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ORIGINAL ARTICLE

Using Marital Status and Continuous Marital Satisfaction Ratings to Predict Depressive Symptoms in Married and Unmarried Women With Systemic Sclerosis: A Canadian Scleroderma Research Group Study

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Objective. **Married persons have, on average, better mental health than nonmarried persons. Among married persons, marital satisfaction is associated with better mental health. Studies on mental health in married and nonmarried persons that consider marital satisfaction have categorized patients as satisfied versus unsatisfied, which reduces statistical power and does not generate clinically useful information on mental health across the satisfaction spectrum. Our objective was to demonstrate a novel regression approach to evaluate mental health in women with systemic sclerosis (SSc), comparing married and unmarried women, accounting for continuously measured marital satisfaction.**

Methods. **Depressive symptoms were assessed using the Center for Epidemiologic Studies Depression Scale (CES-D) and marital satisfaction with the Dyadic Adjustment Scale-7. A single multiple linear regression model was used to predict CES-D scores from marital status and, among married women, continuously measured marital satisfaction, controlling for demographic and clinical characteristics.**

Results. **Of 725 women, 494 (68%) were married or living as married. On average, married women had mean CES-D scores that were 2.0 points (0.19 SDs) lower than unmarried women ($P = 0.013$). Among married women, a 1.0 SD increase in marital satisfaction was associated with a 2.2 point (0.21 SDs) decrease in CES-D scores ($P < 0.001$). Married women whose marital satisfaction scores were below the 19th percentile had greater predicted depressive symptoms than unmarried women. Married women's predicted CES-D scores ranged from 6.7 points lower to 6.9 points higher than those of unmarried women, depending on marital satisfaction.**

Conclusion. **Comparisons of mental health in married and unmarried patients with rheumatic diseases should include continuously measured marital satisfaction.**

INTRODUCTION

People who are married or in marriage-like relationships report, on average, better mental health than those who are not (1). In rheumatology settings, better self-reported mental health outcomes have been reported for married patients compared with unmarried patients in rheumatoid arthritis, lupus, chronic musculoskeletal pain, and sys-

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Significance & Innovations

- Previous studies that have compared mental health between married and unmarried patients in multivariate prediction models have either ignored marital satisfaction or have dichotomized marital satisfaction, which reduces statistical power and minimizes clinically important differences in mental health across the marital satisfaction spectrum.
- This study demonstrates how to integrate a continuous predictor of marital satisfaction into models that include both married and unmarried patients, in order to estimate influence on important mental health outcomes, which has not been done previously.
- On average, married women with systemic sclerosis (SSc) had significantly lower depressive symptom scores than unmarried women with SSc, but this magnitude was much smaller than the difference in depressive symptom scores across the spectrum of marital satisfaction.
- Married women with SSc whose marital satisfaction scores were below the 19th percentile had similar or greater predicted depressive symptom scores than unmarried women with SSc; this is something that could not have been determined if satisfaction were dichotomized with a median split or another cut point, as has been done in previous studies.

temic sclerosis (SSc), for example (2–5). In SSc, a rare multisystem connective tissue disease that affects the skin and internal organs and is associated with significantly reduced quality of life (6,7), unmarried patients report significantly higher levels of depressive symptoms than married patients (4).

Among married people, poor marital quality and low marital satisfaction are consistently associated with worse mental health symptoms and reduced ability to cope with serious medical illnesses (8–12). Most studies of the association between marital quality and mental health, however, have focused only on individuals who are married or in marriage-like relationships (9). Few studies have integrated marital status with marital quality or satisfaction simultaneously in prediction models in order to compare mental health in people with different levels of marital quality to mental health in unmarried individuals.

We identified 3 studies that have used multivariate prediction equations to assess mental health outcomes in married and unmarried participants, including an assessment of marital satisfaction or quality among married participants (13–15). Two studies classified marital satisfaction dichotomously, based on a sample-specific median split of relationship satisfaction scores (13,14). In one (13), a population-based study of more than 3,500 respondents from Australia, men and women in the top half of marital satisfaction scores had better mental health than their single peers, but men and women in the bottom half did not. Similarly, in the second study (14), which included 251 women from the US with chronic pain due to osteoarthritis or fibromyalgia, women in the top half of relationship satisfaction scores had more adaptive affective and cognitive responses to pain than women in the bottom half of scores and patients without partners.

In the third study (15), which included 255 rheumatoid arthritis patients from the US, rather than dichotomizing based on a median split, the authors categorized married patients as "happily partnered" or "unhappily partnered," based on a cut point on the Locke-Wallace Marital Adjustment Test (16). Although based on previous data, the cut point was derived from a sample of young, well-educated husbands and wives who completed the scale in the 1950s, but it has not been validated since or in any other population (16).

Simplicity is gained by dichotomizing continuous marital satisfaction variables for use in prediction models, but it comes at a substantial cost (17–21). One important cost is the loss of statistical power. Grouping patients by dichotomizing is essentially an extreme form of rounding (20), in which all patients above or below a cut point are treated as if their score were exactly the same as all others on the same side of the cut point. The loss of information inherent in doing this results in a potentially substantial underestimation of the magnitude of associations and, thus, of the importance of the dichotomized predictor variable (17–20). Thus, in the case of marital satisfaction, even when associations are identified, dichotomization artificially diminishes their magnitude.

A second major cost of dichotomization relates to the meaning of the cut point that is used. Predictor variables are often dichotomized at the median, but in the case of marital quality or satisfaction there is no inherent reason to assume that exactly half the people in a sample have satisfactory marital relationships, whereas the other half have polar opposite unsatisfactory relationships (17–20). A score below or above a median cut point cannot be interpreted clinically without more information. Adding to the problem, the use of median cut points has been shown to lead to a wide range of different cut points for the same measure across different studies, rendering findings difficult or impossible to compare and underscoring the arbitrary nature of median-based cut points (20,21). Even when cut points are based on some degree of evidence, as with the Locke-Wallace Marital Adjustment Test (16), the meaning of the cut point is still not necessarily clear, and problems related to potentially substantial losses of information and the false assumption that all patients on 1 side of a cut point are equivalent to each other and polar opposites of all patients on the other side remain.

Ideally, rather than dichotomizing, we would compare mental health outcomes between married and unmarried patients in a way that evaluates the influence of marital satisfaction or marital quality continuously for married patients. This would be a more powerful method statistically that also provides more clinically relevant outcomes than dichotomizing. It would also provide an estimate of the degree to which

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mental health symptoms increase as marital satisfaction decreases and would use patient data to identify the point on the spectrum of marital satisfaction at which unmarried and married patients have similar levels of mental health symptoms. No studies, however, have demonstrated how to integrate a continuous predictor of marital satisfaction into models that include both married and unmarried patients, in order to estimate its influence on important mental health outcomes.

Rates of emotional distress are high in SSc (4,22), and they are associated with marital status (4). Thus, the objective of this study was to demonstrate the use of a novel regression model to simultaneously assess the relationship between marital status, continuously measured marital satisfaction, and symptoms of depression among women with SSc. In order to illustrate the differences between this approach and categorical methods that have been used previously, we compared results obtained using this approach to results obtained using a median split of marital satisfaction scores.

PATIENTS AND METHODS

Patient sample. The study sample consisted of female patients from 14 Canadian Scleroderma Research Group (CSRG) Registry sites. Registry patients must be ≥18 years of age, have a rheumatologist-confirmed diagnosis of SSc, and be fluent in English or French. More than 98% of registry patients meet the 2013 American College of Rheumatology/European League Against Rheumatism classification criteria for SSc (23). At annual registry visits, patients undergo standardized clinical evaluations and complete a series of self-report questionnaires, including questions on marital satisfaction. For women who completed the questionnaires at >1 annual visit, we selected the earliest visit with complete data for all variables in our regression model. All patients provided informed consent, and the research ethics board of each participating center approved the data collection protocol. Overall, approximately 80% of the patients approached gave consent to registry enrollment.

Measures. *Sociodemographic and clinical characteristics.* Sociodemographic variables, including age, education level, and race/ethnicity were based on patient report. Clinical characteristics of SSc were recorded by the CSRG recruiting site rheumatologist. SSc disease duration was defined as the amount of time since the onset of a patient's first symptom (either Raynaud's phenomenon or non-Raynaud's phenomenon). Skin involvement was assessed using the modified Rodnan skin thickness score (24), in which the degree of skin thickening is scored from 0 (no involvement) to 3 (severe thickening) across 17 body areas (total score range 0–51). Limited SSc was defined as skin involvement distal to the elbows and knees only, whereas diffuse SSc was defined as skin involvement proximal to the elbows and knees and/or trunk (25). Patients with sine SSc, defined as SSc without skin involvement, were grouped with the limited SSc patients (26). The number of tender joints was determined by summing the total number of joints with tenderness on pressure and/or pain on passive movement, using a 66-joint count. The extent of gastrointestinal involvement and the extent of lung involvement were measured with the Medsger Scleroderma Disease Severity Scale (27,28), with each organ system scored separately from 0 to 4 (where 0 = no involvement and 4 = end-stage involvement).

Marital status and satisfaction. Women were classified as married if they reported being married or living as married. Marital satisfaction was assessed among women married or living as married using the 7-item Dyadic Adjustment Scale (DAS-7) (29). The DAS-7 assesses 3 components of relationship satisfaction: dyadic consensus (degree to which a couple agrees on matters of importance to the relationship; 3 items, 0–5, where 0 = always disagree and 5 = always agree), dyadic cohesion (degree of closeness and shared activities; 3 items, 0–5, where 0 = never and 5 = more than once a day), and global dyadic satisfaction (1 item, 0–6, where 0 = extremely unhappy and 6 = perfect). Total scores range from 0 to 36, with higher scores indicating greater marital satisfaction. Cronbach's $\alpha = 0.84$ in the present study.

Symptoms of depression. Symptoms of depression were assessed with the 20-item Center for Epidemiologic Studies Depression Scale (CES-D) (30). The frequency of each symptom during the past week was rated on a 0–3 Likert-type scale (where 0 = rarely or none of the time and 3 = most or all of the time), and total scores range 0–60, with higher scores indicating more depressive symptoms. Cutoff scores that are sometimes used include ≥16 for possible depression and ≥23 for probable depression (30). Cronbach's $\alpha = 0.90$ in the present study.

Statistical analysis. Married women were compared to unmarried women on sociodemographic and disease variables using chi-square tests for categorical variables and 2-tailed *t*-tests for continuous variables. Bivariate correlations of sociodemographic characteristics (age and education) and clinical characteristics (disease duration, disease classification, number of tender joints, extent of gastrointestinal involvement, and extent of lung involvement) with depressive symptoms were assessed using Kendall's tau.

Multiple linear regression was used to model the association of marital status and, among married women, marital satisfaction, with depressive symptoms, controlling for the aforementioned sociodemographic and clinical characteristics. This model was chosen in order to be consistent with a previous study on predictors of depressive symptoms in SSc (4), adding only the continuous marital satisfaction score. Since marital satisfaction was assessed among married women only, it was entered as an interaction variable in the regression model that included both married and unmarried women. Thus, standardized Z scores from the DAS-7 were entered for married women, whereas for unmarried women, a score of 0 was entered. By constructing the interaction variable in this way, the regression coefficient of the interaction term reflected the change in CES-D outcome scores associated with a 1 SD change in total DAS-7 scores among married women, controlling for sociodemographic and clinical characteristics.

The assumption of normal distribution of residuals in the regression model was tested using a normal-probability plot. Additionally, correlations between independent variables and tolerances were calculated in order to check for multicollinearity. The linearity of the model was assessed using partial residual plots.

Table 1. Patient demographic and disease characteristics*

Characteristic	Total sample (n = 725)	Married (n = 494)	Unmarried (n = 231)	*P*
Sociodemographic variables				
Age, years	57.4 ± 11.2	57.1 ± 10.4	58.2 ± 12.8	0.248
White, no. (%)	652 (92.9)†	449 (93.9)‡	203 (90.6)§	0.112
More than high school education, no. (%)	368 (50.8)	252 (51.0)	116 (50.2)	0.842
DAS-7 score	–	24.2 ± 5.6	–	–
Medical variables				
Disease duration, years	17.6 ± 12.3	17.5 ± 12.4	17.8 ± 12.1	0.813
Diffuse SSc, no. (%)	295 (40.7)	206 (41.7)	89 (38.5)	0.418
Modified Rodnan skin thickness score, range 0–51	7.9 ± 8.5¶	8.0 ± 8.4#	7.8 ± 8.7**	0.749
Number of tender joints	2.1 ± 7.0	2.1 ± 7.4	2.0 ± 6.1	0.816
Disease severity				
Gastrointestinal tract, range 0–4	1.9 ± 0.7	1.9 ± 0.7	2.0 ± 0.7	0.027
Lung, range 0–4	1.4 ± 1.1	1.3 ± 1.1	1.4 ± 1.1	0.862
CES-D score	14.0 ± 10.5	13.3 ± 10.2	15.4 ± 11.0	0.011

* Values are the mean ± SD unless otherwise indicated. DAS-7 = Dyadic Adjustment Scale-7; SSc = systemic sclerosis; CES-D = Center for Epidemiologic Studies Depression Scale.
† Due to missing values, n = 702.
‡ Due to missing values, n = 478.
§ Due to missing values, n = 224.
¶ Due to missing values, n = 711.
# Due to missing values, n = 487.
** Due to missing values, n = 224.

Based on the multiple-regression equation, we estimated the level of marital satisfaction among married women at which married women and unmarried women had equivalent CES-D scores, controlling for sociodemographic and clinical characteristics. Two alternative methods were used to determine the percentage of married women who had an equal or greater number of symptoms of depression than the average unmarried woman. First, we determined the proportion of married women who had DAS-7 scores below the value for which married and unmarried women had equivalent estimated CES-D scores. Second, we transformed the Z score at the intersection point into a percentile based on the normal curve.

To compare the results of our model to results obtained using a median split of marital satisfaction scores, we ran another model that compared 3 groups: unmarried women, married women with DAS-7 scores below the median, and married women with DAS-7 scores equal to or greater than the median.

In post hoc analyses, we evaluated results by comparing married women to 3 groups of unmarried women separately: single women, separated or divorced women, and widowed women. We also assessed the correlation of each of the 3 components of the DAS-7 (consensus, cohesion, and satisfaction) and depressive symptoms, using Kendall's tau. All analyses were conducted using SPSS, version 20.0, and all statistical tests were 2-sided, with *P* values less than 0.05 denoting significance.

RESULTS

Sample characteristics. Sociodemographics and disease characteristics for the entire sample and for married versus unmarried women are shown in Table 1. Of the 725 women included in the study, 494 (68%) were married or living as married and 231 (32%) were unmarried. Among unmarried women, 48 (21%) were single, 121 (52%) were separated or divorced, and 62 (27%) were widowed. The mean ± SD age was 57.4 ± 11.2 years (range 18–83 years). Sociodemographic and clinical characteristics were similar between married and unmarried women. Only gastrointestinal severity was statistically significantly different, but the mean difference was minimal (0.1 point).

The mean ± SD CES-D score was 14.0 ± 10.5 (range 0–52), with 269 patients (37%) scoring 16 or higher, including 148 (20%) scoring 23 or higher. Married women had significantly lower CES-D scores (mean 13.3) than unmarried women (mean 15.4). Among married women, DAS-7 scores ranged from 2 to 36 (mean ± SD 24.2 ± 5.6, median 25).

Association of marital status and marital satisfaction with depressive symptoms. In bivariate correlations, unmarried status ($\tau = -0.08$, $P = 0.014$), less than a high school education ($\tau = -0.08$, $P = 0.012$), more tender joints ($\tau = 0.09$, $P = 0.001$), more gastrointestinal involvement ($\tau = 0.13$, $P < 0.001$), and more lung involvement ($\tau = 0.17$, $P < 0.001$) were significantly correlated with CES-D scores.

In the multivariate regression model, regression diagnostics found no evidence of deviation from the assumption of a normal distribution of residuals. All tolerance values were between 0.85 and 0.99, and all correlations between variables were ≤0.29, indicating that multicollinearity was not an issue. Partial residual plots did not show any violation of the linearity assumption for the model.

Controlling for sociodemographic and disease variables, we found that married women, on average, had CES-D depressive symptom scores that were 2.0 points (0.19 SDs)

Table 2. Multiple linear regression predicting symptoms of depression as measured by Center for Epidemiologic Studies Depression Scale scores*

Variable	B	SE B	β	P
Constant	17.05	2.77	–	< 0.001
Age, years	−0.10	0.04	−0.10	0.007
More than high school education	−1.40	0.76	−0.07	0.065
Time since onset of first SSc symptom, years	−0.03	0.03	−0.03	0.369
Diffuse SSc	−0.51	0.77	−0.02	0.510
Number of tender joints	0.11	0.05	0.07	0.049
Disease severity				
Gastrointestinal tract	1.86	0.52	0.13	< 0.001
Lung	2.02	0.34	0.21	< 0.001
Married	−1.97	0.79	−0.09	0.013
zDAS, married	−2.25	0.45	−0.18	< 0.001

* $R^2 = 0.153$; adjusted $R^2 = 0.124$. SSc = systemic sclerosis; zDAS = standardized Dyadic Adjustment Scale-7 scores.

lower than unmarried women (Table 2). However, among married women, every 1 SD increase in marital satisfaction was associated with a decrease of 2.2 points (0.21 SDs) on the CES-D scale, indicating that greater marital satisfaction was associated with fewer symptoms of depression. To put this in perspective, using average values for demographic and clinical covariates, the predicted CES-D score of a woman with the lowest DAS-7 score (poorest marital satisfaction) reported in this sample (a score of 2) would be 22.2, versus 8.6 for a woman with the highest DAS-7 score (highest marital satisfaction) reported in this sample (a score of 36). Compared to unmarried women, women with very poor marital satisfaction (a score of 2) had predicted CES-D scores that were on average 6.9 points higher, whereas women with very high marital satisfaction (a score of 36) had predicted CES-D scores that were on average 6.7 points lower. Thus, based on differences in individual marital satisfaction scores, predicted CES-D score differences between married and unmarried women differed by almost 14 points, depending on where on the spectrum of marital satisfaction they were assessed.

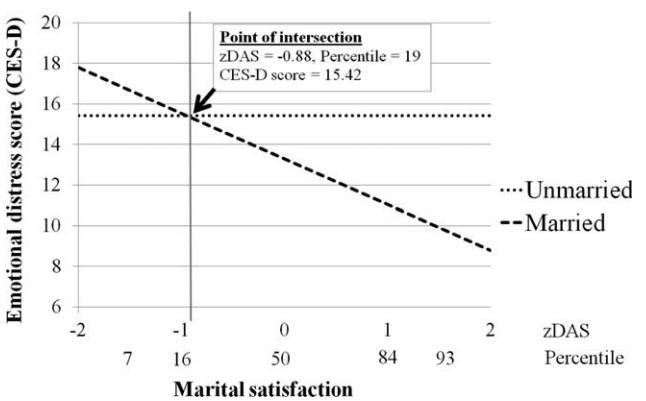

Figure 1. Estimated Center for Epidemiologic Studies Depression Scale (CES-D) scores as a function of marital status and marital satisfaction. zDAS = standardized Dyadic Adjustment Scale-7.

Based on our model, controlling for sociodemographic and clinical characteristics, the point where married and unmarried women had equivalent levels of predicted depressive symptoms occurred with DAS-7 scores of married women 0.88 SD below the mean, which occurred with a DAS-7 score of 19.3. Based on raw DAS-7 scores, 19.1% of married women scored at least 0.88 SD below the mean. Based on a Z score to percentile transformation, 18.6% of married women would be expected to have an equal or greater number of symptoms of depression than the unmarried women on average. Estimated CES-D scores as a function of marital status and marital satisfaction are shown in Figure 1.

In post hoc analyses, controlling for sociodemographic and clinical characteristics, there were no statistically significant differences between the CES-D scores of married women and classes of unmarried women. The CES-D scores of married women were, on average, 1.3 points (95% confidence interval [95% CI] −1.7, 4.3) lower than among single, never-married women, 2.0 points (95% CI 0.0, 3.9) lower than among separated or divorced women, and 2.6 points (95% CI −0.2, 5.3) lower than among widowed women. Correlations between each of the 3 components of the DAS-7 (consensus, cohesion, and satisfaction) and depressive symptoms were similar ($\tau = -0.14$, -0.16, and -0.15, respectively).

Results using dichotomously defined marital satisfaction. In our comparison model that dichotomized DAS-7 marital satisfaction scores based on a median split, married women at or above the median on the DAS-7 scored 3.4 points lower on the CES-D than unmarried women (95% CI −5.2, −1.6). Married women who scored below the median on the DAS-7 did not have significantly different CES-D scores than unmarried women (0.5 points lower [95% CI −2.3, 1.3]).

DISCUSSION

To our knowledge, this was the first study to demonstrate how continuously measured marital satisfaction scores can be incorporated into models that predict mental health out-

comes in order to generate more robust and clinically relevant estimates of the relationship between marital satisfaction and mental health. The novel regression method used in this study showed that the variability of depressive symptoms between women with low levels of marital satisfaction and those with high levels was substantially greater than the difference in depressive symptoms between married and unmarried women or between women classified dichotomously as satisfied with their marriages versus women classified as unsatisfied based on a median-split method.

Among married women, for every 1 SD increase in marital satisfaction, there was a 2.2-point decrease in CES-D score, which translated to a total difference in CES-D scores of almost 14 points across the range of marital satisfaction scores. In contrast, simply classifying women as satisfied or unsatisfied with their marriages dichotomously resulted in only a 3.4-point difference in predicted CES-D scores. Married women whose marital satisfaction scores were in the lowest 19 percent had similar or higher levels of depressive symptoms than the average unmarried woman.

Previous studies that have dichotomized marital quality or satisfaction in multivariate prediction models to estimate associations with mental health outcomes (13–15) have all reported that people classified as being satisfied with their marriages have better mental health outcomes than people who are unsatisfied or people who are unmarried, but that there is no difference between people who are unsatisfied and those who are unmarried. In contrast, the present study, by incorporating continuous marital satisfaction ratings, was able to identify that on average approximately 80% of women who are married have lower depressive symptom scores than unmarried women. Furthermore, the variability in depressive symptoms associated with marital satisfaction among married women was much greater than what could be attributed to marital status alone. In contrast to previous findings of similar mental health in unmarried people and married people with lower marital satisfaction (13–15), this study showed that some women with relatively low marital satisfaction are better off than unmarried women, whereas women with very poor marriage quality do substantially worse.

Clinically, the results from this study underline the strong association between access to social support via marriage or a marriage-like relationship and mental health, given that many marital relationships below the median were associated with similar or better mental health compared to women who were not married. On the other hand, they emphasize the individual nature of the association between marital status and mental health, as women with very poor-quality marriages were predicted to have substantially worse mental health than unmarried women. In sum, less than ideal marriages may be in many cases associated with better mental health than not being married, but very poor marriages are often linked to dramatically worse mental health.

Ideally, future studies that include marital status as a predictor of mental health and other key outcomes should incorporate a measure of marital quality or satisfaction to the exent possible. Inclusive in this, future studies should replicate the present study in different settings to determine the degree to which findings are consistent or sample-specific. Furthermore, research is needed to determine whether marital satisfaction can be improved in women with rheumatic diseases who are in distressed relationships and whether such intervention can improve mood.

Beyond marital status and quality, the regression model described in the present study could also be usefully applied to other research in rheumatology, as well as in health research more generally, in situations where 2 groups are compared and a continuous variable of interest applies to 1 of the groups but not the other. For instance, in studies comparing patients with a disease to healthy controls, investigators could use similar interactions to examine the effect of a variable that is related to the disease, such as time since diagnosis, disease severity, or other important aspects of disease that vary among patients but are not relevant to nonpatients (31).

There are a number of limitations that should be considered in interpreting the results of our study. First, it was cross-sectional and conducted with a convenience sample of women enrolled in the CSRG Registry. Patients with very severe SSc who were too sick to participate, as well as those who may have died earlier in their disease course, are not enrolled in the Registry, which may result in an overrepresentation of healthier patients. Although approximately 80% of approached patients enroll in the registry, data on patients who do not participate are not available. Additionally, with a relatively small number of participants encompassing each of the unmarried subgroups (widowed, divorced or separated, and single) there was not enough power to formally compare these groups. Furthermore, we did not have data on time since partner loss for patients who were widowed or divorced. Nonetheless, our results from post hoc analysis are similar to previous findings that widowed and divorced individuals show higher rates of depressive symptoms than those who are single (32). Future research should include subgroups large enough to perform statistical tests between unmarried groups of participants (widowed, divorced or separated, and single), preferably also taking into account the amount of time since partner loss in widowed and divorced persons, as grief or relief may be important, especially within the first 2 years after the loss (33).

In summary, married women tend to have lower levels of depressive symptoms than unmarried women. Among married women, greater marital satisfaction is associated with fewer symptoms of depression, with those in the lowest quintile of marital satisfaction tending to have more depressive symptoms than the average unmarried woman. This study demonstrates that in addition to marital status, marital satisfaction also plays an important role in depression symptoms. Thus, studies examining social support should consider relationship quality in addition to relationship status and should consider relationship quality or satisfaction on a continuous basis, using the interactions in the regression model that we demonstrated in the present study.

AUTHOR CONTRIBUTIONS

All authors were involved in drafting the article or revising it critically for important intellectual content, and all authors approved the final version to be submitted for publication. Dr. Thombs had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Study conception and design. Levis, Kwakkenbos, Steele, Hagedoorn, Thombs.
Acquisition of data. Steele, Hudson, Baron, Thombs.
Analysis and interpretation of data. Levis, Rice, Kwakkenbos, Steele, Hagedoorn, Thombs.

ROLE OF THE STUDY SPONSOR

Actelion and Pfizer had no role in the study design or in the collection, analysis, or interpretation of the data, the writing of the manuscript, or the decision to submit the manuscript for publication. Publication of this article was not contingent upon approval by Actelion and Pfizer.

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APPENDIX A: CANADIAN SCLERODERMA RESEARCH GROUP RECRUITING RHEUMATOLOGISTS

Recruiting rheumatologists of the Canadian Scleroderma Research Group are as follows: M. Baron (Montreal, Quebec); J. Pope (London, Ontario); D. A. Masetto (Sherbrooke, Quebec); E. Sutton (Halifax, Nova Scotia); N. A. Khalidi (Hamilton, Ontario); D. Robinson (Winnipeg, Manitoba); N. Jones (Edmonton, Alberta); E. Kaminska (Hamilton, Ontario); P. Docherty (Moncton, New Brunswick); J.-P. Mathieu, M. Hudson, S. Ligier, T. Grodzicky (Montreal, Quebec); S. Mittoo (Winnipeg, Manitoba); S. LeClercq (Calgary, Alberta); C. Thorne (Newmarket, Ontario); P. Fortin (Quebec City, Quebec).