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Traumatic experiences, major life stressors, and self-reporting a physician-given fibromyalgia diagnosis

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Abstract

The contribution of stress to the pathophysiology of fibromyalgia has been the subject of considerable debate. The primary purpose of the present study was to evaluate the relationship between traumatic and major life stressors and a fibromyalgia diagnosis in a large group of older women and men. Data were from the federally-funded Biopsychosocial Religion and Health Study, and subjects were 10,424 of the 10,988 survey respondents—two-thirds women and one-third men—providing responses to a fibromyalgia question. Average age was 61.0 ± 13.5 years. A physician-given fibromyalgia diagnosis in a subject's lifetime was reported by 3.7% of the sample, 4.8% of the women and 1.3% of the men. In two multivariable logistic regression models (all respondents and women only, controlling for age, sex, race/ethnicity, and education), two traumatic experience types (sexual and physical assault/abuse) were associated with a fibromyalgia diagnosis. Two other trauma types (life-threatening and emotional abuse/neglect) and major life stress experiences were not. The highest odds ratios in both models were those for sexual assault/abuse followed by physical assault/abuse. The relationship between age and fibromyalgia was curvilinear in both models (odds ratios rising until approximately age 63 and declining thereafter). In the all-subjects model, being a woman increased the odds of a fibromyalgia diagnosis, and in both models, fibromyalgia was associated with being White (versus non-White) and lower education. We recommend that researchers investigate the relationship between stress and fibromyalgia in concert with genetic and biomarker studies.

Keywords

Fibromyalgia; Trauma; Stress; Sexual abuse; Physical abuse

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1. Introduction

Fibromyalgia is a complex and difficult-to-treat medical condition characterized by widespread musculoskeletal pain, decreased pain threshold, and multiple “tender-points” in all four body quadrants (Clauw and Taylor-Moon, 2006; Chakrabarty and Zoorob, 2007; National Institute of Arthritis and Musculoskeletal and Skin Diseases, 2007; Abeles et al., 2008; Wolfe and Rasker, 2008). Prominent associated symptoms/comorbidities include chronic fatigue, sleep disturbances, mood (depression and anxiety) disorders, and irritable bowel syndrome (Bradley, 2008; Schweinhardt et al., 2008; Wolfe and Rasker, 2008).

Fibromyalgia symptoms have been described for centuries and given various labels (e.g., muscular rheumatism and fibrositis) (Inanici and Yunus, 2004). The modern term, fibromyalgia, was coined in the mid-1970s, but it was not until the 1980s that its present formulation was established and, to some extent, legitimized (Yunus, et al., 1981; Goldenberg, 1987; Inanici and Yunus, 2004). In 1990, the American College of Rheumatology established research diagnostic criteria (pain and tender point evaluations), which now are used to diagnose the disorder (Wolfe et al., 1990). Although recognized as a legitimate clinical entity by, for example, the American College of Rheumatology, the American Medical Association, the National Institute of Arthritis, Musculoskeletal, and Skin Diseases, and the World Health Organization (Starlanyl and Copeland, 2001), fibromyalgia, however, is a disputed medical condition (Bohr, 1996; Wolfe and Rasker, 2008; Wolfe, 2009). Many believe, for example, that fibromyalgia is not a disease but rather a collection of symptoms (overlapping most other “medically unexplained” syndromes) that place people at the upper end of a “pain-distress” continuum (Wolfe and Rasker, 2008). Moreover, Wolfe and Rasker (2008) also note that establishing a fibromyalgia “cut-point” is quite arbitrary and that such a cut-point has been made only for political and financial, but not, scientific reasons.

Fibromyalgia prevalence figures in the United States are based on a single study conducted in the early 1990s in Wichita, Kansas (sample approximately 88% White; Wolfe et al., 1995). They estimated that fibromyalgia was affecting 2% (3.7 million people) of the United States population (18 years and older), 3.4% of women and 0.5% of men. In women, prevalence estimates increased dramatically with age (as high as 7.0% in women in the 60 to 79 year age range). Based on 2005 Census Bureau adjustments, Lawrence and colleagues (2008), estimated the number of Americans with fibromyalgia to be approximately 5 million. What causes fibromyalgia is not known, and other than pain testing for making a diagnosis and following clinical course, there are no other biomarkers for susceptibility, diagnosis, or clinical outcome (Dadabhoy et al., 2008). Several factors appear to contribute to fibromyalgia’s pathophysiology: genetics (familial predisposition), abnormal neuroendocrine and autonomic nervous system function (disordered central pain processing), and environmental triggers (mechanical/physical trauma and psychosocial stressors) (Bradley, 2008). The relationship between reporting a fibromyalgia diagnosis and environmental triggers—specifically trauma and major life stressors—is the subject of the present study.

Trauma and major life stress likely do not cause fibromyalgia *per se*; some propose that in genetically susceptible people, early life and prolonged trauma/stress in adulthood affects brain modulatory circuitry of both pain and emotions (Crofford, 2007; Bradley, 2008; Schweinhardt et al., 2008), which could account for fibromyalgia patients’ enhanced pain responses and co-occurring symptoms. A critical review of studies on the relationship between traumatic stress (childhood abuse) and various chronic pain conditions in adulthood, however, supports an association in some cross-sectional, but not prospective, studies (Raphael et al., 2004). Moreover, although individual studies on the relationship between emotional, physical, and sexual abuse and specifically a fibromyalgia diagnosis are intriguing (e.g., Boisset-Pioro et al., 1995; Walker et al., 1997; Van Houdenhove et al., 2001; Ciccone, et al., 2005), reviews across

all studies are inconclusive (Romans and Cohen, 2008; Russell and Raphael, 2008). That some traumatic experiences are related to fibromyalgia in one study and not in another, however, is unsurprising, given that sampling and methods vary considerably from study to study. Clearly needed are large, community-based (versus small, clinical) studies, with (a) sufficient numbers of individuals with fibromyalgia (given its relatively low base rate in the population) and (b) assessment of many and varied trauma/stress experiences.

The primary purpose of the present study is to address this need and evaluate the relationship between traumatic and major life stressors and self-reporting a physician-given fibromyalgia diagnosis in a relatively large group of older women and men.

2. Method

2.1. Data Source

Data were from the Biopsychosocial Religion and Health Study (BRHS; Lee et al., 2008), which randomly sampled participants from the Adventist Health Study (AHS-2) – a cohort study of approximately 96,000 Seventh-day Adventists investigating cancer, diet, and lifestyle (Butler et al., 2008). Seventh-day Adventists are evangelical Protestants who include healthy lifestyle beliefs in their religious doctrine; as such, 1% smoke, 7% consume alcohol, and only 47% eat meat. In Butler and colleagues (2008), AHS-2 recruitment methods and sampling strategy are described; briefly, local church pastors of the approximately 1,000 Black and 3,500 non-Black Adventist congregations in North America selected a local church member to coordinate AHS-2 recruitment materials for their congregation. Moreover, a nationwide recruitment campaign included articles in national and regional church magazines and programs on Adventist television networks encouraging study enrollment. Those who enrolled but did not return a questionnaire received up to three mailed reminders.

From the resulting 96,000 AHS-2 participants, the BRHS team randomly sampled 20,000 Adventists in the U.S. and sent them an invitation to participate with a 20-page religion and health questionnaire followed by up to three mailed reminders (Lee et al., 2008). Among the study's aims were to compare Black and White respondents on several stress, religion, and health variables, and, thus, one recruitment goal was to enroll at least 3400 Blacks and 6600 Whites. Data collection occurred between September, 2006 and August, 2007, with a return of 10,988 usable questionnaires.

2.2. Subjects

Subjects were 10,424 of the 10,988 survey respondents who provided yes or no responses to the fibromyalgia question, 67.3% women and 32.6% men. Average age was 61.0 years ($SD = 13.5$). The majority of the participants were non-Hispanic White (60.2%) or Black (34.3%), and the others were Hispanic (2.9%), Asian (2.3%), or mixed race/ethnicity (0.4%). A substantial percentage (43.4%) had college or post-graduate degrees, and approximately half had household incomes of \$51,000 or more.

2.3. Measures

2.3.1. Fibromyalgia—In the fibromyalgia subgroup were respondents answering 'yes' to a yes-no question, "Has a physician ever diagnosed you with fibromyalgia." The non-fibromyalgia subgroup included those answering 'no' to that same question.

2.3.2. Fibromyalgia symptoms and comorbidities—We measured four fibromyalgia symptoms—pain, energy, sleep, and depression severity—and two comorbidities, lifetime diagnoses of depression and irritable bowel syndrome. 'Pain interfering with life' was assessed with a single bodily pain item from the SF-12 version 2 ("During the past 4 weeks, how much

did pain interfere with your normal work, including both work outside the home and housework?”), rated on a five-point scale ranging from not at all to extremely (Ware et al., 2002). ‘Having a lot of energy’ was assessed with a vitality item from the SF-12 version 2 (“How much of the time during the past four weeks did you have a lot of energy?”), rated on a five-point scale ranging from all of the time to none of the time (Ware et al., 2002). ‘Poor sleep’ was represented by an item average for three sleep quality questions (trouble falling asleep, waking too early, and waking in the middle of the night) during the past four weeks, each rated on a four-point scale (1 = rarely or never, 4 = almost every day; Ohayon, 2002). For depression severity, we used the 11-item version of the Center for Epidemiological Studies-Depression Scale (CES-D) (each item rated on a three-point scale, ranging from 0 or rarely/none to 2 or much/most of the time) (Kohout et al., 1993). The comorbidities, depression and irritable bowel syndrome, each were coded yes-no, based on subjects’ answers to the questions, has a physician ever diagnosed you with depression or irritable bowel syndrome.

2.3.3. Trauma and major life stressors—Items were taken from a modified version of the Trauma Assessment in Adults instrument and Ryff and colleagues’ child abuse scales (Cusak et al., 2004; Ryff et al., 2004; McHugo et al., 2005). Respondents were asked about various types of “stressful or difficult” life events, which we broadly classified as either a traumatic experience or a major life stressor. The trauma items represent experiences that likely involved actual or threatened death (actual death of another person) or serious injury (or threat to one’s physical integrity) and were accompanied by intense reactions (e.g., fear, helplessness, and horror) (Lazarus and Folkman, 1984; Shalev, 1996; American Psychiatric Association, 2000). We further classified traumatic experiences by type: (a) life-threatening (four questions: war, bad accident, natural disaster, witnessing someone seriously injured or killed), (b) emotional abuse/neglect (two questions about mother or father insulting, swearing at, or ignoring), (c) physical assault/abuse (two assault questions, actual and threatened in one’s lifetime; four abuse questions, mother or father pushing, slapping, throwing objects, kicking, biting, striking with an object), and (d) sexual assault/abuse (three questions, actual and threatened in one’s lifetime).

The major life stressors are serious illness (e.g., cancer, leukemia, AIDS, and multiple sclerosis), abortion (self/intimate partner), miscarriage (self/intimate partner), divorce/separation, homelessness, and death of a child. For each of these trauma/stressor variables, subjects were given a score of 0 in the category if their answers to all of the questions in that category were no/never (and given a score of 1, if otherwise).

2.4. Data Analyses

Bivariate—To compare respondents in the fibromyalgia and no fibromyalgia subgroups on biographic/demographic factors and fibromyalgia symptoms and comorbidities, we used t-tests for independent samples and chi square tests. For all tests of statistical significance, we set alpha at 0.05.

Multivariable logistic regression—Our dependent variable was reporting a fibromyalgia diagnosis (yes-no), and our main independent variables were trauma (life-threatening, emotional abuse/neglect, physical assault/abuse, and sexual assault/abuse) and major life stressors. Control variables were age, race/ethnicity, education, and income (categories are shown in Table 1). To evaluate model fit, we used the Hosmer and Lemshow goodness-of-fit test. A p -value > 0.05 suggests that model prediction does not significantly differ from the observed. Our preferred models are those with available data, which we present. We ran the models a second time with imputed data (multiple imputation, conditional on variables in the models) as well, and similarities and differences between the imputed and available data models are noted.

Multivariate risk differences—To calculate multivariate risk differences, predicted probabilities of a fibromyalgia diagnosis were calculated for those with and without each of the trauma variables, holding other covariates constant at their mean value (education was set at some college or less) in multivariate logistic regression models. Standard errors for differences of predicted probabilities were computed using the delta method.

3. Results

3.1. Fibromyalgia diagnosis

A physician-given fibromyalgia diagnosis (in one's lifetime) was reported by 3.7% of the sample, 4.8% of the women and 1.3% of the men. The percentages for White subjects only (more comparable to the established figures) are 4.5% overall, 6.2% women, and 1.5% men; and for non-Whites, respectively, 2.3%, 2.7%, and 0.8%.

3.2. Bivariate comparisons

Biographic/demographic factors by fibromyalgia diagnosis for women, men, and all respondents are shown in Table 1. (In Table 1–Table 3, due to rounding, not all percentages add up to 100.0, and the Total columns include subjects with missing gender data). The relationship between age and fibromyalgia diagnosis was not linear (details given below). Among all subjects, fibromyalgia was more common among Whites (based on a chi square test of Whites versus Black, Hispanic, Asian, and mixed race respondents combined). It also was more common among respondents with some college or less and among those with lower incomes; and less common among respondents with college and postgraduate degrees.

Fibromyalgia symptoms for women, men, and all respondents are shown in Table 2. Within all groups, subjects reporting a fibromyalgia diagnosis had more pain, less energy, worse sleep, and more/severe depressive symptoms. Moreover, those with a fibromyalgia diagnosis were more likely to report having or once having been diagnosed with depression and irritable bowel syndrome. These relationships all were statistically significant ($p < 0.0001$).

Trauma and major life stressors for women, men, and all respondents are shown in Table 3. In general, those respondents reporting a fibromyalgia diagnosis had experienced more trauma and major life stress in their lives. Among women, the differences between the fibromyalgia and no fibromyalgia subgroups across all trauma and major life stressor types were statistically significant. For all subjects, the differences between the fibromyalgia and no fibromyalgia subgroups were statistically significant for all but one trauma type, life-threatening. Among men, the differences between the fibromyalgia and no fibromyalgia subgroups were not significant. Given the small numbers of men and the low fibromyalgia base rate among men, the conclusions that we may draw about men are tentative, at best.

3.3. Multivariable logistic regression

We ran two sets of models, one for all subjects and one for women only. We used logistic regression to examine the linearity assumption between age and fibromyalgia diagnosis. The resulting plot revealed an inverse U-shaped relationship on the logit scale; thus, a quadratic term for age was added to the model. We tested models with education and income (significant in the bivariate analysis), but only education bore a statistically significant relationship to fibromyalgia diagnosis. We, thus, used education as our socioeconomic status proxy.

For both all subjects and women only, the models' estimates fit the data well (Hosmer and Lemshow goodness-of-fit test p -values > 0.05). The quadratic term for age was significant in both the all subjects and women only models. Figure 1 shows the estimated odds ratios (OR) for fibromyalgia diagnosis at various ages for all subjects. The reference age is 61 (the overall

sample mean age), and the odds of having a fibromyalgia diagnosis were highest at approximately age 63. The women-only ORs at various ages were almost identical to the all subjects ORs.

ORs for the other variables in the two models are shown in Table 4. The references for gender, race/ethnicity, and education were, respectively, female, White (non-White subjects were grouped for these analyses), and some college or less. In the all subjects model ($n = 9,644$; complete information was available for 9,644 of the 10,988 subjects, 87.8%), male and non-White subjects were less likely to report a fibromyalgia diagnosis (respective ORs = 0.26 and 0.42) as were those with master's/doctoral degrees (OR = 0.60). Sexual assault/abuse and physical assault/abuse, on the other hand, were associated with an increased likelihood of reporting a fibromyalgia diagnosis (ORs = 1.41 and 1.38, respectively); education-bachelor's degree or less, life-threatening trauma, emotional abuse/neglect, and major life stressors were not significant. In the women only model ($n = 6,463$ of 7,259 had complete data available, 89.0%), the results were similar (the ORs were roughly comparable in both models). The highest ORs in both the all-subjects and women-only models were those for sexual abuse/assault and physical abuse/assault (ranging across models from 1.34 to 1.42).

There were no material differences between the two models summarized above and the corresponding two with imputed data. In the models with income (rather than education), however, the highest income category was significant (OR = 0.69), whereas it was not significant in the available data models.

3.4. Risk differences

Risk differences are shown in Table 5 for all subjects and for women only. For all subjects, there were approximately 0.7 percentage point increases in risk with sexual assault/abuse and physical assault/abuse, and for women, approximately 1 percentage point increases (again, with sexual assault/abuse and physical assault/abuse).

4. Discussion

Among all respondents and women only, two types of traumatic experiences—sexual assault/abuse and physical assault/abuse—were associated with a fibromyalgia diagnosis, whereas life-threatening trauma, emotional abuse/neglect, and major life stress were not. The highest odds ratios in both models were those for sexual and physical assault/abuse. Traumatic stress bore the stronger relationship to fibromyalgia compared to major life stress (as operationalized in the present study), and among the traumatic stressors, the two personal/physical contact types (sexual and physical) had stronger relationships to fibromyalgia. Our data are consistent with studies showing that the consequences of trauma may be expressed as chronic musculoskeletal pain, fatigue as well as sleep and mood disturbances, all cardinal features of fibromyalgia (Crofford, 2007; Bradley, 2008; Schweinhardt et al., 2008; Wolfe and Rasker, 2008). It is important to note, however, that although the trauma versus major life stress distinction we have made is defensible, and to some extent, conventional, there is not universal agreement on the appropriateness of this distinction (Shalev, 1996).

A physician-given fibromyalgia diagnosis was reported by 3.7% of the sample, 4.8% of the women and 1.3% of men. The figures for White individuals, which are more comparable to the widely-cited prevalence estimates (Wolfe et al., 1995) were 4.4% total, 6.2% women, and 1.5% men, all higher than the Wolfe and colleagues' (1995), 2.0% total, 3.4% women, and 0.5% men. The figures reported herein likely are higher for two reasons: (a) they reflect fibromyalgia in one's lifetime, not point-in-time and (b) our sample was older (slightly more than three-quarters of our subjects were 50 years and older versus approximately half of Wolfe and colleagues' normative sample). Also, relatively high percentages of our sample had

experienced personal trauma in their lifetime (Table 3) (which, in turn, was associated with fibromyalgia), but we do not have comparative trauma/stress data for the normative sample.

The bulk of the research on fibromyalgia has evaluated women only. In the present study, with the exception of percentages reporting fibromyalgia, the differences between women and men were unremarkable with respect to fibromyalgia symptoms and comorbidities (Table 2). Regarding trauma/major life stressors (Table 3), men had experienced more life-threatening trauma, whereas women had experienced more sexual assault/abuse. Among men, however, differences in traumatic and major life stress between those in the fibromyalgia versus no fibromyalgia subgroups were not statistically significant. Given the small number of men with fibromyalgia (43 in the total sample), however, we have only modest confidence in the stability/interpretability of these patterns.

Race/ethnicity generally is not listed as a risk factor for fibromyalgia (Chakrabarty and Zoorob, 2007). In the present study, however, fibromyalgia rates were considerably lower among non-White respondents. Non-White subjects were on average younger (57.9 versus 63.8 years); specifically, 30.3% of the non-Whites compared to 18.5% of the Whites were under age 50. With respect to education, individuals with master's or doctoral degrees were much less likely to report fibromyalgia than were those with less education.

In the present sample, the odds of self-reporting a fibromyalgia diagnosis increased until approximately age 63 and declined thereafter, whereas Wolfe and colleagues (1995) reported rate increases through age 79 as did Branco and colleagues (2009). In the latter study, however, with data from France, Portugal, Spain, Germany, and Italy, the authors also reported a curvilinear relationship between age and fibromyalgia. This curvilinear relationship appears quite consistently across studies, although the age that the decrease begins differs. In two studies, for example, the decrease occurred in the 70s (Wolfe et al., 1995; Branco et al., 2009), whereas in four studies, the decrease in fibromyalgia reports occurred in the 60s, just after midlife, which is similar to our data (Makela and Heliovaara, 1991; White et al., 1999; Carmona et al., 2001; Senna et al., 2004). Although the reason for the drop off in fibromyalgia reports with age is unclear (may be decreased incidences or inadequate diagnoses), the curvilinear relationship shown here is consistent with other samples.

4.1 Study limits

Chief among our study limits are fibromyalgia diagnosis, trauma and major life stressor self-reports. Although subjects were asked whether a physician had given them a fibromyalgia diagnosis (life-to-date), we have no data on how these diagnoses were made. Moreover, this is an older sample, and the modern term, fibromyalgia, was not introduced until the mid-1970s, and it was not until the 1980s and 1990s that physicians evaluated fibromyalgia patients more consistently. As such, we cannot be certain that our figures are accurate, and if not, whether in fact they are low. Our data provide, at least, moderate support for the validity of this diagnosis, as the rates that we report are reasonable, given (a) sample age and composition, (b) the rate for women was higher than that of men, and (c) individuals reporting a fibromyalgia diagnosis had more pain, less energy, worse sleep, more/severe depressive symptoms, and life-to-date diagnoses of depression and irritable bowel syndrome.

Also, the trauma/stressor variables all are self-report; none of these experiences were corroborated. Moreover there is the potential for systematic reporting bias; specifically we do not know whether fibromyalgia patients under-report (because they are attending to physical illness causes) or over-report (because they are seeking an illness cause) physical and sexual abuse. The self report bias, however, likely creates an underreporting of a socially unacceptable experience, such as child abuse or violence exposure (Ruiz-Perez et al., 2009), which may have weakened our associations.

Moreover, we were not able to make a distinction between acute versus chronic stress. Acute versus chronic stress can be a particularly important distinction to make, and it is especially important in studies of the consequences of sexual and physical abuse (Herman, 1992; Ruiz-Perez, et al., 2009). Other potentially useful distinctions that we were unable to make were early versus late-life trauma/stress and individual perceptions, such as the degrees of predictability and control for given experiences or the extent to which stressful/traumatic experiences had affected individuals' lives. We also had no data on whom, if anyone had been diagnosed with PTSD following a traumatic experience.

Finally, our sample is unique. Almost all (99%), for example, were members of the Seventh-day Adventist Church and Blacks were oversampled. How sample uniqueness may have affected our results is not obvious; nevertheless, one must be cautious about generalizing to other groups.

4.2. Conclusion

Despite these limits, it seems reasonable to conclude that trauma—particularly physical and sexual assault/abuse—are associated with self-reporting a physician-given fibromyalgia diagnosis. We recommend that researchers continue to invest in trauma/stress-fibromyalgia research. This work, coupled with genetic and biomarker studies (Bradley, 2008; Dadabhoy et al., 2008), could lead to a better understanding of fibromyalgia, and importantly, more effective treatment (Abeles et al., 2008). We recommend, too, that researchers study trauma and stress and fibromyalgia in men and racial/ethnic minority groups.

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Figure 1.

Estimated Odds Ratios for Age and a Fibromyalgia Diagnosis, All Subjects

Note: Boxes represent the odds ratio for a given age. Shaded area is the 95% confidence region.

Table 1

Age, Race/Ethnicity, Education, and Income by Fibromyalgia Diagnosis

	Women*				Men**				Total*			
	Yes		No		Yes		No		Yes		No	
	n	%	n	%	n	%	n	%	n	%	n	%
<u>Age</u>												
<50	51	15.9	1678	26.2	3	7.3	701	21.7	56	15.1	2407	24.4
50-59	92	28.8	1555	24.2	9	22.0	727	22.5	103	27.7	2321	23.5
60-69	98	30.6	1485	23.1	9	22.0	772	23.9	110	29.6	2305	23.4
70+	79	24.7	1699	26.5	20	48.8	1036	32.0	103	27.7	2835	28.7
Mean ± SD	61.6	+ 11.3	60.2	+ 13.5	67.5	+ 11.7	62.0	+ 13.3	62.4	+ 11.5	60.9	+ 13.5
<u>Race/Ethnicity</u>												
White, non-Hispanic	238	75.1	3624	55.9	33	78.6	2194	67.2	277	74.9	5943	59.6
Black	67	21.1	2484	38.3	7	16.7	902	27.6	79	21.4	3470	34.8
Hispanic	10	3.2	189	2.9	1	2.4	93	2.9	11	3.0	288	2.9
Asian	1	0.3	159	2.5	1	2.4	67	2.1	2	0.5	231	2.3
Mixed	1	0.3	26	0.4	0	0.0	9	0.3	1	0.3	35	0.4
<u>Education</u>												
Some college or less	229	70.9	3862	59.9	17	40.5	1504	46.1	253	67.5	5496	55.3
Bachelor's degree	64	19.8	1552	24.1	8	19.1	739	22.6	74	19.7	2331	23.5
Master's/doctoral degree	30	9.3	1039	16.1	17	40.5	1022	31.3	48	12.8	2106	21.2
<u>Family Income</u>												
<\$10,000	26	9.6	398	7.6	0	0.0	246	8.2	27	8.5	662	7.9
\$11,000-20,000	40	14.7	549	10.4	5	13.2	216	7.2	46	14.5	782	9.3
\$21,000-30,000	43	15.8	598	13.2	7	18.4	318	10.6	51	16.1	1039	12.3
\$31,000-50,000	64	23.5	1205	22.9	9	23.7	632	21.1	75	23.7	1874	22.3
\$51,000-75,000	45	16.5	950	18.0	12	31.6	600	20.1	58	18.3	1574	18.7
\$76,000-100,000	26	9.6	648	12.3	1	2.6	415	13.9	27	8.5	1078	12.8
\$101,000-200,000	20	7.4	652	12.4	4	10.5	432	14.5	25	7.9	1101	13.1
>\$200,000	8	2.9	172	3.3	0	0.0	130	4.4	8	2.5	310	3.7

Note. The relationship between age and fibromyalgia diagnosis (yes-no) is not linear.

* Differences between fibromyalgia “yes-no” groups were statistically significant ($p < 0.05$) for race/ethnicity, education, and income.

** Differences between fibromyalgia “yes-no” groups were statistically significant for income ($p < 0.05$).

Table 2

Pain, Energy, Sleep, and Depression by Fibromyalgia Diagnosis

	Women*				Men*				Total*			
	Yes		No		Yes		No		Yes		No	
	n	%	n	%	n	%	n	%	n	%	n	%
<u>Pain Interfering with Life</u>												
Not at all	52	16.2	3139	48.4	8	18.6	1790	54.8	63	16.8	5013	50.3
A little bit	54	16.8	1684	26.0	13	30.2	834	25.5	69	18.4	2572	25.8
Moderately	73	22.7	779	12.0	10	23.3	293	9.0	84	22.3	1103	11.1
Quite a bit	94	29.2	567	8.8	10	23.3	198	6.1	106	28.2	798	8.0
Extremely	49	15.2	312	4.8	2	4.7	151	4.6	54	14.4	478	4.8
Mean ± SD	3.1	± 1.3	2.0	± 1.2	2.7	± 1.2	1.8	± 1.1	3.1	± 1.3	1.9	± 1.2
<u>Having a Lot of Energy</u>												
All of the time	6	1.9	474	7.3	2	4.7	327	10.0	8	2.1	815	8.2
Most of the time	73	22.7	3004	46.3	8	18.6	1707	52.4	82	21.8	4804	48.2
Some of the time	101	31.4	2029	31.3	17	39.5	842	25.8	123	32.7	2948	29.6
A little of the time	81	25.2	744	11.5	12	27.9	293	9.0	97	25.8	1064	10.7
None of the time	61	18.9	232	3.6	4	9.3	90	2.8	66	17.6	330	3.3
Mean ± SD	3.4	± 1.1	2.6	± 0.9	3.2	± 1.0	2.4	± 0.9	3.4	± 1.1	2.5	± 0.9
<u>Poor Sleep</u>												
Item (3) average ± SD	2.1	± 0.8	1.7	± 0.7	2.1	± 0.6	1.6	± 0.7	2.1	± 0.8	1.7	± 0.7
<u>Depression (CES-D)</u>												
11-item total ± SD	7.1	± 6.0	4.4	± 3.0	6.9	± 4.7	3.7	± 3.9	7.1	± 5.1	4.2	± 4.2
<u>Depression Diagnosis</u>												
Yes	144	45.4	896	13.9	16	38.1	286	8.8	165	44.6	1204	12.1
No	173	54.6	5558	86.2	26	61.9	2972	91.2	205	55.4	8716	87.9
<u>Irritable Bowel Diagnosis</u>												
Yes	91	28.6	505	7.8	11	26.8	174	5.3	105	28.5	691	7.0
No	227	71.4	5961	92.2	30	73.2	3094	94.7	264	71.5	9256	93.1

* Differences between fibromyalgia "yes-no" groups were statistically significant ($p < 0.0001$) for all four symptoms and the two diagnoses ($p < 0.0001$).

Table 3

Trauma/Major Life Stressors by Fibromyalgia Diagnosis

	Women*				Men**				Total***			
	Yes		No		Yes		No		Yes		No	
	n	%	n	%	n	%	n	%	n	%	n	%
<u>Trauma, Life-threatening</u>												
None	132	40.7	3165	48.8	11	25.6	983	30.2	147	39.0	4246	42.6
One or More	192	59.3	3325	51.2	32	74.4	2268	69.8	230	61.0	5712	57.4
<u>Trauma, Emotional Abuse/Neglect</u>												
None	171	52.6	4045	62.2	25	61.0	2154	65.9	201	53.3	6344	63.5
From one or both parents	154	47.4	2454	37.8	16	39.0	1117	34.2	176	46.7	3645	36.5
<u>Trauma, Physical Assault/Abuse</u>												
None	150	46.0	3667	56.0	19	45.2	1850	56.3	172	45.4	5643	56.2
One or More	176	54.0	2880	44.0	23	54.8	1435	43.7	207	54.6	4394	43.8
<u>Trauma, Sexual Assault/Abuse</u>												
None	166	52.0	4129	64.3	35	85.4	2830	87.3	208	56.2	7115	72.1
One or More	153	48.0	2291	35.7	6	14.6	413	12.7	162	43.8	2757	27.9
<u>Major Life Stressors</u>												
None	93	28.8	2456	37.9	14	32.6	1249	38.4	110	29.3	3785	38.0
One or More	230	71.2	4030	62.1	29	67.4	2008	61.7	266	70.7	6175	62.0

* Differences between fibromyalgia "yes-no" groups were statistically significant ($p < 0.01$) for all five trauma-stressor groupings.

** No differences between fibromyalgia "yes-no" groups were statistically significant.

*** Differences between fibromyalgia "yes-no" groups were statistically significant ($p < 0.05$) for all but Trauma, Life-threatening.

Table 4

Multivariable Logistic Regression: Odds Ratios for Fibromyalgia Diagnosis, Yes-No

	<u>Women and Men</u> [*]	<u>Women</u> ^{**}
	<i>Odds Ratio, 95% Confidence Interval</i>	<i>Odds Ratio, 95% Confidence Interval</i>
Gender (reference = female)	0.26, 0.19 – 0.37	
Race (reference = white)	0.42, 0.33 – 0.55	0.41, 0.32 – 0.54
Education, Bachelor's Degree (reference = ≤ some college)	0.80, 0.60 – 1.05	0.76, 0.57 – 1.02
Education, Master's/Doctoral Degree (reference as above)	0.60, 0.42 – 0.86	0.47, 0.30 – 0.73
Trauma, Life-threatening	1.17, 0.92 – 1.47	1.19, 0.93 – 1.52
Trauma, Emotional	1.16, 0.90 – 1.49	1.16, 0.88 – 1.52
Abuse/Neglect		
Trauma, Physical Assault/Abuse	1.38, 1.07 – 1.78	1.34, 1.02 – 1.76
Trauma, Sexual Assault/Abuse	1.41, 1.11 – 1.80	1.42, 1.11 – 1.83
Major Life Stressors	1.26, 0.98 – 1.61	1.21, 0.93 – 1.58

* N=9644, fibromyalgia cases = 341.

** N=6463, fibromyalgia cases = 302.

Models also controlled for age and age squared (see Figure 1); statistically significant ($p < 0.05$) odds ratios in boldface type.

Table 5**Multivariate Risk Differences**

<u>All subjects</u>	<i>Risk Difference</i>	<i>95% Confidence Interval</i>
Trauma, Life-threatening	0.0030	−0.0017 – 0.0078
Trauma, Emotional Abuse/Neglect	0.0029	−0.0025 – 0.0082
Trauma, Physical Assault/Abuse	0.0069	0.0005 – 0.0132
Trauma, Sexual Assault/Abuse	0.0075	0.0010 – 0.0140
Major Life Stressors	0.0047	−0.0006 – 0.0100
<u>Women</u>		
Trauma, Life-threatening	0.0052	−0.0026 – 0.0131
Trauma, Emotional Abuse/Neglect	0.0045	−0.0043 – 0.0132
Trauma, Physical Assault/Abuse	0.0102	0.0001 – 0.0204
Trauma, Sexual Assault/Abuse	0.0118	0.0015 – 0.0220
Major Life Stressors	0.0059	−0.0025 – 0.0143

Predicted probabilities of a fibromyalgia diagnosis were calculated for those with and without each of the trauma variables, holding other covariates constant at their mean value (education was set at some college or less) in multivariate logistic regression models.