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Journal

ISSN

Authors

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et al.

Publication Date

2016-08-02

DOI

Peer reviewed

Gradients in Depressive Symptoms by Socioeconomic Position Among Men Who Have Sex With Men in the EXPLORE Study

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Abstract

Objectives—This study examines gradients in depressive symptoms by socioeconomic position (SEP) (i.e., income, education, employment) in a large, multi-site sample of MSM.

Methods—Baseline data were used from EXPLORE, a randomized controlled behavioral HIV prevention trial for HIV-uninfected MSM in 6 U.S. cities (n=4,277). Depressive symptoms were

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assessed using the Center for Epidemiologic Studies Depression scale (short form). A series of multiple linear regressions were fitted with interaction terms to assess additive and multiplicative relationships between SEP and depressive symptoms.

Results—Depressive symptoms were more prevalent among MSM with lower income, lower educational attainment, and those in the unemployed/other employment category. Income, education and employment all made significant contributions in additive models after adjustment. The employment and income interaction was statistically significant, indicating a multiplicative effect.

Conclusions—This study revealed gradients in depressive symptoms across SEP of MSM, pointing to income and employment status, and to a lesser extent education, as key factors for understanding heterogeneity of depressive symptoms.

Keywords

MSM; depression; gradients; population health; epidemiology

Introduction

Men who have sex with men (MSM) and other sexual minority men (e.g., men who identify as gay or bisexual) are at a disproportionate risk for mental health problems (e.g., depressive symptomatology, distress) compared to their heterosexual peers (Mills, 2004). Large population health studies in the U.S. and internationally have demonstrated mental health disparities experienced by various populations of sexual minority men (Cochran & Mays, 2005; King et al., 2008; Meyer, 2003). The minority stress model is the leading theoretical framework for explaining those disparities, positing that sexual minorities experience chronic distal (e.g., discrimination, victimization) and proximal stressors (e.g., expectations of rejection, hyper-vigilance) (Meyer, 1995, 2003). A growing body of evidence has pointed to the importance of socioeconomic position (SEP) (e.g., income, employment, education) as salient influences on the health of sexual minority adults (Institute of Medicine, 2011). Discrimination because of SEP has been found to predict higher depressive and anxious symptoms in gay and bisexual men (Gamarel, Reisner, Parsons, & Golub, 2012). Evidence indicates that sexual minority men experience institutional discrimination in a range of areas, such as employment and housing (Hatzenbuehler, McLaughlin, Keyes, & Hasin, 2010), and structural factors have been implicated in lower incomes of sexual minorities despite equivalent or higher educational levels compared to their heterosexual peers (American Psychological Association, n.d.; Waite & Denier, 2015).

SEP is well known to be associated with inverse gradients across a wide range of health outcomes, including mental health (Adler et al., 1994; Frank, Cohen, Yen, Balfour, & Smith, 2003; Krieger, Williams, & Moss, 1997; Marmot & Wilkinson, 2005; Smith, Smith, Etches, & Mustard, 2012). The social gradient theory of health suggests that a person's health status is a function of their SEP and, through the structured nature of social processes, is liable to selective accumulation of future advantage or disadvantage (Marmot & Wilkinson, 2005). For men in particular, low income has been found to be associated with disproportionately higher rates of ill health, with income gradients more pronounced and non-linear than those

for women (Frank et al., 2003). While there is evidence of a strong association between SEP and health gradients in studies of general populations (Adler et al., 1994; Frank et al., 2003; Krieger et al., 1997; Marmot & Wilkinson, 2005; Smith et al., 2012), there is a paucity of research on gradients among sexual minorities. The consideration of SEP to understand the health of sexual minority men has been largely limited to the field of sexual health (HIV in particular), where they are used as both correlates and moderators of studied relationships (Halkitis & Figueroa, 2013; Janssen, de Wit, Hospers, & van Griensven, 2001; LA McGarrity & Huebner, 2014; Raymond et al., 2014). In the field of mental health, few studies have focused on SEP as correlates of mental health outcomes in this population (Friedman et al., 2014; Irwin, Coleman, Fisher, & Marasco, 2014; Mao et al., 2009). One recent study documented the multiplicative disadvantage of low income and sexual minority status of gay and bisexual Canadian men (Veenstra, 2011). To our knowledge, no studies have examined gradients—in either between-group or within-group analyses—in the prevalence of mental health outcomes among MSM.

To address this knowledge gap, we undertook the current study to examine gradients in depressive symptoms by SEP (income, education, employment) in a sample of MSM who participated in the EXPLORE Study, a randomized behavioral interventional trial of HIV negative men. Although previous examinations of the EXPLORE data have shown that younger participants had elevated prevalence of depressive symptoms compared to their older counterparts (Salomon et al., 2009), the associations of depressive symptoms with income, education, and employment, as well as the interactions between them, have not been studied. The study hypothesizes that: (H1) gradients in depressive symptoms will be observed for MSM at disadvantaged positions (e.g., low *vs.* high education), and (H2) the largest gradients will be observed for MSM at intersections of disadvantaged socioeconomic positions (e.g., low income *and* low education). The examination of the gradients in mental health may shed light on the basic mechanisms by which higher SEP conveys health benefits; for example, whether they are related to material deprivation, psycho-social factors, or others (Frank et al., 2003). This type of knowledge is needed to inform and advance policies, services, and programs designed to address the mental health disparities of MSM as well as to direct interventions at subgroups of men who experience the highest burden of illness.

Methods

Study Population

The EXPLORE Study was a behavioral intervention trial of HIV negative MSM. Recruitment occurred between January 1999 and February 2001 in 6 U.S. cities: Boston, Chicago, Denver, New York, San Francisco, and Seattle. Men were eligible if they were aged 16 years or older and reported having engaged in anal sex with 1 or more men during the past year. Men were excluded if they reported that they had been involved in a mutually monogamous relationship for 2 or more years with a male partner known to be negative for HIV antibodies. The recruitment, sampling, data collection, measures, and other methods of the EXPLORE Study have been described in detail elsewhere (Barresi et al., 2010; Chesney et al., 2003; Koblin et al., 2003; Koblin, Chesney, & Coates, 2004). In brief, participants

were recruited using street- and venue-based outreach in areas where MSM were known to congregate (e.g., dance clubs, bathhouses, health clubs). Project staff also mounted public relations and media campaigns, with participants recruited through Internet sites, community forums, and community-based agencies. Finally, individuals were referred from other study participants and clinics (Marshall et al., 2015). The present study is a cross-sectional examination of the EXPLORE data at baseline (n=4,295), restricted to those who have complete baseline information for the primary outcome of interest (n=4,277).

Study Measures

The primary outcome in the study was a measure of depressive symptomatology, defined using a short form of the Center for Epidemiologic Studies Depression Scale (CESD-SF). This 7-item measure asked respondents to rate how often during the past week they: felt like they could not shake off the blues even with help from their family or friends, had trouble keeping their minds on what they were doing, felt that everything they did was an effort, had trouble sleeping, felt lonely, felt sad, or felt like they "just couldn't get going." Responses corresponded to the number of days the symptoms were experienced [never/rarely (0 days; scale score=0), sometimes (1–2 days; scale score=1), often (3–4 days; scale score= 2), mostly or always (5–7 days; scale score=3)]. The scores for each item were summed to create a composite score, with higher scores representing greater depressive symptomatology. A cut-off point for the CESD-SF has not been established, although a median split has previously been used (Salomon et al., 2009). The use of the short version of the CESD has been previously validated by (Ross & Mirowsky, 2006). The validity of alternative versions of the CESD-SF has been documented in other studies (Andresen, Malmgren, Carter, & Patrick, 1994; Chang & Weng, 2013; Kohout, Berkman, Evans, & Cornoni-Huntley, 1993; Levine, 2013), including in studies with MSM (Salomon et al., 2009), and vulnerable and minority groups (Burton, Marshal, Chisolm, Sucato, & Friedman, 2013; Callahan & Wolinsky, 1994; Kim, Decoster, Huang, & Chiriboga, 2011; Perreira, Deeb-Sossa, Harris, & Bollen, 2005).

Based on examinations of health gradients in the general population (Frank et al., 2003; Krieger, 2001; Myers, 2009; Smith et al., 2012), the following SEP characteristics were selected as independent variables: household annual income, educational attainment, and employment status. Household annual income (<$11,999, $12,000 – $29,999, $30,000 – $59,999, $60,000+), educational attainment (High school or less [including GED], Some College, College Degree, Post-College), and current employment status (Employed full-time, part-time, unemployed, or other) were measured based on categorizations previously used in other studies using EXPLORE data (Salomon et al., 2009). The other employment category included those on disability or "between jobs," and therefore the unemployed/other categories were collapsed.

The selection of covariates was guided by a review of the literature. The race/ethnicity variable was obtained using a combination of two separate variables on race/ethnicity: (a) Are you white, black, Asian/Pacific Islander, or Other race?; and (b) Are you Latino or Hispanic?, which were used to create the following mutually exclusive categories: White/Not Hispanic, Black/Not Hispanic, Hispanic, Other/Not Hispanic (including Asian/

Pacific Islander). Other covariates in the study included age group (16–25, 26–30, 31–35, and 36+), geographic site (Boston, Chicago, Denver, New York, San Francisco, and Seattle), and having experienced childhood sexual abuse (yes/no). Studies have shown that MSM are more likely to report childhood sexual abuse, and it has been suggested that proximate causes of psychological distress for some MSM may stem from early childhood experiences, such as physical and emotional abuse by family or peers (Mayer et al., 2012). The childhood sexual abuse variable was defined as any sexual experience either with a person 5 years or older before the age of 13, or with a person 10 years or older between the ages of 13 and 17. This definition is consistent with existing literature on sexual abuse and has been used previously (Mimiaga et al., 2009).

Statistical Analyses

The analytical strategy included modeling the main effects of the SEP variables in additive models (hypothesis 1), and then interactions between them in multiplicative models (hypothesis 2), on the primary outcome of depressive symptoms (CESD-SF) (n=4,277). A series of multiple linear regression models were fitted to examine the independent relationships between the SEP variables with depressive symptomatology. Interaction was examined using 2-way interaction terms. All regression models adjusted for age group, race/ethnicity, history of sexual abuse, and geographic site. The results from the various models were compared and contrasted, and their model fit assessed. The models were implemented in Stata 13 using regress procedures. Tests of collinearity between all independent variables showed no substantial collinearity (all correlation coefficients < 0.15). All reported p-values are two-sided.

Findings

Sample Description

Table 1 displays the characteristics of the EXPLORE Study participants and their CESD-SF scores at baseline. The mean CESD-SF score in the sample was 6.0 (SD = 4.3). The median score was 5.0, and the range represented the full range of possible scale scores (0–21). The majority of participants were white/not Hispanic, young (35 years old or younger), employed full-time, and had college or post college education, with just over 40% of participants reporting household income of less than $29,999. A large proportion (40%) reported having experienced childhood sexual abuse. Statistical analyses indicated that disadvantaged socioeconomic positions were associated with greater depressive symptomatology compared to non-disadvantaged positions (see Table 1). The highest CESD-SF scores were observed for those with household income of $11,999 or less (mean score = 7.9), those with educational attainment of high school or less (mean score = 7.2), those who were in the unemployed/other employment category (mean score = 7.2), and those aged 16–25 (mean score = 6.8), and these associations were significant ($p < 0.05$) in unadjusted models (2-tailed tests). Figure 1 shows the distributions of depressive symptoms at intersections of the SEP variables. A consistent gradient of depressive symptoms can be seen, such that CESD-SF scores experienced by MSM are graded within and across socioeconomic positions (e.g., scores are graded by income within each category of

educational attainment, and they are highest for those at intersections of low income and low education).

Multiple Regression Results

As hypothesized (H1), household income, educational attainment and employment status all made significant contributions to additive models after adjustment (see Table 2). In the multiple model (R.4), respondents in the <$11,999 group had 2.2 higher units of depressive symptoms compared to those in the > $60,000 group, those with high school education or less had 1.0 higher units of depressive symptoms on average compared to those in the group with post college education, and those in unemployed/other employment category had 0.74 higher units of depressive symptoms compared to those employed full-time (all $p < 0.001$). Table 3 shows results of regression models with 2-way interactions between the SEP variables. As hypothesized (H2), the interaction between employment and income was significant (p<0.01); however, interactions between employment and education (R.2), and education and income (R.3) were not significant. When all cross-product terms were added in model R.4, the employment and income interaction continued to retain significance (p=0.01). Household income remained significant and its regression coefficients stable in all regression models with interaction terms. In our final model with the statistically significant interaction for employment and education (R.1), the individual SEP variables also retained significance. Compared to their respective reference groups, respondents in the <$11,999 group had 2.4 higher units of depressive symptoms, those in part-time employment category had 1.7 higher units, and those with high school education or less had 0.9 higher units of depressive symptoms (all $p < 0.05$).

Discussion

This study revealed gradients in depressive symptomatology by SEP amongst MSM participating in the EXPLORE Study. As hypothesized (H1), gradients in depressive symptoms were observed for MSM at more disadvantaged socioeconomic positions across income, educational attainment, and employment status in additive models. Associations between SEP variables with depressive symptoms remained significant in the fully adjusted model (R.4, Table 2). Moreover, the attenuation in the coefficient for income was small, suggesting income may be particularly relevant for understanding heterogeneity in depressive symptomatology observed in the sample. In the models testing statistical interactions to examine gradients at intersections of disadvantaged socioeconomic positions (H2), a multiplicative disadvantage of low income and under-employment was observed, with the individual SEP variables still retaining significance in the model (R.1, Table 3).

These findings are consistent with studies in the general population documenting gradients in mental health by SEP (Frank et al., 2003; Krieger et al., 1997; Marmot & Wilkinson, 2005; Smith et al., 2012). The results of the current study also correspond with the results of a study of sexually active Australian gay men found that major depression was strongly associated with socioeconomic deprivation (Mao et al., 2009). A longitudinal study of MSM (who also have sex with women) also found income to be a predictor of CESD scores, alongside race/ethnicity (Friedman et al., 2014). In the current study, the race/ethnicity

covariate did not retain significance after model adjustment (results not shown); however, race/ethnicity effects (e.g., economic forms of racial/ethnic discrimination, such as in the labour market or educational system) also may be manifested via socioeconomic factors (income; education) (Krieger, 2001; Williams & Mohammed, 2009). In a study of young (ages 18–19) MSM in New York city, the effect of race/ethnicity was no longer significant after controlling for SEP in its association with mental health outcomes (depression, PTSD, and suicidality) (Storholm et al., 2013).

The current study has a number of strengths and limitations. The study utilizes a robust and publicly available secondary dataset to address knowledge gaps in exiting literature. The large sample size of the EXPLORE study provided a novel opportunity to examine gradients in reported depressive symptoms among MSM populations that are typically understudied. However, the results should be interpreted with caution. The data was collected between years 1999–2001, and it is possible that the gradients observed in our analysis may not accurately reflect the current experiences of MSM. Given the recruitment and eligibility criteria for inclusion in the EXPLORE Study, the findings may not be generalizable to the wider population of MSM, particularly HIV-infected populations, and those living outside of urban centers. An abridged version of the CESD scale provided a useful measure of depressive symptoms, but it should not be conflated with clinical diagnoses of depression.

Conclusions

The findings of the study have important implications for both research and policy. First, social inequalities researchers in studies of general populations have long recommended that SEP be treated as a construct in its own right (as opposed to a control variable) (Adler et al., 1994). This study demonstrates that SEP may be particularly important to understanding mental health outcomes in MSM samples, suggesting that this kind of approach to SEP is relevant in studies of sexual minorities. For sexual minorities, lower SEP may be concomitantly associated with greater risk of discrimination, more barriers to employment, fewer opportunities for connection to the LGB community, and therefore greater stress (Barrett & Pollack, 2005; Gamarel et al., 2012; McGarrity & Huebner, 2014). Future research, and longitudinal studies in particular, are needed to examine the pathways and mechanisms through which SEP influences mental health outcomes among sexual minorities, so that appropriate interventions may be identified and implemented. Second, policy and program efforts targeting socioeconomic barriers facing sexual minorities (e.g., institutional discrimination in employment or housing) may hold promise in reducing depressive symptoms amongst MSM. For example, the introduction or expansion of housing programs (e.g., Ruth Ellis Center, Ali Forney Center), LGBT Centers (e.g., Los Angeles LGBT Center which provides mental health and social support services, including employment support), financial aid programs (e.g., Massachusetts transgender emergency fund; LGBT student financial assistance funds), and the provision of assistance in accessing health and legal services (e.g., Gay City Health Project, California Legal Rural Assistance LGBT Program) may help to reduce the higher rates of depression among MSM of lower SEP. Some preliminary examinations of select programs and health service models for LGBT populations have been conducted (Burwick, Friend, Gates, & Durso, 2014; Sanchez, 2008). A number of best practices for mental health facilities working with LGBT clients

have been recommended on the American Psychological Association website, and an integrated approach to clinical care for MSM has been outlined (Mayer et al., 2012). However, ongoing research and evaluations are needed to identify effective programs and interventions; in particular, those that address and ameliorate the adverse effects of low SEP. Third, because MSM continue to face high levels of stigma-related stress, the development of interventions to address homophobia and heterosexism also should be examined as a means to improve mental health outcomes amongst sexual minority men (Mayer et al., 2012; Meyer, 1995).

As the results of the current study demonstrate, there are several, intersecting factors implicated in the production of a gradient in mental health outcomes amongst MSM, which reinforces the idea that no single intervention approach is likely to fully resolve this complex problem. As previous research has shown, MSM who are of low SEP may be unable to access services because of resource and financial barriers (Fredriksen-Goldsen et al., 2013; Larissa McGarrity & Huebner, 2014); they may also be unable to benefit from the resources available to gay- and bisexual- identified men due to the lower levels of identification with and access to the LGB community (Barrett & Pollack, 2005). Also, there may be complex and dynamic interactions between experiences of discrimination because of SEP and other forms of discrimination based on sexual orientation, gender identity, and race/ethnicity (Gamarel et al., 2012). While higher SEP (e.g., financial security and educational attainment) may allow some individuals to insulate themselves from exposure to sources of discrimination (McAdams-Mahmoud et al., 2014), reducing disparities in health for all sexual minorities will depend on combinations of universal (e.g., legal protection of human rights) and targeted (e.g., programs and services that are tailored to meet the mental health needs of MSM) intervention approaches.

Acknowledgments

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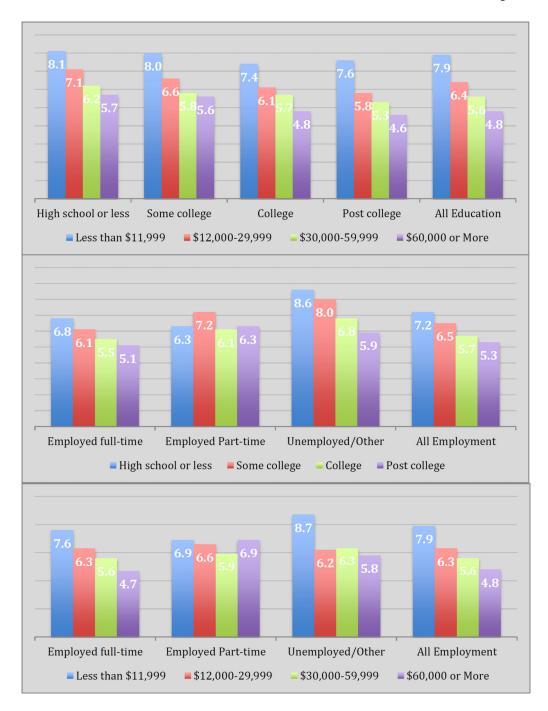
Figure 1.
CESD-SF Scores at Intersections of SEP Variables among EXPLORE Study Participants

Table 1

Characteristics of the EXPLORE Study Participants and Baseline CESD-SF Scores across Strata (n=4,277)

	Sample characteristics		CESD-SF		
	n	%[1]	Mean	95% CI	p-value[2]
Income group					
Less than $11,999	562	13.1	7.9	4.5–8.3	<0.01
$12,000–29,999	1166	27.2	6.4	6.1–6.6	<0.01
$30,000–59,999	1656	38.6	5.6	5.4–5.8	<0.01
$60,000 or More	904	21.1	4.8	4.6–5.1	Ref.
Educational attainment					
High school or less	407	9.5	7.2	6.8–7.7	<0.01
Some college	1129	26.3	6.5	6.3–6.8	<0.01
College degree	1534	35.7	5.7	5.5–5.9	0.01
Post college	1223	28.5	5.3	5.0–5.5	Ref.
Employment Status					
Unemployed/Other	622	14.5	7.2	6.8–7.5	<0.01
Employed part-time	426	9.9	6.6	6.2–7.0	<0.01
Employed full-time	3247	75.6	5.6	5.5–5.8	Ref.
Race/ ethnicity					
Black/ Not Hispanic	281	6.5	6.1	5.6–6.6	0.61
Hispanic	652	15.2	6.5	6.2–6.9	<0.01
Other/ Not Hispanic	218	5.1	6.4	5.8–7.0	0.13
White/ Not Hispanic	3112	72.5	5.8	5.6–5.9	Ref.
Age group					
16–25	817	19.0	6.8	6.5–7.1	<0.01
26–30	915	21.3	6	5.7–6.3	0.90

	Sample characteristics			CESD-SF		
	n	%[1]	Mean	95% CI	p-value[2]	
31–35	911	21.2	5.7	5.5–6.0	0.09	
>=36	1652	38.5	5.6	5.4–5.8	Ref.	
Sexual Abuse						
Yes	1723	40.1	6.5	6.3–6.8	<0.01	
No	2558	59.6	5.5	5.4–5.7	Ref.	
Geographic site						
Seattle	743	17.3	5.8	5.5–6.1	0.37	
Chicago	624	14.5	5.9	5.6–6.3	0.88	
Boston	729	17.0	6.1	5.8–6.4	0.24	
New York	737	17.2	6.4	6.1–6.7	<0.01	
Denver	726	16.9	5.6	5.3–5.9	0.02	
San Francisco	736	17.4	5.8	5.5–6.1	Ref.	

[1] Percentages may not add up due to rounding and missing values

[2] P-value for t-test comparisons with reference category

Table 2

Results of Linear Regressions Modeling Depressive Symptomatology (CESD-SF) among EXPLORE Study Participants

	Regression coefficient (*Standard error*)			
	Model R.1	Model R.2	Model R.3	Model R.4
Employment status				
Employed part-time	0.7 *** (0.22)			0.05 (0.23)
Unemployed/Other	1.4 *** (0.19)			0.7 *** (0.20)
Employed full-time	1.0			1.0
Income level				
Less than $11,999		2.8 *** (0.24)		2.2 *** (0.28)
$12,000–29,999		1.4 *** (0.20)		1.1 *** (0.20)
$30,000–59,999		0.8 *** (0.17)		0.7 *** (0.18)
$60,000 or More		1.0		1.0
Educational attainment				
High school or less			1.7 *** (0.25)	1.0 *** (0.26)
Some college			1.0 *** (0.19)	0.7 *** (0.19)
College degree			0.3 * (0.16)	0.3 (0.16)
Post college			1.0	1.0
Root MSE	4.2	4.1	4.2	4.1
Model F-test (df_1, df_2)	13.0 (14, 4221)	17.9 (15, 4213)	11.8 (15, 4218)	15.2 (20, 4206)

Notes. All models adjust for age group, race/ethnicity, history of sexual abuse, geographic site

*** $p < .001$,

** $p < .01$,

* $p < .05$

Table 3

Results of Linear Regressions with Statistical Interactions Modeling Depressive Symptomatology (CESD-SF) among EXPLORE Study Participants

	Regression coefficient (*Standard error*)			
	Model R.1	**Model R.2**	**Model R.3**	**Model R.4**
Employment status				
Employed part-time	1.7[*] (0.76)	0.5 (0.45)	0.04 (0.24)	1.8[*] (0.86)
Unemployed/Other	1.0[*] (0.51)	0.1 (0.35)	0.8[***] (0.21)	0.6 (0.57)
Employed full-time	1.0	1.0	1.0	1.0
Income level				
Less than $11,999	2.4[***] (0.42)	2.2[***] (0.28)	2.5[***] (0.55)	2.5[***] (0.56)
$12,000–29,999	1.3[***] (0.22)	1.2[***] (0.21)	0.9[**] (0.36)	1.4[***] (0.37)
$30,000–59,999	0.8[***] (0.19)	0.7[***] (0.18)	0.7[*] (0.27)	0.7[**] (0.28)
$60,000 or More	1.0	1.0	1.0	1.0
Educational attainment				
High school or less	0.9[***] (0.26)	1.1[***] (0.31)	1.0 (0.89)	1.0[*] (0.42)
Some college	0.6[***] (0.19)	0.5[*] (0.22)	0.9[*] (0.45)	0.6 (0.46)
College degree	0.3 (0.16)	0.3 (0.18)	0.2 (0.30)	0.1 (0.30)
Post college	1.0	1.0	1.0	1.0
Interaction terms (p-values for omnibus tests)				
Employment[*]Income……	p<0.01	……………	……………	p=0.01
Employment[*]Education…	…………	p=0.08	……………	p=0.31
Income[*]Education………	…………	……………	p=0.92	p=0.97
Root MSE	4.1	4.1	4.1	4.1
Model *F*-test (df_1, df_2)	12.5 (26, 4200)	12.1 (26, 4200)	10.6 (29, 4197)	8.6 (39, 4187)

Notes. All models adjust for age group, race/ethnicity, history of sexual abuse, geographic site

[***] p < .001,

[**] p < .01,

[*] p < .05