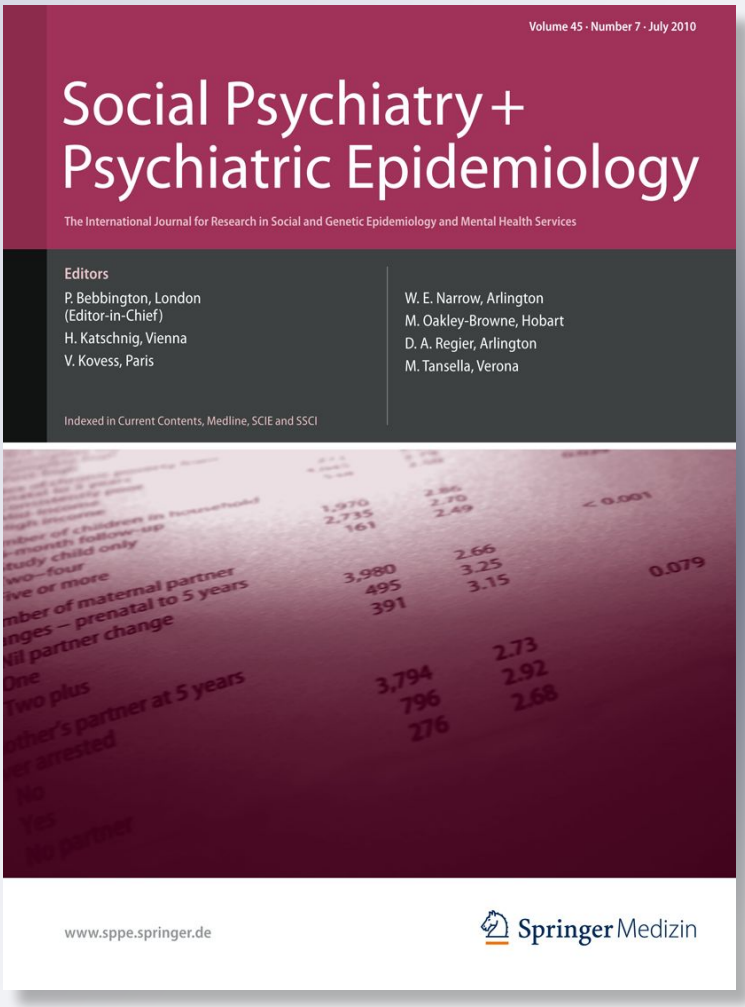
State-level women's status and psychiatric disorders among US women

Katie A. McLaughlin, Ziming Xuan, S. V. Subramanian & Karestan C. Koenen

Social Psychiatry and Psychiatric Epidemiology
The International Journal for Research in Social and Genetic Epidemiology and Mental Health Services

ISSN 0933-7954
Volume 46
Number 11

Soc Psychiatry Psychiatr Epidemiol
(2011) 46:1161-1171
DOI 10.1007/s00127-010-0286-z



Springer

Soc Psychiatry Psychiatr Epidemiol (2011) 46:1161–1171
DOI 10.1007/s00127-010-0286-z

ORIGINAL PAPER

State-level women's status and psychiatric disorders among US women

Katie A. McLaughlin · Ziming Xuan · S. V. Subramanian · Karestan C. Koenen

Received: 4 March 2010 / Accepted: 2 September 2010 / Published online: 19 September 2010

Abstract
Purpose Although greater gender equality at the state-level is associated with fewer depressive symptoms in women after controlling for individual-level confounders, the extent to which state-level women's status is related to psychiatric disorders in women and gender differences in psychopathology has never been examined. We examined these associations in the current report.
Methods We used data from the National Epidemiologic Survey on Alcohol and Related Conditions ($n = 34{,}653$), a national probability sample of US adults. Respondents completed structured diagnostic assessments of DSM-IV psychiatric disorders. We used generalized estimating equations to examine associations between four state-level indicators of women's status (political participation, employment/earnings, social/economic autonomy, and reproductive rights) and odds of 12-month mood and anxiety disorders among women. We also tested whether women's status predicted the magnitude of gender differences in psychiatric disorders.
Results State-level political participation, employment/earnings, and social/economic autonomy were unrelated to odds of 12-month mood and anxiety disorders among women. However, the prevalence of major depression and post-traumatic stress disorder was lower in states where women have greater reproductive rights (OR 0.93–0.95), controlling for individual-level risk factors. None of the women's status indicators predicted gender differences in mood and anxiety disorder prevalence.
Conclusions State-level women's status was largely unrelated to mood and anxiety disorders in women or to gender differences in these disorders. Investigation of social factors that play a role in shaping the distribution of individual-level risk factors that are associated with gender disparities in psychiatric disorders represents an important avenue for future research.

Keywords Women's status · Gender inequalities · Psychiatric disorders · Anxiety · Depression

K. A. McLaughlin (✉) · Z. Xuan · S. V. Subramanian · K. C. Koenen
Department of Society, Human Development, and Health, Harvard School of Public Health, 677 Huntington Avenue, Boston, MA 02115, USA
e-mail: Katie_McLaughlin@hms.harvard.edu

Introduction

The prevalence of mood and anxiety disorders is approximately twice as high among women as compared with men in the United States population [1–9]. This marked gender disparity in risk for mood and anxiety disorders begins in early adolescence [10, 11] and is evident throughout the remainder of the life course [7]. A wide range of individual-level factors have been posited to underlie these gender differences, ranging from sex differences in biological factors, including sex hormone changes during puberty [12, 13], to psychological factors including self-efficacy, stress reactivity, emotion regulation, and coping styles [12, 14, 15], to psychosocial and environmental factors such as exposure to interpersonal violence, child abuse, poverty, and other chronic stressors [12–15]. However, none of these individual-level factors fully explain the extant gender disparities [14, 16]. Macro-social factors are thought to play a role [17]; however, empirical tests of whether such factors explain gender differences in risk are sorely lacking. This paper is the first to examine state-level women's status as a determinant of gender disparities in mood and anxiety disorder in the United States.

States exert a great deal of control over the construction of public policy relevant to women's status. Substantial variability exists at the state-level in factors such as women's labor force participation, earnings relative to men, political participation and representation, and reproductive rights [18]. Initial evidence for the importance of women's status in shaping the distribution of women's health and well-being came from a study of inter-marital violence that documented higher rates of partner violence directed at women by their husbands in states with lower levels of gender equality [19]. Since this initial study, state-level women's status has been linked to a variety of health indicators including both global and cause-specific mortality rates and functional disability among both women and men, low birth weight, teen pregnancy, and infant and teen mortality [20, 21]. Recent evidence also suggests that lower women's status at the state level is associated with higher levels of depressive symptoms among women [22]. However, to our knowledge, state-level women's status has yet to be examined as a determinant of the prevalence of psychiatric disorders among women or of gender differences in disorder prevalence.

The current investigation addresses these two gaps in the literature. We first examined the associations between four indicators of state-level women's status and the prevalence of mood and anxiety disorders among women in a US. national probability sample. We expected the prevalence of these disorders to be lower in states with higher women's status. Second, we examined associations between state-level women's status and the magnitude of gender differences in the prevalence of mood and anxiety disorders. We hypothesized that gender differences would be less pronounced in states with higher women's status.

Methods

Sample

Data come from the 2004–2005 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), a population-based sample of psychiatric disorders in civilian non-institutionalized US adults aged 18 years and older [23, 24]. Wave 1 of the NESARC was carried out in 2001–2002 and included structured diagnostic interviews with 43,093 respondents with an overall response rate of 81.0%. Young adults, Blacks, and Hispanics were over-sampled. A second wave of interviews was conducted between 2004 and 2005 with 34,653 of the original NESARC respondents, for a conditional (on Wave 1 participation) response rate of 86.7%. A total of 20,089 women residing in all 50 states participated in the Wave 2 NESARC. The number of women per state ranged from 40 in Alaska to 2206 in California. Further information on the design and implementation of the NESARC is found elsewhere [24, 25]. Respondents provided written informed consent. The research protocol received full ethical review and approval from the US Census Bureau and the US Office of Management and Budget.

Measures

Psychiatric disorders

DSM-IV [26] mood (major depression and dysthymia) and anxiety disorders [generalized anxiety disorder (GAD), panic disorder with or without agoraphobia, social phobia, and post-traumatic stress disorder (PTSD)] were assessed with the Alcohol Use Disorder and Associated Disabilities Interview Schedule-DSM-IV Version (AUDADIS-IV) [27]. Substance-induced mood and anxiety disorders, those due to somatic illnesses, or (in the case of major depression) bereavement were ruled out as per DSM-IV definition. Diagnoses met the DSM-IV criterion requiring distress or social/occupational impairment. AUDADIS-IV mood and anxiety diagnoses have been found to be reliable and valid in a number of general population and clinical reappraisal studies [28–30]. The current analysis focuses on mood and anxiety disorders that were present in the 12 months prior to the Wave 2 interview.

Women's status

Indicators of women's status in four domains (reproductive rights, political participation, employment and earnings, and social and economic autonomy) were created by The Institute for Women's Policy Research (IWPR) to examine state-level variation in women's progress in achieving rights and opportunities and to identify barriers to gender equality [31]. These indicators have been used previously in epidemiologic research [20–22]. Indicators were selected based on relevance to women's lives and reliability and comparability of data across states. State-level data regarding women's status along a number of dimensions (described in more detail below) are used to give each state a score on the four indicators, and these composite scores are updated on a semi-annual basis. For all indicators, higher composite scores reflect higher levels of women's status. We use women's status indicators from 2002, the most recent year preceding the assessment of psychiatric disorders in which data are available for all states.

The *political participation* composite index reflects women's power and participation in state-level politics and includes four components: women's voter registration, voter turnout, representation in elected office, and the existence of institutional resources for women. The proportion of women holding political office at four levels was calculated and weighted based on prestige: (1) state representatives (weight = 1.0), (2) state senators (weight = 1.25), (3)

executive officials and US representatives (weight = 1.5), and (4) US senators and governors (weight = 1.75). Institutional resources include a state commission and/or a legislative caucus for women. The four components were standardized by subtracting the mean national value from the state value and dividing by the national standard deviation. Standardized scores were summed to create the composite index. The components were given a weight of 1.0, with the exception of representation of women in elected office, which was given a weight of 4.0.

The *employment and earnings* composite index reflects women's status related to occupation and income and includes four components: women's median annual earnings, ratio of women's to men's earnings, women's labor force participation, and women's representation in managerial and professional occupations. Each component was standardized as previously described, and standardized scores were summed to create the composite. Scores for each component were weighted equally.

The *social and economic autonomy* composite index includes four components: proportion of women with health insurance, women's educational attainment (proportion with a college degree), women's business ownership, and proportion of women living above the federal poverty level. After standardizing each score as previously described, the scores were summed to create the composite. Proportion of women living above poverty was weighted 4.0, and the remaining components were weighted 1.0.

The final composite index reflects *reproductive rights* and includes nine components involving the presence of various legal and policy protections of women's reproductive health. These include mandatory abortion consent/notification laws, mandatory abortion waiting period, coverage of infertility treatments, and legality of same sex couple adoption. After standardizing these components, they received a weight of 0.5 in the composite index. The composite also includes public funding for abortion, proportion of women living in counties with at least one abortion provider, contraceptive coverage laws, mandatory sexual education, and presence of a pro-choice legislature or governor. For each of these components, states were given a score of 0 for having a law that restricts reproductive rights and a score of 1 if they had no such law. In some cases, a score between 0 and 1 was given (e.g., states that required partial coverage of contraception received a score of 0.5, whereas states with full coverage received a score of 1). Detailed information regarding the four women's status indicators and their components is available elsewhere [18, 20].

Covariates

We included the following controls in multivariate analyses: age, race-ethnicity (White, Black, Native American, Asian and Pacific Islander, and Hispanic), marital status (never married, married or cohabitating, divorced/separated), educational attainment (less than high school diploma, high school graduate, some college, and college graduate), household annual income (<$10,000, $10,000–$29,999, $30,000–$49,999, $50,000–$64,999, $70,000–$99,999, and ≥$100,000), and occupation in all models. Age was entered as series of dummy variables representing young (ages 20–34), middle-aged (ages 35–49), and older adults (ages 60–89). Occupation was coded into three categories: professional (executive, administrative, managerial, and professional specialty), technical/support/clerical (technical and related support, sales, administrative support, clerical, private household, protective services, and other services), and unskilled/manual (operators, fabricators, laborers, transportation and material moving, handlers, equipment cleaners, and military).

Statistical analysis

To estimate the associations between state-level women's status and 12-month mood and anxiety disorders among women, we used logistic regression, applying generalized estimating equations (GEE). This analysis strategy accounts for both the complex sample design of the NESARC and for correlations among individuals living in the same state [32].[1]

[1] We conducted a multi-level analysis in order to replicate the results of our GEE analysis regarding the association between state-level women's status and mood and anxiety disorders among women. We estimated three-level models with individuals (level 1) nested within primary sampling units (level 2), nested within states (level 3). Because we were unable to scale the weights in order to apply them to each level of the multi-level model, we estimated un-weighted models. In situations where scaling the weights is not possible, an un-weighted analysis is preferable to using the raw weights without scaling [47]. We first estimated a series of "empty" models with no covariates. These models revealed significant variation in the prevalence of mood and anxiety disorders across states. We then estimated a series of models including the same individual- and state-level covariates as the GEE analysis. The parameter estimates and confidence intervals from the multi-level models were consistent with the results of our GEE analysis. In only one case did the results of the multi-level analysis differ from the corresponding GEE analysis. The association between state-level reproductive rights and female mood disorders was not significant in the multi-level model, in contrast to the GEE model where the association was statistically significant. Caution is therefore warranted in interpreting this association.

We reported the GEE approach in the text because of several complexities associated with estimating multi-level models in complex survey data. Most notably, difficulties arise in determining how to utilize survey weights, which must be applied to adjust for unequal selection probabilities of units within each level of the model. Failure to account for differential selection probabilities generates biased variance and parameter estimates [48, 49]. To account for these biases, numerous investigators have explored options for including weights in multi-level models. These approaches involve scaling the weights and applying the weights separately at each level of the model [47, 49]. We were unable to use this approach in the NESARC, because sufficient information is not provided in the publicly available data to allow the weights to be disaggregated and applied to each level of the model.

In the women sample, we first examined bivariate associations between women's status indicators and 12-month mood and anxiety disorders, followed by the associations adjusted for (1) socio-demographics (age, race/ethnicity, marital status) and (2) both socio-demographics and socio-economic factors (educational attainment, household income, occupation). To determine whether state-level women's status was associated with the magnitude of gender differences in the prevalence of 12-month mood and anxiety disorders, we utilized the full sample and created interaction terms between women's status and gender. The main effect of women's status, gender, and their interaction were added to the model including socio-demographic and socio-economic factors to evaluate the presence of effect modification of gender by women's status. The Wald Chi-square test statistic for the interaction term was used to evaluate the presence of statistically significant effect modification.

GEE parameter estimates and standard errors were exponentiated to generate odds ratios (ORs) and 95% confidence intervals (CIs). NESARC weights were applied to account for selection and response probabilities and to adjust the sample to be representative of the US population. Analyses were completed with SUDAAN software version 9.1 [33], which uses the Taylor series linearization method to calculate standard errors adjusted for the complex sample design. Statistical significance was tested using two-sided alpha level of 0.05.

Results

Descriptive statistics and distribution of covariates by women's status

The distribution of socio-demographic factors in the NESARC according to state-level women's status is presented in Table 1. We find no notable differences in the distribution of age, race/ethnicity, marital status, educational attainment, household income, and occupational prestige among women in states with high versus low women's status. Consistent with prior research, [1–4, 8] the prevalence of major depression and anxiety disorders was higher among respondents who were younger, unmarried, White, had lower household incomes, and technical or manual occupations (Table 2).

Women's status and 12-month mood and anxiety disorders

In bivariate models, women's state-level political participation was associated with only one of the mood and anxiety disorder outcomes, and this association was not in the expected direction (Table 3). Greater state-level political participation was associated with elevated odds of 12-month dysthymia (OR 1.05), and this association remained statistically significant after adjustment for socio-demographic and socio-economic factors.

Women's employment and earnings at the state level was not associated with 12-month prevalence of any of the mood and anxiety disorder outcomes in bivariate models or in the adjusted multivariate models (Table 4).

Associations between women's state-level social and economic autonomy and 12-month mood and anxiety disorders were not significant in bivariate or adjusted multivariate models (Table 5).

State-level reproductive rights were significantly associated with several mood and anxiety disorder outcomes in bivariate models (Table 6). The odds of having 12-month major depression (OR 0.94) and PTSD (OR 0.92) was lower among women living in states with greater reproductive rights. Greater reproductive rights at the state level also were associated with reduced odds of having any mood disorder (OR 0.93) and any anxiety disorder (OR 0.95) among women. The associations between women's reproductive rights and major depression, PTSD, and any mood disorder remained significant after adjustment for socio-demographic and socio-economic factors.

Women's status and gender differences in mood and anxiety disorders

To determine whether gender differences in the prevalence of 12-month mood and anxiety disorders were greater in states with lower women's status, we examined interactions between gender and each of the four women's status indicators. In contrast to the previous analyses, these models included the total sample of men and women. Of 32 possible interactions of this sort, none were significantly associated with odds of past-year mood or anxiety disorders, indicating no effect modification of gender on 12-month mood and anxiety disorders by state-level women's status (detailed results not shown but available on request).

Discussion

Our results indicated state-level women's status was largely unrelated to the distribution of mood and anxiety disorders among women and to gender disparities in these disorders. The single exception was our finding that women living in states with greater reproductive rights had a lower 12-month prevalence of major depression and PTSD. This finding is consistent with prior work on depressive symptoms [22]. Also consistent with this work, we found no negative association between women's political

Table 1 Distribution of socio-demographic factors by four indicators of state-level women's status among females ($n = 20{,}089$) in the National Epidemiologic Survey of Alcohol and Related Conditions (NESARC)

	Reproductive rights[a]		Political participation[a]		Employment and earnings[a]		Social and economic autonomy[a]	
	Low[b] (%)	High (%)	Low (%)	High (%)	Low (%)	High (%)	Low (%)	High (%)
Age								
20–34	24.2	22.6	24.3	22.9	23.1	23.4	23.3	23.1
35–49	30.9	31.6	31.7	31.0	31.4	31.3	31.3	31.4
50–64	23.3	23.5	23.2	23.7	23.6	23.2	23.5	23.3
65–89	21.6	22.4	20.8	22.4	22.0	22.1	21.9	22.2
Race/ethnicity								
Black	21.0	21.0	21.0	20.8	22.8	19.4	22.6	19.5
Native	2.1	1.4	2.0	1.5	1.7	1.6	1.8	1.6
Asian and Pacific Islander	1.8	3.3	2.3	3.2	1.8	3.5	2.1	3.2
Hispanic	15.4	20.1	18.1	17.2	15.7	20.4	17.3	19.0
White	59.7	54.2	56.6	57.3	58.0	55.0	56.2	56.7
Marital status								
Never married	51.3	49.6	51.2	49.9	49.9	50.7	49.9	50.7
Widowed, divorced, or separated	16.1	18.6	17.1	18.2	17.5	17.7	17.7	17.5
Married or living with someone	32.6	31.8	31.7	31.9	32.6	31.7	32.4	31.9
Education								
Less than high school diploma	17.1	16.7	17.3	16.9	17.2	16.5	17.6	16.2
High school graduate	29.4	29.2	29.3	29.1	29.4	29.2	29.5	29.2
Some college	31.1	30.7	31.2	30.3	30.9	30.8	30.7	31.0
College graduate and above	22.3	23.4	22.2	23.7	22.5	23.4	22.2	23.6
Household income								
<$10,000	11.1	10.6	10.5	10.9	11.3	10.4	11.4	10.3
$10,000–$29,999	33.2	31.4	33.0	31.1	32.5	31.8	32.4	31.9
$30,000–$49,999	22.1	20.7	21.2	21.3	21.7	21.0	21.7	20.9
$50,000–$64,999	14.1	14.3	14.2	14.3	14.2	14.2	14.3	14.2
$70,000–$99,999	10.7	11.5	11.3	11.4	10.9	11.4	10.8	11.6
≥$100,000	8.7	11.5	9.7	11.0	9.5	11.2	9.4	11.2
Occupation								
Technical/support/clerical	44.4	43.1	44.5	42.4	44.3	43.0	43.9	43.4
Unskilled/Manual	8.7	8.0	8.8	8.4	8.1	8.5	8.0	8.6
Occupation missing	18.3	19.8	18.0	19.8	18.9	19.4	19.4	19.1
Professional	28.5	29.1	28.7	29.4	28.7	29.0	28.8	29.0

[a] State-level indicators of women's status across four dimensions (reproductive rights, political participation, employment and earnings, and social and economic autonomy) were drawn from the Institute for Women's Policy Research. See "Methods" for details

[b] Low and high status were defined using a median split

participation and the prevalence of mood and anxiety disorders. In contrast, however, we also found no association between state-level employment and earnings or social and economic autonomy and the prevalence of mood and anxiety disorders among women. Moreover, we found no evidence to suggest that gender differences in the prevalence of mood and anxiety disorders are related to state-level variation in women's status. However, we found strong associations between individual-level factors including age, educational attainment, income, and occupational prestige and the prevalence of mood and anxiety disorders among women, which is consistent with previous epidemiologic research [1–3, 8, 9].

The significant association between state-level reproductive rights and lower mood and anxiety disorder prevalence among women after accounting for individual-level characteristics merits further investigation. These data suggest mood and anxiety disorder prevalence is lower in states that have enacted policies that provide funding or mandate insurance coverage for contraception and reduce

Table 2 Associations (odds ratios) between socio-demographic factors and 12-month mood and anxiety disorders among females ($n = 20,089$) in the National Epidemiologic Survey of Alcohol and Related Conditions (NESARC)

	Major depression		Dysthymia		GAD		Social phobia		PTSD		Panic disorder		Any mood disorder		Any anxiety disorder	
Age																
20–34	2.8*	(2.3–3.3)	2.2*	(1.4–3.5)	1.8*	(1.3–2.4)	3.9*	(2.5–5.8)	2.0*	(1.7–2.5)	4.3*	(3.0–6.3)	2.7*	(2.2–3.2)	2.3*	(1.9–2.7)
35–49	2.4*	(2.0–2.9)	2.3*	(1.5–3.7)	2.2*	(1.7–2.8)	3.6*	(2.4–5.4)	2.4*	(1.9–2.9)	4.5*	(2.9–5.9)	2.4*	(2.0–2.8)	2.5*	(2.1–2.9)
50–64	2.2*	(1.8–2.7)	2.2*	(1.5–3.4)	2.0*	(1.5–2.7)	2.5*	(1.7–3.8)	1.9*	(1.5–2.3)	2.7*	(1.9–4.0)	2.2*	(1.8–2.7)	1.9*	(1.6–2.3)
65–89	1.0	–	1.0	–	1.0	–	1.0	–	1.0	–	1.0	–	1.0	–	1.0	–
χ^2_3 (p value)	177.0*	(<0.001)	36.5*	(<0.001)	79.3*	(<0.001)	77.6*	(<0.001)	128.5*	(<0.001)	112.3*	(<0.001)	179.8*	(<0.001)	236.9*	(<0.001)
Race/ethnicity																
Black	0.9	(0.8–1.1)	1.3	(1.0–1.7)	0.8	(0.7–1.0)	0.8	(0.7–1.1)	1.1	(0.9–1.3)	0.9	(0.7–1.2)	0.9	(0.8–1.1)	1.0	(0.8–1.1)
Native	1.6*	(1.1–2.2)	1.3	(0.5–3.5)	0.8	(0.4–1.7)	1.9	(1.1–3.3)	1.7*	(1.2–2.5)	1.5	(0.9–2.7)	1.5*	(1.1–2.1)	1.3	(0.9–1.8)
Asian and Pacific Islander	0.7	(0.5–1.1)	1.5	(0.7–3.1)	0.7	(0.4–1.4)	0.6	(0.3–1.2)	0.6*	(0.4–0.9)	0.8	(0.3–1.9)	0.7	(0.5–1.1)	0.7*	(0.5–0.9)
Hispanic	1.0	(0.8–1.1)	1.8*	(1.3–2.7)	0.7*	(0.5–0.9)	0.9	(0.6–1.3)	1.0	(0.8–1.2)	1.0	(0.8–1.3)	1.0	(0.9–1.2)	0.9	(0.7–1.1)
White	1.0	–	1.0	–	1.0	–	1.0	–	1.0	–	1.0	–	1.0	–	1.0	–
χ^2_4 (p value)	21.3*	(<0.001)	13.7*	(<0.001)	17.3*	(<0.001)	8.2	(.08)	28.1*	(<0.001)	6.6	(.16)	22.4*	(<0.001)	25.8*	(<0.001)
Marital status																
Never married	1.4*	(1.3–1.6)	1.9*	(1.4–2.6)	1.3*	(1.1–1.6)	1.5*	(1.2–1.9)	1.4*	(1.2–1.6)	1.2	(1.0–1.5)	1.4*	(1.3–1.6)	1.4*	(1.2–1.5)
Widowed, divorced, or separated	1.6*	(1.4–1.9)	2.0*	(1.3–2.9)	1.0	(0.8–1.4)	1.6*	(1.2–2.1)	1.1	(0.9–1.3)	1.1	(0.9–1.5)	1.6*	(1.3–1.8)	1.2*	(1.0–1.4)
Married or living with someone	1.0	–	1.0	–	1.0	–	1.0	–	1.0	–	1.0	–	1.0	–	1.0	–
χ^2_2 (p value)	54.7*	(<0.001)	22.9*	(<0.001)	11.9*	(<0.001)	27.9*	(<0.001)	33.2*	(<0.001)	5.9*	(0.05)	54.7*	(<0.001)	39.6*	(<0.001)
Education																
Less than high school diploma	1.0	(0.9–1.2)	0.7	(0.5–1.0)	0.8	(0.6–1.0)	1.3	(1.0–1.8)	0.9	(0.7–1.0)	0.7*	(0.5–1.0)	1.0	(0.9–1.2)	0.9*	(0.8–1.0)
High school graduate	1.1	(0.9–1.3)	0.6*	(0.4–0.9)	1.0	(0.8–1.3)	1.2	(0.9–1.7)	1.0	(0.8–1.2)	0.7*	(0.5–0.9)	1.1	(0.9–1.3)	1.0	(0.9–1.2)
Some college	0.8*	(0.6–0.9)	0.5*	(0.3–0.7)	0.7	(0.5–1.0)	0.7	(0.5–1.1)	0.7*	(0.6–0.8)	0.4*	(0.3–0.6)	0.7*	(0.6–0.9)	0.7*	(0.6–0.8)
College graduate and above	1.0	–	1.0	–	1.0	–	1.0	–	1.0	–	1.0	–	1.0	–	1.0	–
χ^2_3 (p value)	26.1*	(<0.001)	21.1*	(<0.001)	14.0*	(<0.001)	20.3*	(<0.001)	36.3*	(<0.001)	32.9*	(<0.001)	27.8*	(<0.001)	48.1*	(<0.001)
Household Income																
<$10,000	2.1*	(1.6–2.8)	9.7*	(4.7–20.1)	2.0*	(1.4–3.0)	2.5*	(1.6–3.8)	1.8*	(1.4–2.4)	2.3*	(1.5–3.5)	2.3*	(1.7–3.0)	1.9*	(1.5–2.4)
$10,000–$29,999	1.7*	(1.4–2.1)	7.3*	(3.5–14.9)	1.7*	(1.2–2.2)	1.7*	(1.2–2.6)	1.5*	(1.1–1.9)	1.7*	(1.2–2.4)	1.7*	(1.4–2.2)	1.4*	(1.2–1.8)
$30,000–$49,999	1.4*	(1.1–1.8)	4.9*	(2.4–10.2)	1.4	(1.0–1.9)	1.5	(1.0–2.3)	1.3	(1.0–1.7)	1.3	(0.9–2.0)	1.5*	(1.2–1.8)	1.3*	(1.1–1.6)
$50,000–$64,999	1.2	(0.9–1.6)	4.0*	(1.7–9.5)	1.2	(0.8–1.8)	2.1*	(1.3–3.2)	1.0	(0.7–1.4)	1.2	(0.8–1.8)	1.2	(1.0–1.6)	1.2	(1.0–1.5)
$70,000–$99,999	1.1	(0.9–1.4)	2.5*	(1.1–5.9)	1.2	(0.8–1.9)	1.3	(0.8–2.1)	0.9	(0.7–1.3)	1.1	(0.7–1.9)	1.1	(0.9–1.4)	1.0	(0.9–1.3)
≥$100,000	1.0	–	1.0	–	1.0	–	1.0	–	1.0	–	1.0	–	1.0	–	1.0	–
χ^2_5 (p value)	90.5*	(<0.001)	79.9*	(<0.001)	37.6*	(<0.001)	44.5*	(<0.001)	83.5*	(<0.001)	48.7*	(<0.001)	99.1*	(<0.001)	88.4*	(<0.001)
Occupation																
Technical/support/clerical	1.3*	(1.2–1.5)	1.9*	(1.3–2.9)	1.1	(0.9–1.3)	1.3	(1.0–1.6)	1.1	(1.0–1.3)	1.4*	(1.1–1.7)	1.3*	(1.2–1.5)	1.2*	(1.1–1.3)
Unskilled/manual	1.1	(0.9–1.4)	2.2*	(1.3–3.9)	1.4	(1.0–2.0)	1.3	(0.9–2.0)	1.3*	(1.1–1.7)	1.7*	(1.1–2.6)	1.1	(0.9–1.4)	1.4*	(1.1–1.7)

Table 2 continued

	Major depression		Dysthymia		GAD		Social phobia		PTSD		Panic disorder		Any mood disorder		Any anxiety disorder	
Occupation missing	0.9	(0.8–1.1)	2.2*	(1.4–3.5)	1.1	(0.9–1.4)	1.0	(0.7–1.3)	0.9	(0.7–1.0)	1.0	(0.7–1.4)	1.0	(0.8–1.2)	0.9	(0.8–1.0)
Professional	1.0	–	1.0	–	1.0	–	1.0	–	1.0	–	1.0	–	1.0	–	1.0	–
χ^2_3 (p value)	34.8* (<0.001)		19.9* (<0.001)		3.7 (0.29)		8.3* (0.04)		15.1* (<0.001)		23.1* (<0.001)		30.8* (<0.001)		37.0* (<0.001)	

* $p < 0.05$, 2-sided test

barriers to obtaining an abortion. Although the mechanisms underlying this association are unclear, increased autonomy over reproduction may provide one explanation. Indeed, lower rates of unintended pregnancy have been documented in communities with lower gender inequality [34]. Increased autonomy over reproduction may reduce anxiety about unintended pregnancy and lead to actual reductions in the prevalence of unintended pregnancy, which has been linked to risk for both anxiety and depression among women [35, 36].

One potential explanation for the lack of association between the other indicators of women's status and female psychiatric disorders concerns the difference in level between the putative social determinants and psychiatric outcomes. State-level women's political participation, social and economic autonomy, and employment and earnings are contextual determinants that reflect the cumulative participation or representation of individual women in a state. Reproductive rights, on the other hand, reflect policies that both confer protection and determine the reproductive choices that are available to individual women and therefore come closer to the definition of a true contextual determinant. These protective policies are likely to have a more direct impact on individual women's lives than, for example, the number of women who participate in politics in their state and, as a result, may be more strongly related to mental health. However, the association between reproductive rights and female mood and anxiety disorders warrants replication in future research given that this was the only significant association we found between an indicator of state-level women's status and female psychiatric disorders. This association should be interpreted cautiously, as the large sample size used in the current analyses and number of tests conducted increases the likelihood of finding a significant association in the absence of a true relationship.

Although variations in state-level women's status are associated with depressive symptoms among women [22], on the whole these variations are not important determinants of the prevalence of mood and anxiety disorders among women or gender differences in disorder prevalence. There are at least two possible explanations for the discrepancy between our findings and previous work. The first involves differences in the definition of mental health problems. Prior work used a self-report measure of depressive symptoms; we relied on structured diagnostic interviews of psychiatric diagnoses. Self-report measures of symptoms tend to measure non-specific psychological distress or 'demoralization' rather than psychiatric diagnoses [37] and perform relatively poorly at identifying cases of major depression as compared to diagnostic interviews [38–40]. These measurement problems with self-report scales arise as a result of incomplete coverage of

Table 3 Bivariate and adjusted associations (odds ratios) between state-level women's political participation and 12-month mood and anxiety disorders among women ($n = 20{,}089$)

	Bivariate		Adjusted[a]		Adjusted[b]	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Mood disorders	1.01	(1.0–1.03)	1.01	(1.0–10.3)	1.02	(1.0–1.03)
Major depression	1.01	(0.99–1.02)	1.01	(1.0–1.03)	1.01	(1.0–1.03)
Dysthymia	1.05*	(1.01–1.09)	1.05*	(1.01–1.09)	1.05*	(1.01–1.10)
Anxiety disorders	1.00	(0.98–1.01)	1.00	(0.98–1.01)	1.00	(0.98–1.01)
Panic Disorder	1.00	(0.98–1.03)	1.01	(0.98–1.04)	1.01	(0.98–1.04)
Generalized anxiety disorder	0.99	(0.97–1.02)	0.99	(0.97–1.02)	0.99	(0.97–1.02)
Social phobia	1.02	(0.99–1.05)	1.03	(1.0–1.06)	1.03	(1.0–1.06)
Posttraumatic stress disorder	1.00	(0.99–1.02)	1.01	(0.99–1.02)	1.01	(0.99–1.02)

State-level indicators of women's political participation were drawn from the Institute for Women's Policy Research. See "Methods" for details. Analysis conducted using generalized estimating equations

* $p < 0.05$, 2-sided test

[a] Controlling for age, race/ethnicity, and marital status

[b] Controlling for age, race/ethnicity, and marital status, household income, educational attainment, and occupation

Table 4 Bivariate and adjusted associations (odds ratios) between state-level women's employment and earnings and 12-month mood and anxiety disorders among women ($n = 20{,}089$)

	Bivariate		Adjusted[a]		Adjusted[b]	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Mood disorders	1.22	(0.70–2.16)	1.16	(0.66–2.01)	1.16	(0.67–1.99)
Major depression	1.30	(0.72–2.34)	1.24	(0.70–2.22)	1.25	(0.71–2.19)
Dysthymia	0.45	(0.12–1.69)	0.31	(0.09–1.15)	0.30	(0.08–1.14)
Anxiety disorders	1.34	(0.84–2.14)	1.37	(0.84–2.22)	1.38	(0.82–2.30)
Panic disorder	1.07	(0.45–2.52)	1.01	(0.44–2.35)	1.01	(0.43–2.37)
Generalized anxiety disorder	1.25	(0.58–2.67)	1.32	(0.61–2.84)	1.31	(0.60–2.86)
Social phobia	0.65	(0.26–1.66)	0.62	(0.25–1.57)	0.64	(0.25–1.66)
Posttraumatic stress disorder	1.38	(0.77–2.47)	1.34	(0.74–2.44)	1.34	(0.71–2.52)

State-level indicators of women's social and economic autonomy were drawn from the Institute for Women's Policy Research. See "Methods" for details. Analysis conducted using generalized estimating equations

[a] Controlling for age, race/ethnicity, and marital status

[b] Controlling for age, race/ethnicity, and marital status, household income, educational attainment, and occupation

diagnostic criteria (resulting in low sensitivity), inclusion of items that are not part of the diagnostic criteria (resulting in low specificity), and inability to ascertain clinical significance and functional impairment associated with symptoms [41]. As a result, symptom scales and diagnostic interviews assess different underlying constructs.

A second possibility is that women living in states with lower gender equality have higher levels of depressive symptoms, but these symptom elevations do not cross the threshold to psychiatric disorder. Consistent with this interpretation, depressive symptoms among women were less than one point higher in states with low status relative to states with high status in the one prior study on women's status and mental health [22]. Importantly, we used measures of women's status that are identical to those used in prior work on mental and physical health outcomes [20–22], ruling out potential methodological explanations resulting from differences in the measurement of women's status.

Contrary to our predictions, we found that dysthymia was more common among women in states with greater female political participation. Although greater state-level political participation among women has been associated with decreased female mortality [21], no relationship was found between this indicator and female depressive symptoms in previous research [22] or with any of the other psychiatric disorders in the current analysis. It is difficult to provide an explanation for why dysthymia was more common in states with greater political participation of women. Dysthymia is the least common of the disorders

Table 5 Bivariate and adjusted associations (odds ratios) between state-level women's social and economic autonomy and 12-month mood and anxiety disorders among women ($n = 20{,}089$)

	Bivariate		Adjusted[a]		Adjusted[b]	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Mood disorders	1.00	(0.70–1.44)	1.02	(0.72–1.45)	1.05	(0.75–1.46)
Major depression	0.97	(0.66–1.42)	0.97	(0.67–1.39)	0.99	(0.70–1.40)
Dysthymia	1.74	(0.63–4.79)	2.32	(0.84–6.45)	2.50	(0.88–7.08)
Anxiety disorders	0.97	(0.69–1.36)	0.93	(0.66–1.30)	0.95	(0.67–1.35)
Panic disorder	0.92	(0.49–1.74)	0.92	(0.50–1.71)	0.96	(0.52–1.80)
Generalized anxiety disorder	1.05	(0.61–1.80)	0.97	(0.72–1.31)	1.01	(0.59–1.72)
Social phobia	1.35	(0.68–2.68)	1.33	(0.67–2.64)	1.34	(0.66–2.69)
Posttraumatic stress disorder	0.99	(0.68–1.44)	0.99	(0.67–1.45)	1.02	(0.68–1.53)

State-level indicators of women's social and economic autonomy were drawn from the Institute for Women's Policy Research. See "Methods" for details. Analysis conducted using generalized estimating equations

[a] Controlling for age, race/ethnicity, and marital status

[b] Controlling for age, race/ethnicity, and marital status, household income, educational attainment, and occupation

Table 6 Bivariate and adjusted associations (odds ratios) between state-level women's reproductive rights and 12-month mood and anxiety disorders among women ($n = 20{,}089$)

	Bivariate		Adjusted[a]		Adjusted[b]	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Mood disorders	0.93*	(0.89–0.97)	0.94*	(0.90–0.98)	0.94*	(0.90–0.98)
Major depression	0.94*	(0.90–0.98)	0.95*	(0.90–0.99)	0.95*	(0.91–0.99)
Dysthymia	0.92	(0.83–1.03)	0.91	(0.80–1.02)	0.91	(0.81–1.02)
Anxiety disorders	0.95*	(0.91–0.99)	0.96	(0.92–1.01)	0.96	(0.92–1.00)
Panic disorder	0.94	(0.87–1.02)	0.95	(0.88–1.03)	0.95	(0.88–1.03)
Generalized anxiety disorder	0.93	(0.87–1.0)	0.95	(0.88–1.02)	0.95	(0.88–1.02)
Social phobia	0.93	(0.86–1.02)	0.95	(0.87–1.03)	0.95	(0.87–1.03)
Posttraumatic stress disorder	0.92*	(0.88–0.97)	0.93*	(0.88–0.98)	0.93*	(0.88–0.98)

State-level indicators of women's reproductive rights were drawn from the Institute for Women's Policy Research. See "Methods" for details. Analysis conducted using generalized estimating equations

* $p < 0.05$, 2-sided test

[a] Controlling for age, race/ethnicity, and marital status

[b] Controlling for age, race/ethnicity, and marital status, household income, educational attainment, and occupation

considered here, with fewer than 2% of women in the NESARC meeting criteria for the disorder [42]. Dysthymia also is distinct from the other mood and anxiety disorders because it must be present for at least 2 years to be diagnosed and is thus thought to reflect, in part, chronic depressive personality characteristics [43]. We are thus inclined to believe that this association is a chance finding, particularly given the large number of tests conducted.

Several limitations of the current study warrant discussion. First, the study design was cross-sectional, which did not allow us to examine potential selection effects based on mental health status. Women with better mental health may be more likely to move to states that have more equitable laws and policies and that provide better opportunities for women. Such selection effects would inflate associations between state-level women's status and psychiatric disorder prevalence. Second, although women's status was assessed 2–3 years before psychiatric disorders it is possible that there is a latency period before these contextual factors impact risk for mental disorders. Finally, because information on women's status is not updated on an annual basis for each state [18] we could not examine the impact of changes in women's status on trends in psychiatric disorders over time. Prospective investigation of the effect of such changes on psychiatric disorder prevalence among women represents an important avenue for future research.

Despite these limitations, the current study has a number of strengths that extend the literature on social determinants of mental health outcomes in the US. To our knowledge, we provide the first empirical evaluation of the

association between state-level women's status and both the prevalence of psychiatric disorders among women and gender differences in prevalence in a national probability sample. Our findings suggest that state-level women's status has no association with gender differences in mood and anxiety disorder prevalence and, with the exception of reproductive rights, is unrelated to disorder prevalence among women. Investigation of other social and contextual factors that play a role in shaping the distribution of individual- and community-level risk factors that are associated with gender differences in mental health outcomes, such as exposure to inter-personal violence, control over sexual decision-making and use of contraception, pay inequity, income, and educational attainment [1, 4, 34, 44–46], represents an important avenue for future research.

Acknowledgments This work was supported by the Robert Wood Johnson Foundation (Grant Number 053572) and by the National Institute of Health (Grant Numbers MH078928 and MH070627). Disclosure: the authors have no competing interests to report.

References

1. Kessler RC, Berglund P, Demler O et al (2005) Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. Arch Gen Psychiatry 62:593–602
2. Kessler RC, Chiu WT, Demler O et al (2005) Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication. Arch Gen Psychiatry 62:617–627
3. Kessler RC, McGonagle KA, Zhao S et al (1994) Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States: results from the National Comorbidity Survey. Arch Gen Psychiatry 51:8–19
4. Blazer DG, Kessler RC, McGonagle KA et al (1994) The prevalence and distribution of major depression in a national community sample: the National Comorbidity Survey. Am J Psychiatry 151:979–986
5. Kessler RC, McGonagle KA, Nelson CB et al (1994) Sex and depression in the National Comorbidity Survey. II: cohort effects. J Affect Disord 30:15–26
6. Kessler RC, Sonnega A, Bromet E et al (1995) Posttraumatic stress disorder in the National Comorbidity Survey. Arch Gen Psychiatry 52:1048–1060
7. Magee WJ, Eaton WW, Wittchen H-U et al (1996) Agoraphobia, simple phobia, and social phobia in the National Comorbidity Survey. Arch Gen Psychiatry 53:159–168
8. Eaton WW, Kessler RC, Wittchen H-U et al (1994) Panic and panic disorder in the United States. Am J Psychiatry 151:413–420
9. Kessler RC, McGonagle KA, Swartz MS et al (1993) Sex and depression in the National Comorbidity Survey I: lifetime prevalence, chronicity and recurrence. J Affect Disord 29:85–96
10. Twenge JM, Nolen-Hoeksema S (2002) Age, gender, race, socioeconomic status, and birth cohort differences on the children's depression inventory: a meta-analysis. J Abnorm Psychol 111:578–588
11. Hankin BL, Abramson LY (2001) Development of gender differences in depression: an elaborated cognitive vulnerability-transactional stress model. Psychol Bull 127:773–796
12. Nolen-Hoeksema S, Girgus JS (1994) The emergence of gender differences in depression during adolescence. Psychol Bull 115:424–443
13. Nolen-Hoeksema S (1990) Sex differences in depression. Stanford University Press, Stanford
14. Nolen-Hoeksema S (2001) Gender differences in depression. Curr Dir Psychol Sci 10:173–176
15. Nolen-Hoeksema S, Larson J, Grayson C (1999) Explaining the gender difference in depressive symptoms. J Pers Soc Psychol 77:1061–1072
16. Siefert K, Bowman PJ, Heflin CM et al (2000) Social and environmental predictors of maternal depression in current and recent welfare recipients. Am J Orthopsychiatry 70:510–522
17. Earls F (1987) Sex differences in psychiatric disorders: origins and developmental influences. Psychiatr Dev 5:1–23
18. Institute for Women's Policy Research (2002) The status of women in the states, 4th edn. Institute for Women's Policy Research, Washington, DC
19. Yllö K (1984) The status of women, marital equality, and violence against wives: a contextual analysis. J Fam Issues 5:307–320
20. Koenen KC, Lincoln A, Appleton A (2006) Women's status and child well-being: a state-level analysis. Soc Sci Med 63:2999–3012
21. Kawachi I, Kennedy BP, Gupta V et al (1999) Women's status and the health of women and men: a view from the states. Soc Sci Med 48:21–32
22. Chen Y-Y, Subramanian SV, Acevedo-Garcias D et al (2005) Women's status and depressive symptoms: a multilevel analysis. Soc Sci Med 60:49–60
23. Grant BF, Dawson DA, Stinson FS et al (2004) The 12-month prevalence and trends in DSM-IV alcohol abuse and dependence: United States, 1991–1992 and 2001–2002. Drug Alcohol Depend 74:223–234
24. Grant BF, Moore TC, Shepard J et al (2003) Source and accuracy statement: Wave 1 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC). National Institute on Alcohol Abuse and Alcoholism, Bethesda
25. Grant BF, Goldstein RB, Chou SP, et al (2009) Sociodemographic and psychopathologic predictors of first incidence of DSM-IV substance use, mood and anxiety disorders: results from the Wave 2 National Epidemiologic Survey on Alcohol and Related Conditions. Mol Psychiatry 14:1051–1066
26. American Psychiatric Association (1994) Diagnostic and statistical manual of mental disorders (DSM-IV), 4th edn. American Psychiatric Press, Washington, DC
27. Grant BF, Dawson DA, Hasin DS (2001) The Alcohol Use Disorder and Associated Disabilities Interview Schedule-DSM-IV Version. National Institute on Alcohol Abuse and Alcoholism, Bethesda, MD
28. Ruan WJ, Goldstein RB, Chou SP et al (2008) The Alcohol Use Disorder and Associated Disabilities Interview Schedule-IV (AUDADIS-IV): reliability of new psychiatric diagnostic modules and risk factors in a general population sample. Drug Alcohol Depend 92:27–36
29. Grant BF, Harford TC, Dawson DA et al (1995) The alcohol use disorder and associated disabilities interview schedule (AUDADIS): reliability of alcohol and drug modules in a general population sample. Drug Alcohol Depend 39:37–44
30. Grant BF, Dawson DA, Stinson FS et al (2003) The Alcohol Use Disorder and Associated Disabilities Interview Schedule-IV (AUDADIS-IV): reliability of alcohol consumption, tobacco use, family history of depression and psychiatric diagnostic modules in a general population sample. Drug Alcohol Depend 71:7–16
31. Werschkul M, Williams E (2004) In: Caiazza AB, Shaw A (eds) The status of women in the states. The Institute for Women's Policy Research, Washington, DC

32. Hanley JA, Negassa A, deB Edwardes MD et al (2003) Statistical analysis of correlated data using generalized estimating equations: an orientation. Am J Epidemiol 157:364–375
33. Software for Survey Data Analysis (SUDAAN) (2004) Research triangle park. Research Triangle Institute, NC
34. Pallitto CC, O'Campo P (2005) Community level effects of gender inequality on intimate partner violence and unintended pregnancy in Colombia: testing the feminist perspective. Soc Sci Med 60:2205–2216
35. Leathers SJ, Kelley MA (2000) Unintended pregnancy and depressive symptoms among first-time mothers and fathers. Am J Orthopsychiatry 70:523–531
36. Najman JM, Morrison J, Williams G et al (1991) The mental health of women 6 months after they give birth to an unwanted baby: a longitudinal study. Soc Sci Med 32:241–247
37. Dohrenwend BP (1990) 'The problem of validity in field studies of psychological disorders' revisited. Psychol Med 20:195–208
38. Boyd JH, Weissman MM, Thompson WD et al (1982) Screening for depression in a community sample: understanding the discrepancies between depression symptom and diagnostic scales. Arch Gen Psychiatry 39:1195–1200
39. Breslau N (1985) Depressive symptoms, major depression, and generalized anxiety: a comparison of self-reports on CES-D and results from diagnostic interviews. Psychiatry Res 15:219–229
40. Hammen C (1980) Depression in college students: beyond the Beck Depression Inventory. J Consult Clin Psychol 48:126–128
41. Zimmerman MA, Coryell W (1987) The Inventory to Diagnose Depression (IDD): a self-report scale to diagnose major depression. J Consult Clin Psychol 55:55–59
42. Grant BF, Stinson FS, Dawson DA et al (2004) Prevalence and co-occurrence of substance use disorders and independent mood and anxiety disorders: results from the National Epidemiologic Survey of Alcohol and Related Conditions. Arch Gen Psychiatry 61:807–816
43. Bagby RM (1999) Ryder AG. Diagnostic discriminability of dysthymia and depressive personality disorder Depression and Anxiety 10:41–49
44. Dutton M, Green BL, Kaltman SI et al (2006) Intimate partner violence, PTSD, and adverse health outcomes. J Interpers Violence 21:955–968
45. Hedtke KA, Ruggiero KJ, Fitzgerald MM et al (2008) A longitudinal investigation of interpersonal violence in relation to mental health and substance use. J Consult Clin Psychol 76:633–647
46. O'Campo P, Eaton WW, Muntaner C (2004) Labor market experience, work organization, gender inequalities and health status: results from a prospective analysis of US employed women. Soc Sci Med 58:585–594
47. Carle AC (2009) Fitting multilevel models in complex survey data with design weights: recommendations. BMC Med Res Method 9:49–63
48. Longford NT (1996) Model-based variance estimation in surveys with stratified clustered designs. Aust J Stat 38:333–352
49. Rabe-Hesketh S, Skrondal A (2006) Multilevel modeling of complex survey data. J R Stat Soc Ser A (Stat Soc) 169:805–827