foreign nationality or at least 1 parent of respondent born outside of Germany) were also dichotomised. Urbanisation was defined by areas with either < 100,000 inhabitants or ≥100,000 inhabitants according to the paediatric practice location.

2.3.3. Psychosocial factors (social structural and other adversities)

Welfare receipt was the proxy indicator for financial hardship and dichotomised as yes/no. Perceived social support, a more substantial measure of social support and support networks was measured by two items from the *Panel Analysis of Intimate Relationships and Family Dynamics* (PAIRFAM) (Thönnissen et al., 2014). These items assess the perceived availability of social support covering childcare assistance and advice. Each item employs a 4-point Likert scale (Cronbach's $\alpha = 0.68$). A score of ≥4 of 6 was defined as lack of perceived social support.

Three items based on the original *Investigation of Maternal Attitudes for Mothers of Infants and Toddlers* (EMKK) index were used to report childhood adversity encompassing experiences of neglect and punishment (Codreanu and Engfer, 1984). As the shortened EMKK version has only been applied as a 5-point scale in previous studies (Thönnissen et al., 2014), we adapted this screener into a 4-point scale in order to maintain consistency and assessed its psychometric properties. The adapted version showed good internal reliability (Cronbach's $\alpha = 0.79$) and one uniform underlying factor, childhood adversity. The adapted version gave a maximum score of 9 and was dichotomised by cut-off point of ≥5 for history of childhood maltreatment. History of any physical domestic violence experienced by the respondent was captured by a single yes/no item extracted from the *Konstanz Index* (KINDEX) (Schauer and Ruf-Leuschner, 2010). Unplanned pregnancy was also obtained as a yes/no measure.

2.4. Statistical analysis

Bivariate analyses assessing outcome differences between partnered and single mothers, our predictor variable, were carried out using the χ^2-test. Prior to regression, multicollinearity and correlation of independent predictors were assessed and consequently excluded from analyses when variables were highly correlated (Cramér's $V > 0.30$). Multiple logistic regressions were conducted with available case analyses to determine single mothers' mental health and associated risk factors. Modelling was conducted in hierarchical steps, adding groups of variables to each model, commencing with the predictor variable in an unadjusted univariate model (model 1). Model 2 included socio-demographic factors while models 3–6 assessed the impact of the individual psychosocial (social-structural and adversity) factors. The psychosocial factors were considered as potential mediating variables, although in at least one case and not in a strictly theoretical sense as the variable refers to historical events before the individual's single motherhood. A final model adjusting for all described factors was conducted (model 7) and presented together with models 1-6 for comparison. Urbanisation and planned pregnancy were excluded from regression after consistent insignificances and collinearity. Since welfare receipt and income were highly correlated, welfare receipt was used as a proxy indicator of financial hardship instead of income and was thus not used in the regression analyses. In order to examine possible moderating variables, interactions between single mothers and several relevant factors (socio-demographic variables including lower education level, non-employment, migrant background and also the psychosocial variables welfare receipt, lack of perceived social support, childhood maltreatment and physical domestic violence) were tested as sensitivity analyses and only displayed when significant (Wald test). Clustering effects within paediatric practices were accounted for using the cluster sandwich estimator of variance, adjusting the standard errors of coefficients. All statistical analyses were conducted using Stata SE version 13 (Statacorp, Texas, USA).

3. Results

3.1. Study sample and characteristics

A higher proportion of single mothers were observed to be younger and not employed while a smaller proportion were highly educated compared to partnered counterparts (Table 1). Newborns (≤12 months) appeared as the predominant child age group, particularly among partnered mothers (63.0% vs. 52.1%, $p < 0.001$). As for social-structural factors, approximately 70% of single mothers with young children declared receipt of welfare benefits and 84.6% earned a net equivalised income of < 1000 Euros per month, compared to 13% and 31% of partnered mothers respectively ($p < 0.001$). Social support was

Table 1
Descriptive comparison of partnered and single mothers in the KiD 0–3 study*.

Characteristics	*N*	Single n (%)	Partnered n (%)	*p*-value[a]
Maternal age (yr)	6731			0.000
15–24		128 (25.6)	438 (7.0)	
25–34		278 (55.6)	3918 (62.9)	
≥35		94 (18.8)	1875 (30.1)	
Child age (months)[b]	6260			0.000
0–12		232 (52.1)	3662 (63.0)	
13–24		93 (20.9)	1113 (19.1)	
25–36		120 (27.0)	1040 (17.9)	
Child gender	6881			0.181
Male		270 (52.7)	3163 (49.7)	
Female		242 (47.3)	3206 (50.3)	
Urbanisation (Inhabitants)	6925			0.096
Rural (< 100,000)		327 (63.3)	4283 (66.8)	
Urban (≥100,000)		190 (36.8)	2125 (33.2)	
Migrant background	6728			0.079
No		380 (76.5)	4538 (72.8)	
Yes		117 (23.5)	1693 (23.5)	
Employment status	6448			0.000
Employed		113 (24.3)	1387 (23.2)	
Maternity allowance		83 (17.9)	1139 (19.0)	
Maternity leave		141 (30.3)	2845 (47.6)	
Not in workforce		56 (12.0)	454 (7.6)	
Unemployed		72 (15.5)	158 (2.6)	
Education level (ISCED 2011)	6701			0.000
High		87 (17.7)	2498 (40.2)	
Medium		242 (49.2)	3088 (49.7)	
Low		163 (33.1)	623 (10.0)	
Household net income equivalised (€ per month)	6190			0.000
Low (< 1000)		363 (84.6)	1757 (30.5)	
Sufficient (≥ 1000)		66 (15.4)	4005 (69.5)	
Other dependent minors (3–18 yr)	6925			0.001
No		224 (43.3)	3137 (49.0)	
Yes		293 (56.7)	3271 (51.1)	
Psychosocial factors (social-structural and other adversities)				
Welfare receipt	6375			0.000
No		143 (29.7)	5142 (87.3)	
Yes		339 (70.3)	751 (12.7)	
Perceived social support	6711			0.001
Sufficient		383 (76.1)	5091 (82.0)	
Lacking		120 (23.9)	1117 (18.0)	
Childhood history of maltreatment	6704			0.000
No		379 (76.6)	5702 (91.8)	
Yes		116 (23.4)	507 (8.2)	
Unplanned pregnancy	6885			0.000
No		207 (40.5)	5340 (83.8)	
Yes		304 (59.5)	1034 (16.2)	
History of any physical domestic violence	6742			0.000
No		336 (66.9)	5818 (93.2)	
Yes		166 (33.1)	422 (6.8)	

*All analyses presented combine child age groups and do not have weights applied, while potential effects of sample composition are either accounted for in the statistical analyses or were ruled out in descriptive analyses.
[a] χ^2 test.
[b] Due to the time sequence of screening examinations, infants appear over-represented in the KiD 0-3 sample.

perceived as lacking in almost a quarter of single parents, but also among a fifth of partnered mothers ($p < 0.001$). Reporting of childhood maltreatment experiences, previous physical domestic violence and unplanned pregnancies was approximately 3 times higher among single mothers. No significant differences were found between mothers residing in communities of denser or sparser populations or those with migrant backgrounds. Prevalence of mild depression or anxiety as well as general life stress was more than twice as high for single mothers compared to partnered mothers ($p < 0.001$, Fig. 1). A greater proportion of single mothers also indicated high parenting stress (26.4 vs. 16.3% $p < 0.001$).

3.2. Depression and anxiety

Significant risk factors for depressive or anxiety symptoms were single motherhood, young maternal age, migrant background, toddler-aged child, welfare receipt, lack of social support, experience of childhood maltreatment and physical domestic violence. Single mothers were consistently at higher risk; approx. 2.68 times ($CI_{95\%}$ 2.17–3.29) more likely than partnered mothers when unadjusted (Table 2). As socio-demographic and further potentially mediating variables were added to the models, the likelihood of single mothers at an early parenting stage to report depressive or anxiety symptoms was reduced to the odds ratio 1.63 but remained significant ($CI_{95\%}$ 1.25–2.11). In particular, welfare receipt, reported history of childhood maltreatment and lacking social support in increasing order demonstrated stable significance in the predictor variable (models 3, 5 and 4 respectively).

3.3. Life stress

Similarly, the significant risk factors for general stress appear to correspond to observations for depression and anxiety. Single mothers

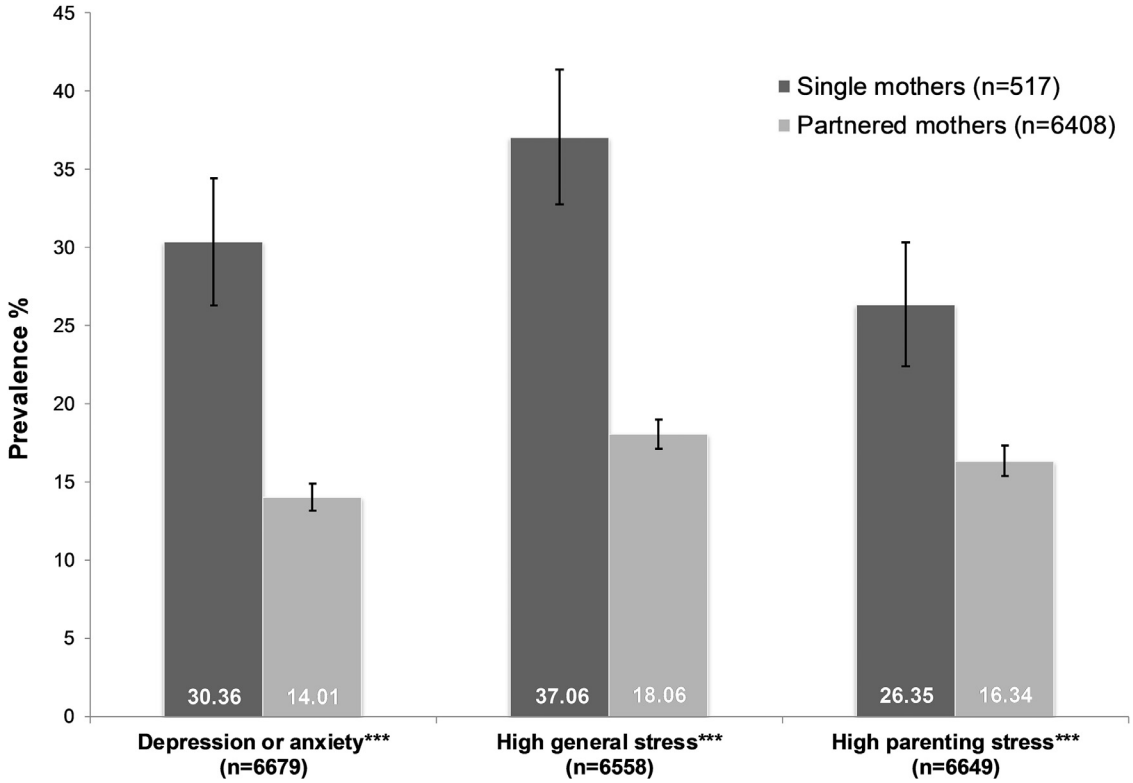

Fig. 1. Prevalence of symptoms for depression and/or anxiety, general stress and parenting stress among single and partnered mothers[a].
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ (χ^2-test)
[a] Microsoft Excel was used to create this figure
Depression or anxiety—PHQ-4 score ≥4 of 12
General stress—PSS-4 score ≥10 of 20
Parenting stress—PSI score ≥47 of 80.

perceived high life stress 2.67 times ($CI_{95\%}$ 2.20–3.25) greater than partnered counterparts when not considering confounding effects (Table 3). The effect of partner status also remained significant when adjusting for all relevant mediating variables (OR 1.79, $CI_{95\%}$ 1.40–2.28). Among socio-demographic characteristics, medium-level vs. high level of education appeared considerably significant for life stress. Mothers who perceived lack of social support or were previously exposed to childhood maltreatment were more likely to report high stress, exacerbating the effect among single mothers more than socio-demographics and welfare receipt respectively (OR 2.22, $CI_{95\%}$ 1.79–2.77; OR 2.03, $CI_{95\%}$ 1.62–2.55). Past physical domestic violence also explained these effects greater than welfare receipt, but not more than socio-demographics. These factors also appear to be the strongest risks for general life stress in mothers when accounting for all factors (model 7).

3.4. Parenting stress

Single motherhood remained associated with high parenting stress in the unadjusted model (OR 1.83, $CI_{95\%}$ 1.38–2.41), as well as after adjusting for all factors (Table 4). Socio-demographic factors including migrant background and not being employed significantly predicted high parenting stress while those with an additional minor-aged dependent exhibited significantly decreased rates of high parenting stress. Additionally, low to medium vs. high education levels significantly reduced the odds of parenting stress, contrary to observations for general life stress. Respectively, lack of perceived social support, welfare receipt, history of childhood maltreatment, and domestic violence mediated elevated odds in single mothers but not more than socio-demographic factors. After controlling for all factors, single motherhood was no longer significant.

Across all outcomes, lack of perceived social support and exposure to some form of distal adversity were consistently strong risk factors in explaining indicators of mental health disorders. Apart from parent status and migrant background, young parental age and toddler-aged children appeared to be the only socio-demographic factors negatively indicating depression or anxiety and general stress.

Further analysis highlighted the value of the included psychosocial factors as (partial) mediators for the effect of single motherhood on all 3 outcomes (approx. 50% of effects mediated in the presence of socio-demographic controls). For illustrative purposes additional models highlighting the effects of the predictor variable on the suggested mediators are provided in the online supplement.

3.5. Sensitivity analyses

Further analyses using the PHQ-4 at a higher cut-off value (≥6) revealed no significant changes (see supplementary material). Investigation of interaction terms also showed no further moderation of single mothers' circumstances, except for migrant background. Partnered mothers of non-migrant background (German) were less likely to report depression and anxiety, general life stress and parental stress than single mothers of non-migrant background (Table 5). This effect was not present, however, in mothers with a migration background. We also carried out alternative statistical modelling with the PHQ-4 variable split into its depression and anxiety sub-scales (PHQ-2 and GAD-2 respectively) and the original 3 final models with continuous outcomes. Details of all sensitivity analyses are presented in the online supplement.

Table 2
Hierarchical logistic regression models of socio-demographic and psychosocial factors for symptoms of depression and/or anxiety (PHQ-4) among German mothers[a].

	(1) OR ($CI_{95\%}$)	(2) OR ($CI_{95\%}$)	(3) OR ($CI_{95\%}$)	(4) OR ($CI_{95\%}$)	(5) OR ($CI_{95\%}$)	(6) OR ($CI_{95\%}$)	(7) OR ($CI_{95\%}$)
Single mother	2.675***	2.266***	1.958***	2.218***	2.080***	1.795***	1.625***
	(2.173–3.291)	(1.808–2.840)	(1.550–2.473)	(1.765–2.788)	(1.649–2.622)	(1.404–2.295)	(1.252–2.109)
Young parent < 25 *yr*		1.339*	1.311*	1.472**	1.308*	1.347*	1.445**
		(1.038–1.728)	(1.016–1.692)	(1.125–1.925)	(1.015–1.685)	(1.039–1.747)	(1.102–1.894)
Migrant background		1.345***	1.340***	1.224*	1.338***	1.332***	1.229*
		(1.141–1.587)	(1.132–1.587)	(1.033–1.451)	(1.134–1.580)	(1.126–1.575)	(1.030–1.467)
Other dependent minors aged 3–18 *yr*		1.021	1.032	0.988	1.009	1.016	0.973
		(0.880–1.185)	(0.886–1.202)	(0.848–1.150)	(0.868–1.173)	(0.873–1.184)	(0.830–1.140)
Toddler		1.456***	1.470***	1.360***	1.447***	1.452***	1.386***
		(1.254–1.692)	(1.262–1.711)	(1.167–1.586)	(1.241–1.686)	(1.246–1.692)	(1.180–1.627)
Not employed		1.418**	1.337**	1.312*	1.387**	1.387**	1.226
		(1.146–1.755)	(1.080–1.655)	(1.055–1.632)	(1.122–1.715)	(1.119–1.721)	(0.983–1.530)
Medium vs. high education		1.070	1.021	1.050	1.021	1.037	0.956
		(0.910–1.259)	(0.859–1.214)	(0.890–1.238)	(0.867–1.202)	(0.879–1.223)	(0.799–1.143)
Low vs. high education		1.141	1.022	1.026	0.986	0.969	0.792
		(0.875–1.489)	(0.762–1.369)	(0.781–1.348)	(0.755–1.288)	(0.740–1.270)	(0.584–1.075)
Welfare receipt			1.429**				1.257*
			(1.152–1.772)				(1.003–1.576)
Lack of perceived social support				2.520***			2.393***
				(2.118–2.999)			(1.992–2.874)
Childhood history of maltreatment					2.329***		1.702***
					(1.884–2.880)		(1.342–2.158)
History of any physical domestic violence						2.483***	2.035***
						(2.018–3.054)	(1.629–2.543)
Observations	6679	6222	5974	6112	6194	6149	5833
Pseudo R^2	0.014	0.027	0.031	0.048	0.039	0.039	0.067

* $p < 0.05$,
** $p < 0.01$,
*** $p < 0.001$.
[a] Reference groups: partnered mother, older parent (≥25 years), no migrant background, no other minor-aged dependent, newborn (< 12 months), employed, high education, no welfare receipt, sufficient perceived social support, no history of childhood maltreatment and no history of domestic violence.

Table 3
Hierarchical logistic regression models of socio-demographic and psychosocial factors for life stress (PSS-4) among German mothers[a].

	(1) OR ($CI_{95\%}$)	(2) OR ($CI_{95\%}$)	(3) OR ($CI_{95\%}$)	(4) OR ($CI_{95\%}$)	(5) OR ($CI_{95\%}$)	(6) OR ($CI_{95\%}$)	(7) OR ($CI_{95\%}$)
Single mother	2.672***	2.175***	1.895***	2.224***	2.029***	1.986***	1.789***
	(2.195–3.252)	(1.744–2.713)	(1.499–2.396)	(1.786–2.770)	(1.616–2.547)	(1.580–2.498)	(1.402–2.283)
Young parent < 25 *yr*		1.456**	1.357**	1.604***	1.391**	1.460**	1.456**
		(1.162–1.823)	(1.077–1.709)	(1.271–2.025)	(1.102–1.755)	(1.159–1.840)	(1.140–1.860)
Migrant background		1.398***	1.419***	1.296***	1.386***	1.408***	1.330***
		(1.213–1.612)	(1.226–1.642)	(1.116–1.506)	(1.204–1.594)	(1.218–1.626)	(1.143–1.547)
Other dependent minors aged 3–18 *yr*		1.097	1.103	1.033	1.078	1.074	1.024
		(0.957–1.257)	(0.960–1.268)	(0.895–1.192)	(0.940–1.236)	(0.934–1.235)	(0.884–1.185)
Toddler		1.237**	1.250**	1.168*	1.230**	1.242**	1.177*
		(1.085–1.411)	(1.092–1.430)	(1.021–1.335)	(1.075–1.406)	(1.087–1.418)	(1.022–1.355)
Not employed		1.341**	1.268*	1.242*	1.318**	1.336**	1.173
		(1.092–1.646)	(1.022–1.573)	(1.005–1.534)	(1.075–1.615)	(1.088–1.642)	(0.940–1.465)
Medium vs. high education		1.526***	1.445***	1.524***	1.457***	1.514***	1.388***
		(1.325–1.758)	(1.249–1.672)	(1.316–1.764)	(1.264–1.681)	(1.312–1.746)	(1.191–1.616)
Low vs. high education		1.934***	1.592***	1.738***	1.704***	1.768***	1.311
		(1.519–2.463)	(1.220–2.078)	(1.362–2.217)	(1.326–2.189)	(1.382–2.262)	(0.996–1.726)
Welfare receipt			1.488***				1.384**
			(1.230–1.799)				(1.125–1.704)
Lack of perceived social support				2.682***			2.447***
				(2.261–3.183)			(2.049–2.921)
Childhood history of maltreatment					2.145***		1.712***
					(1.747–2.634)		(1.365–2.147)
History of any physical domestic violence						1.608***	1.308*
						(1.314–1.969)	(1.050–1.630)
Observations	6558	6121	5883	6017	6093	6053	5749
Pseudo R^2	0.014	0.038	0.041	0.063	0.047	0.041	0.071

* $p < 0.05$,
** $p < 0.01$,
*** $p < 0.001$.
[a] Reference groups: partnered mothers, older parent (≥25 years), no migrant background, no other minor-aged dependent, newborn (< 12 months), employed, high education, no welfare receipt, sufficient perceived social support, no history of childhood maltreatment and no history of domestic violence.

Table 4
Hierarchical logistic regression models for socio-demographic and psychosocial factors for parenting stress (PSI) among German mothers[a].

	(1) OR ($CI_{95\%}$)	(2) OR ($CI_{95\%}$)	(3) OR ($CI_{95\%}$)	(4) OR ($CI_{95\%}$)	(5) OR ($CI_{95\%}$)	(6) OR ($CI_{95\%}$)	(7) OR ($CI_{95\%}$)
Single mother	1.832*** (1.458–2.301)	1.733*** (1.337–2.247)	1.584** (1.195–2.099)	1.721*** (1.327–2.232)	1.528** (1.173–1.989)	1.482** (1.131–1.942)	1.333 (0.990–1.795)
Young parent < 25 *yr*		1.142 (0.855–1.525)	1.088 (0.810–1.461)	1.212 (0.899–1.633)	1.107 (0.827–1.483)	1.127 (0.843–1.508)	1.143 (0.843–1.550)
Migrant background		1.281*** (1.106–1.484)	1.286** (1.107–1.495)	1.187* (1.026–1.374)	1.270** (1.093–1.476)	1.275** (1.101–1.477)	1.193* (1.024–1.389)
Other dependent minors aged 3–18 *yr*		0.790*** (0.689–0.906)	0.786*** (0.685–0.902)	0.756*** (0.658–0.869)	0.773*** (0.675–0.886)	0.784*** (0.684–0.899)	0.731*** (0.635–0.841)
Toddler		1.136 (0.988–1.305)	1.124 (0.974–1.297)	1.072 (0.931–1.233)	1.128 (0.981–1.297)	1.143 (0.995–1.314)	1.068 (0.923–1.236)
Not employed		1.515*** (1.226–1.872)	1.472*** (1.181–1.835)	1.436*** (1.166–1.769)	1.477*** (1.194–1.827)	1.453*** (1.174–1.799)	1.365** (1.092–1.705)
Medium vs. high education		0.810** (0.702–0.935)	0.797** (0.689–0.923)	0.792** (0.685–0.915)	0.767*** (0.662–0.889)	0.787** (0.681–0.909)	0.743*** (0.638–0.865)
Low vs. high education		0.808 (0.624–1.046)	0.737* (0.556–0.976)	0.742* (0.574–0.960)	0.705** (0.543–0.914)	0.736* (0.567–0.956)	0.609*** (0.458–0.808)
Welfare receipt			1.275* (1.014–1.605)				1.105 (0.859–1.421)
Lack of perceived social support				2.191*** (1.852–2.592)			2.042*** (1.709–2.439)
Childhood history of maltreatment					2.316*** (1.899–2.823)		1.765*** (1.404–2.219)
History of any physical domestic violence						1.919*** (1.535–2.399)	1.690*** (1.322–2.160)
Observations	6449	6000	5763	5957	5940	5987	5655
Pseudo R^2	0.005	0.013	0.014	0.028	0.023	0.019	0.039

* $p < 0.05$,
** $p < 0.01$,
*** $p < 0.001$.
[a] Reference groups: partnered mothers, older parent (≥25 years), no migrant background, no other minor-aged dependent, newborn (< 12 months), employed, high education, no welfare receipt, sufficient perceived social support, no history of childhood maltreatment and no history of domestic violence.

4. Discussion

In this study, an alarming majority of those living under great adversity were single mothers with young children. This particular parent sub-group reported over twice the rate of depressive and anxiety symptoms than when parenting duties were shared, corresponding to trends found in other countries (Cairney et al., 2006; Kong et al., 2017; Targosz et al., 2003; Tobias et al., 2009). Our findings also compare well to findings from Germany, despite those being largely based on single mothers in a highly urbanised region, assessing only socio-demographic factors or family structure, or having no comparison group (Franz et al., 2003; Sperlich and Geyer, 2015; von der Lippe et al., 2013). Additionally, in similar studies examining mothers with young children, poorer mental health was more elevated among single mothers than for partnered mothers, although the study from Mistry et al. did not adjust for adversities (Mistry et al., 2007; Sperlich et al., 2011). Nevertheless, these conclusions support our findings that single mothers with young children or in early parenting stages show elevated rates of symptoms of depression or anxiety.

Single mother status was also significantly associated with general life stresses and parenting stress despite accounting for a range of known adversity determinants, also observed in other large epidemiological studies (Cooper et al., 2009; Muhammad and Gagnon, 2010). The significant risk factors for general stress correspond closely to those for depression and anxiety, while lower education levels and having other minor dependents buffered parenting stress. The transition period from partnership to singlehood has been suggested to add to these stresses, particularly in the first year of parenthood (Wade and Pevalin, 2004). Additionally, separation from the previous partner may lead to not only loss in financial and caregiving resources but also social and emotional resources that may keep general and parenting stresses, and ultimately poorer mental health status at bay (McLanahan and Sandefur, 1994).

A unique aspect of this study was the investigation of social-structural and exposure to adversities associated with not only symptoms of depression and anxiety but also general stress and parenting stress. Lack of social support impacts not only single mothers with young children but also partnered mothers, albeit exacerbated in the former group. The most consistent and significant factor for indicators of depression, anxiety, general stress and parenting stress among single mothers was lack of perceived social support, as observed in other epidemiological studies (Bull and Mittelmark, 2009; Cairney et al., 2003; Hope et al., 1999). On the other hand, in a recent study, social support did not appear to explain why diagnosed depression rates were higher among single mothers in Germany (Rattay et al., 2017). As no specific analyses based on child age were conducted, this theory may hold true for single mothers with school-aged or older children, and highlights in our study that social support is a particularly important factor for mediating mental health during early childhood years. Moreover, although we were unable to determine so, social support is bidirectional and often seen as a mediating effect, on the one hand playing a key role in mitigating depression and stress when inadequate and on the other hand acting as a protective factor against adversity (Brown et al., 1986). The necessity to screen for lack thereof is critical, as adequate social support for parents at an early parenting stage has not only the potential of improving parent-child well-being but also preventing parental psychopathology (Pfeiffer et al., 2011).

Childhood maltreatment and history of partner abuse were also consistently significant risk factors mediating elevated depressive and anxiety symptoms, reflecting existing observations (Lutenbacher, 2002). Systematic reviews and meta-analyses additionally found estimates up to 3 times the rate for depression and anxiety among single mothers, particularly if they experienced domestic violence before or during pregnancy (Howard et al., 2013; Lancaster et al., 2010). This raises the point that some single mothers in our study were never married or separated due to this exposure.

Table 5
Effects of controlling for all socio-demographic and mediating variables on depression and/or anxiety, general and parenting stress among German mothers including significant interaction term.

	Depression/ Anxiety[b]		General Life Stress[c]		Parenting Stress[d]	
	OR	$CI_{95\%}$	OR	$CI_{95\%}$	OR	$CI_{95\%}$
Unadjusted model						
Single mother	2.675***	(2.173–3.291)	2.672***	(2.195–3.252)	1.832***	(1.458–2.301)
Observations	6679		6558		6449	
Adjusted model[a]						
Single mother	1.878***	(1.430–2.466)	2.129***	(1.621–2.797)	1.537**	(1.112–2.123)
Socio-demographic controls		–				
Migrant background	1.307**	(1.094–1.562)	1.427***	(1.219–1.671)	1.258**	(1.075–1.472)
Interaction term: Single mother x migrant	0.539*	(0.305–0.953)	0.466**	(0.270–0.804)	0.516*	(0.278–0.959)
Young mother	1.432**	(1.090–1.883)	1.440**	(1.125–1.843)	1.134	(0.835–1.539)
Other dependent minors 3–18 years	0.974	(0.831–1.141)	1.024	(0.885–1.185)	0.731***	(0.635–0.841)
Toddler	1.383***	(1.177–1.624)	1.174*	(1.020–1.351)	1.065	(0.920–1.233)
Not employed	1.231	(0.988–1.533)	1.176	(0.942–1.469)	1.369**	(1.096–1.711)
Medium vs. high education	0.948	(0.793–1.135)	1.376***	(1.181–1.603)	0.738***	(0.634–0.859)
Low vs. high education	0.786	(0.579–1.066)	1.300	(0.988–1.709)	0.602***	(0.454–0.800)
Psychosocial factors (social-structural and other adversities)						
Welfare receipt	1.259*	(1.005–1.577)	1.388**	(1.130–1.706)	1.106	(0.861–1.420)
Lack of perceived social support	2.380***	(1.982–2.858)	2.437***	(2.041–2.911)	2.033***	(1.702–2.429)
Childhood history of maltreatment	1.701***	(1.342–2.157)	1.713***	(1.366–2.149)	1.767***	(1.406–2.220)
History of any physical domestic violence	2.074***	(1.657–2.594)	1.337**	(1.072–1.667)	1.718***	(1.342–2.198)
Observations	5833		5749		5655	

* $p < 0.05$,
** $p < 0.01$,
*** $p < 0.001$ (χ^2-test).
[a] Reference groups: partnered mothers, no migrant background, older parent (≥25 years), no other minor-aged dependent, newborn (< 12 months), employed, high education, no welfare receipt, sufficient perceived social support, no history of childhood maltreatment and no history of domestic violence.
[b] PHQ-4; cut-off ≥4 of 12.
[c] PSS-4; cut-off ≥10 of 20.
[d] PSI; cut-off ≥47 of 80.

However, we are unable to confirm this. For general and parenting stress as outcomes, childhood maltreatment showed greater mediating potential than physical domestic violence. Available research on this observation points to the additive exposure of stressors to existing distal adversities (in childhood) which likely mediate depressive symptoms (Davies et al., 1997).

Despite the wealth of evidence supporting the strong association found between welfare recipients and depression, welfare was not among the strongest mediating factors for poorer mental health, except in the case of parenting stress. Although still significant for depression and anxiety as well as general stress, our results correspond to some observations (Rattay et al., 2017) but contrast other findings (Bull and Mittelmark, 2009), which however did not adjust for maltreatment as a factor. This observed effect may be due to several social programs available in Germany targeting single parents of young children, such as taxation advantages (Thevenon, 2011). Another theory involves the subjective perception of financial hardship, which may act as a buffer particularly among single mothers who may consider welfare support sufficient (Köngeter, 2011). Overall, simply being exposed to a greater number of burdens appears to be one underlying reason for predisposition (Avison et al., 2007; Cohen and Wills, 1985), but we were able to demonstrate that financial hardship via welfare receipt is not a dominant force for depression, anxiety and stress among single mothers with young children. As for parenting stress, it is viable that stresses relating to total responsibility of childcare among single mothers leads to parenting stress.

In this study we also were able to determine potential socio-demographic risk factors for all outcomes. We controlled for socio-demographics such as employment status, which was insignificant in predicting depression and/or anxiety as well as general stress, similar to results from a longitudinal study by Baker and North (1999). They argue that less than full-time employment for single mothers is unlikely to improve stress, as the fundamental obstacle to employment and financial stability is inadequate childcare. Another explanation of this may be due to modern arrangements, where mothers are generally less affected by stresses of unemployment due to alimony payments from the father or financial help from other family members. Parenting stress however was significantly and positively associated with non-employment, perhaps better underscoring the lack of childcare support constraining the labour market participation of some mothers. No significant effects were found between low education and depression and anxiety or general stress but mothers with medium-level education had a significant risk for general stress. It is possible that mothers who have a medium education level are more prone to stress, as they are both unable to find higher grossing salaries and remain ineligible for welfare support. As for parenting stress, both lower and medium educational background showed protective effects, aligning with one study where elevated stresses among higher educated mothers were largely due to the perceived pressures of obtaining a fulfilling career (Nomaguchi and Brown, 2011).

Interestingly, the odds of parenting stress were reduced with the presence of more than one dependent child (3–18 years), contrary to existing observations in Sweden (Östberg and Hagekull, 2000). Perhaps this is a result of learned parenting experiences with older dependents compared to new parents or more informal childcare arrangements and financial help involving grandparent and friend networks in this group (Parkes et al., 2015). Sharing childcare duties may alleviate parenting stresses and thus symptoms of anxiety or depression. However, single mothers may not always be defined as we have in this study: completely independently caring for their child. As we wanted to observe the

impact of childcare and caregiving stresses among completely independent single mothers, we classified any childcare help as a form of partnered parenthood. In the interest of observing mental health among a more heterogeneous range of single mothers with various family and social situations, more information quantifying shared caregiving would be necessary.

Furthermore, the association between migration background and higher depression and anxiety was observed as a significant risk factor across all outcomes. We observed partner status as a significant factor among German-background mothers rather than among mothers of migrant background, contrary to previous findings (Sieberer et al., 2011). This may be due to cultural and structural tendencies among migrant background families such as 3-generation household constellations that may alleviate some of the stresses observed (Landale et al., 2011) and prompts for further research into this subgroup.

5. Limitations

There are limitations to this study. First, the observational study design does not allow a causal relationship between single parenthood and mental health outcomes to be established. Second, this study did not collect information on previous diagnoses of depression and anxiety among participants, which would aid in differentiating history of depression prior to or during early parenthood particularly for parenting stress. The utilisation of mental health screening tools, although validated, were of limited diagnostic ability given the self-completion nature of the study and application of clinical interview as the gold standard. The number of single mothers with a child aged under 3 years may be victim to selection bias. This may be largely attributable to the fact that the sample was determined by the sequence of the screening examinations (closer together in a child's first year of life), which led to recruitment of more parents of newborn infants (< 12 months) than older children. We also acknowledge that not all single mothers can be represented in this study, as parenthood and providing for a family ranges with various situations and constellations.

Despite these limitations, this study gathered population-based sensitive information from a substantial proportion of at-risk groups by means of validated approaches. Our findings offer an up-to-date and nationally representative analysis of single mothers particularly with young children. Additionally, this study takes into account major psychosocial factors found in the literature and comprehensively assesses the significance among single and partnered mothers.

6. Conclusions

Overall, despite growing awareness of mental health issues, single mothers with young children are at greater disadvantage during early parenthood compared to partnered mothers, which add to greater risks of poorer mental health. Our findings imply that the relevant risks for mental health disorders and stresses are exacerbated by lack of perceived social support, history of any maltreatment and exposure to financial hardship, which are either exacerbated by the greater demands of caring for a young child or pre-exist before parenthood. With the additional care requirements for young children, the risk of mental health disorder in vulnerable populations continues to be overlooked. Although support initiatives such as the National Initiative on Prevention and Early Intervention exist (Nationales Zentrum Frühe Hilfen (NZFH), 2016), it is apparent that particular groups continue to lack the support needed to reduce disparities in mental health outcomes. This should be addressed by more rigorous efforts to screen for or promote awareness among at-risk parents, particularly when healthcare and childcare services are more frequently utilised. Finally, single fathers should also be considered in future research, given transformations in care-giving roles and gender norms.

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Conflict of interests

The authors declare that they have no conflict of interests.

Contributors

L.A.L. conceptualised the research paper, conducted literature review, conducted data analyses, interpreted the data and compiled the manuscript.

U.B. contributed to the data analyses planning, supervised the data analyses and interpretation of findings, provided feedback on the manuscript and provided additional literature.

C.B. was part of the team that designed and conducted the KiD 0-3 study, supervised the data analyses and interpretation of findings, contributed to the manuscript and provided feedback.

All authors read and approved the final manuscript.

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Ethics approval and consent

The KID 0-3 pilot study, testing whether recruitment of parents for survey research during routine infant screening appointments was feasible, was reviewed favourably by the Ärztekammer Nordrhein ethics board (ref 2013247). Additional ethical approval for the national KiD 0-3 study was not deemed necessary as it was designed as a survey research project which followed national ADM (Arbeitskreis Deutscher Markt- und Sozialforschungsinstitute e.V.) guidelines and no concerns were raised by its principal supporters, the Federal Association of Paediatricians or the Federal Ministry of Family Affairs, Senior Citizens, Women and Youth (BMFSFJ). All participants were given written and oral information regarding the study and consented by participating in the anonymous self-completion survey (sealed envelope). Names and addresses were recorded separately for those who consented in written form to being contacted for further research (additional sealed envelope). In accordance with German law and national guidelines (ADM, BVM, D.G.O.F. 2006), minors aged 14–17 were deemed capable of consenting to survey research. Minors under the age of 14 were excluded from recruitment.

Availability of data and materials

The data that support the findings of this study are available from the German Youth Institute (DJI, e.V.) with permission from the National Centre for Early Prevention (NZFH) but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of the NZFH and the DJI.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jad.2018.08.013.

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