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# Women's sexual satisfaction in the context of midlife relationships: examining an ecological model

Katherine Arenella [a] and Ann Steffen [b]

[a]Department of Family Medicine and Community Health, University of Minnesota, Minneapolis, Minnesota, USA; [b]Department of Psychological Sciences, University of Missouri – St. Louis, St. Louis, Missouri, USA

**ABSTRACT**

This study examined an ecological model of sexual satisfaction in midlife women. Participants were 1,411 midlife women who participated in the Midlife in the United States (MIDUS) study. Regression analyses were used to test the hypothesis that an ecological model – including the macrosystem level variable of religiosity, the exosystem level variables of SES, social support, and parenthood, the mesosystem level variables of affectual solidarity, relationship length, and sexual functioning, and the microsystem level variables of age, negative affect, and physical health – would together predict sexual satisfaction. Partial support for an ecological understanding of sexual satisfaction was found.

**KEYWORDS**

Sexual satisfaction; midlife women; ecological model; midlife in the United States; sexual function

Sexual satisfaction is a critical component of general wellbeing and is tied to various physical and mental health outcomes. There are various definitions of sexual satisfaction in the literature, with Lawrance and Byers (1995) definition being the most prominent. Sexual satisfaction is defined as "an affective response arising from one's subjective evaluation of the positive and negative dimensions associated with one's sexual relationship" (Lawrance & Byers, 1995).

Despite the importance of sexual satisfaction, there is a lack of research on this construct as it relates to middle-aged women. Middle-aged women, generally defined as women between 45– 65 years of age, are an important and unique group in which to study sexual satisfaction. As a group, they face a range of specific circumstances that may be tied to sexuality, such as changes in sexual function, long-term relationships, and familial role changes, all of which likely impact sexual satisfaction (Ahlborg et al., 2005; Dundon & Rellini, 2010; Impett et al., 2014).

The existing research on sexuality has shown that women tend to experience sexual satisfaction differently than other genders. Overall, women's sexuality tends to be more strongly rooted in relationships, emotional closeness, intimacy, family perceptions, and self-relationships, as opposed to sexual frequency (Bridges et al., 2004; Calvillo et al., 2020). Research highlights the relevance of biological, medical and relational factors in women's sexuality across the lifespan, as well (Malatesta, 2007). Middle age also has an impact on sexual satisfaction. Researchers have found that midlife women tend to experience less sexual satisfaction than younger women, and that dissatisfaction increases with age (Dundon & Rellini, 2010). Research has also found that women experience sexuality differently during these midlife years in comparison to women over the age of 70 (Freixas et al., 2015). Because women's sexual satisfaction is closely related to many factors beyond sexual frequency, there is a great likelihood that middle age influences satisfaction by affecting specific midlife experiences.

**CONTACT** Katherine Arenella arene002@umn.edu Department of Family Medicine and Community Health, University of Minnesota, 1300 South 2nd St West Bank, Office Building, Suite 180, Minneapolis, MN 55415.

### The ecological framework as a meta-model of sexual satisfaction

An ecological model can be used as an organizing framework for the predictors of sexual satisfaction in middle-aged women. There is currently a diverse range of theories and measures of sexual satisfaction, which is one of the more pressing problems in the literature (Sánchez-Fuentes et al., 2014). Additionally, the existing models of satisfaction do not account for all of the researched predictors of sexual satisfaction, highlighting the need for more complex models (Byers, 2005; Štulhofer, Buško, & Brouillard, 2010). Given the variety of theories, measures, and models for sexual satisfaction, in combination with research showing how personal, social, and cultural factors are tied to women's sexuality, an ecological model is equipped to provide a more comprehensive understanding of sexual satisfaction in this population. Ecological theory, broadly, outlines how development or other outcomes can be organized into levels that are interrelated: the microsystem, mesosystem, exosystem, and macrosystem (Bronfenbrenner, 1994).

Support for an ecological framework of sexual satisfaction has been found by Henderson et al. (2009), Sánchez-Fuentes et al. (2014), Sánchez-Fuentes et al. (2016), and Calvillo et al. (2020). For example, Sánchez-Fuentes et al. (2014) conducted a literature review on sexual satisfaction research from 1979 through 2012 and found that sexual satisfaction was most easily organized according to ecological model levels (Sánchez-Fuentes et al., 2014). Calvillo et al. (2020) similarly found that relational level variables were significant in understanding sexual satisfaction in men and women with same-sex partners. Predictors of sexual satisfaction can be organized according to the ecological levels as defined by Sánchez-Fuentes et al. (2014): (1) Microsystem: individual characteristics; (2) Mesosystem: intimate relationships and sexual functioning; (3) Exosystem: social networks and social status; and (4) Macrosystem: institutional and societal factors. As attractive as an ecological framework is for understanding sexual satisfaction, there are real challenges to achieving this due to practical constraints on research scope and sample size, as an investigation of an ecological model requires inclusion of a wide variety of variables and a large enough sample to test their relative contributions. This study utilizes regression analyses to test an ecological framework, using the Midlife in the United States (MIDUS) national study data to examine key variables that have garnered the most consistent support throughout the literature (see Figure 1).

### Microsystem predictors of sexual satisfaction

The microsystem as it relates to sexual satisfaction is defined as a person's immediate environment, including individual characteristics such as gender and personality (Sánchez-Fuentes et al., 2014). For midlife women, microsystem-level variables that may affect sexual satisfaction include age, psychological wellbeing, and physical health and functioning.

Research is mixed regarding the effects of age on sexual satisfaction in women. The majority of research points to decreased satisfaction with increased age (Byers & Rehman, 2014; Sánchez-Fuentes et al., 2014). For example, older age is associated with less sexual activity and increased sexual dysfunction, which negatively impact sexual satisfaction (Sánchez-Fuentes et al., 2014). However, correlations between age and satisfaction tend to weaken, disappear, or even reverse when analyses take other aging factors into account (Impett et al., 2014). Increased age may even carry protective factors, as evidenced by some reports of *greater* satisfaction in a midlife population (Sánchez-Fuentes et al., 2014). "Sexual wisdom" refers to the knowledge and skills that one acquires with age and life experience (Forbes et al., 2017) and can result in higher levels of sexual satisfaction. Expectations about sex also tend to change with older age; compared to younger women, older women reporting no recent sexual activity are more likely to report satisfaction (Huang et al., 2009).

Depression, anxiety, and stress are all associated with decreased sexual satisfaction (Byers & Rehman, 2014; Sánchez-Fuentes et al., 2016, 2014). Because the transition into menopause is associated with increased psychological disorders, midlife women may be particularly prone to

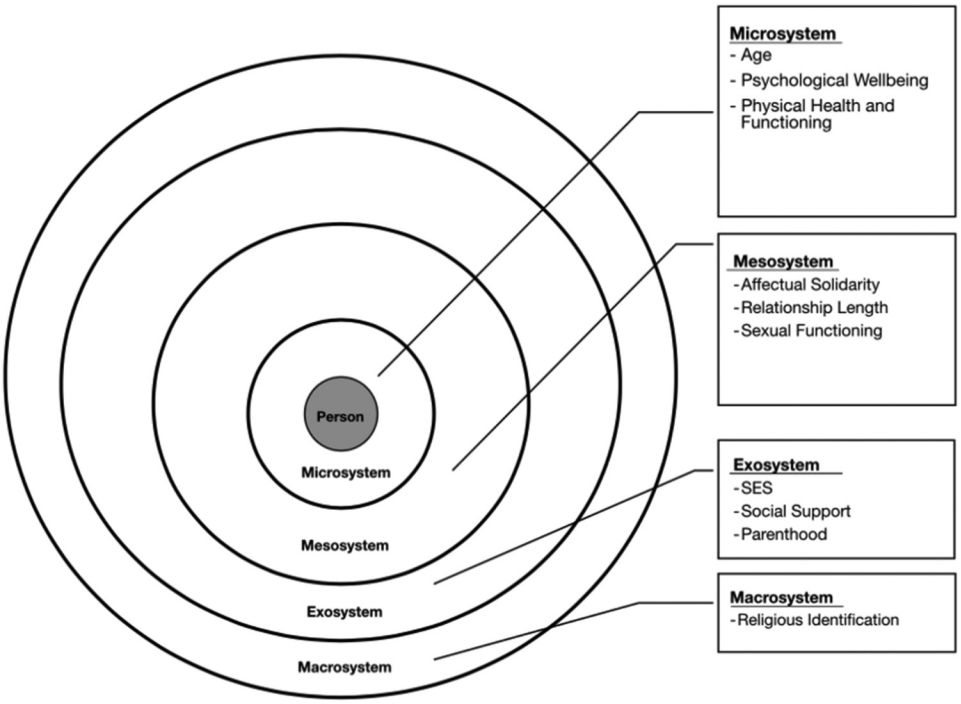


**Figure 1.** Ecological framework of sexual satisfaction of midlife women in relationships.

experiencing decreased satisfaction (Dundon & Rellini, 2010). Throughout the literature, depressed affect is consistently associated with decreased sexual functioning and decreased relationship satisfaction, both of which are closely tied with sexual satisfaction (Henderson et al., 2009).

Greater physical health and functioning are other microsystem-level variables related to higher sexual satisfaction (Sánchez-Fuentes et al., 2014). Physical activity was found to be associated with greater sexual enjoyment in middle-aged women, regardless of menopausal stage (Hess et al., 2009). Researchers have often found correlations between fitness level, exercise frequency, and sexual satisfaction (Penhollow & Young, 2008).

Other noteworthy constructs include menopause and body image. The research is mixed regarding the specific effects of menopause, such that some findings show negative effects on satisfaction and others reveal no effects on sexual satisfaction, despite associations with greater sexual dysfunction (Dundon & Rellini, 2010; Thomas & Thurston, 2016). With regard to body image, research has found that positive body image is associated with greater sexual satisfaction and poor body image is associated with lower sexual frequency and enjoyment (Byers & Rehman, 2014; Sánchez-Fuentes et al., 2014; Weaver & Byers, 2006).

### *Mesosystem predictors of sexual satisfaction*

The mesosystem level of sexual satisfaction includes close connections, such as intimate relationships, and sexual functioning within the context of these relationships (Sánchez-Fuentes et al., 2014). For midlife women in relationships, relevant mesosystem predictors of sexual satisfaction include relationship satisfaction, relationship length, and sexual functioning in the context of those relationships.

Relationship satisfaction is one of the most examined predictors of sexual satisfaction, and it is probable that relationship satisfaction and sexual satisfaction influence each other reciprocally (Byers, 2005; Byers & Rehman, 2014; Dyar et al., 2020; Impett et al., 2014; Lawrance & Byers, 1995; Sprecher,

2002). Relationship satisfaction appears crucial to sexual satisfaction due to factors such as experiences of positive and negative interpersonal behaviors (Schoenfeld et al., 2017), as well as communication and emotional satisfaction (Blumenstock et al., 2020). Relationship satisfaction is particularly relevant to midlife women's experiences of sexual satisfaction, given that middle age carries implications for relationship variables and quality. Additionally, in women, the positive relationship between sexual satisfaction and relationship satisfaction becomes stronger with older age (Impett et al., 2014).

Although relationship satisfaction and sexual satisfaction are highly related, they are still independent from each other. Individuals, however, may view these two constructs as fundamentally the same. This is one reason that research can be more robust when measuring more specific and related constructs to relationship satisfaction, such as partner affectual solidarity. This construct of partner affectual solidarity encompasses important facets of relationship satisfaction as relating to sexual satisfaction, including emotional closeness and bond strength (Schuster et al., 1990).

Given that a majority of midlife relationships are long-term, it is worth examining the impact of relationship length on sexual satisfaction. Longer relationships tend to be associated with lower satisfaction, but findings are not consistent (Sánchez-Fuentes et al., 2014). For example, relationship exclusivity and cohabitation are associated with greater sexual satisfaction, and are common characteristics of long-term relationships (Sánchez-Fuentes et al., 2014).

Sexual functioning is another aspect of relationships that might influence sexual satisfaction, and involves physical, psychological, sociocultural, and interpersonal aspects of an individual's ability to respond to sexual interactions (Thomas & Thurston, 2016). Better sexual functioning is generally related to greater sexual satisfaction in women (Dundon & Rellini, 2010; Heiman et al., 2011; Henderson et al., 2009; Velten & Margraf, 2017). This relationship may be especially relevant for middle-aged women, given that the prevalence of sexual dysfunction is highest in midlife (Thomas & Thurston, 2016).

Communication within a relationship, both sexual and nonsexual, is also strongly related to sexual satisfaction (Byers & Rehman, 2014). Of note, sexual communication predicts sexual satisfaction in long-term relationships, and is also related to sexual frequency in partnered middle-aged and older adults (Gillespie, 2017).

### *Exosystem predictors of sexual satisfaction*

The exosystem of sexual satisfaction is comprised of social networks and social status, such as socioeconomic status (SES), social support and parenthood. These variables are more peripheral to the experience of sexual satisfaction, but still exert an impact on the overall experience of sexual satisfaction.

Higher SES is related to greater sexual satisfaction, likely due to its impact on wellbeing, stress, and relationship patterns (Sánchez-Fuentes et al., 2014). For example, the proportion of household income earned by the female in heterosexual relationships has been found to be predictive of positive sexual satisfaction, which is likely due to a more equal distribution of work and power (Velten & Margraf, 2017). In fact, research has found that perceptions of equity and fairness within relationships can be tied to feelings of anger or guilt within the relationships of midlife and older women (Pillemer et al., 2008). SES may also provide a buffer in the face of stressful life events (Henderson et al., 2009).

Social support, defined as an individual's appraisal of support, feelings of belonging, and tangible support, is related to higher sexual satisfaction, as well (Cohen et al., 1985; Sánchez-Fuentes et al., 2014). Social support is associated with enhanced sexual engagement and enjoyment in middle-aged women after accounting for menopausal stage (Hess et al., 2009). Transitions into midlife may be accompanied by smaller networks that are geographically farther away (Ajrouch et al., 2005); this may have a detrimental effect on satisfaction in this population.

Having children affects relationship and sexuality variables that are known to relate to satisfaction, such as sexual frequency. For example, having children in the home is associated with reduced relationship satisfaction and lower sexual functioning, as well as parenting stress (Ahlborg et al., 2005; Leavitt et al., 2017). The majority of this research has not been done in midlife samples, despite the fact that middle-aged women are increasingly likely to be living with children in the home (Infurna et al., 2020). More research is needed to better understand the effects parenthood might have on this specific population.

### *Macrosystem predictors of sexual satisfaction*

The macrosystem of sexual satisfaction includes institutional and societal factors that have an impact on sexual satisfaction. Constructs related to this level are less studied in the field of sexual satisfaction. Religion, however, has been examined in relation to sexual satisfaction more consistently than other variables. In Sánchez-Fuentes et al.'s (2014) review, religion's effects on sexual satisfaction varied across studies. For example, some researchers found that greater religious belief was related to lower satisfaction, and other researchers found no clear effects (Davidson et al., 1995; Higgins et al., 2010; Sánchez-Fuentes et al., 2014). It is important for researchers to study religiosity and sexual satisfaction in a middle-aged sample, and to clearly define how "religiosity" is measured. Another macrosystem level variable that may be relevant to sexual satisfaction, but that has not been studied in detail, is political ideology (Sánchez-Fuentes et al., 2014). Macrosystem-level variables may be particularly relevant in shaping, strengthening, or changing personal beliefs about sex.

### *Current study*

The available research suggests that the ecological levels combine to create unique experiences of sexual satisfaction. An ecological model is especially pertinent to middle-aged women due to specific life experiences that this population is likely to face, such as long-term relationships, changes in sexual function, and familial role shifts (Ahlborg et al., 2005; Dundon & Rellini, 2010; Impett et al., 2014). The investigation of sexual satisfaction in this population also has important clinical implications; a more detailed understanding of sexual satisfaction using an ecological framework can help direct assessment and intervention with midlife women. There is currently no existing research testing an ecological framework of sexual satisfaction in a population of midlife women, specifically. The aim of this study was to test the fit of an ecological model as articulated by Sánchez-Fuentes et al. (2014) for understanding factors that influence the sexual satisfaction of midlife women in relationships.

### *Hypothesis*

An ecological model – including the macrosystem level variable of religiosity, the exosystem level variables of SES, social support, and parenthood, the mesosystem level variables of affectual solidarity, cohabitation length, and sexual functioning, and the microsystem level variables of age, negative affect, and physical health and functioning – together significantly predict sexual satisfaction in a national sample of women in midlife. Of these variables, is expected that SES, social support, affectual solidarity, sexual functioning, and physical health and functioning will have positive relationships with sexual satisfaction, and parenthood and negative affect will have negative relationships with sexual satisfaction. Given conflicting evidence in the literature, religiosity, relationship length, and age could have either positive or negative relationships with sexual satisfaction.

## Methods

### Source of the data

MIDUS (Midlife in the United States) is a national, longitudinal study on health and wellbeing. MIDUS data were chosen for these research questions for many reasons. First, MIDUS contains a large sample of middle-aged women in relationships, which is a population that can be difficult to recruit. The MIDUS sample is also nationally representative, capturing a diverse range of participants from different geographical areas in the United States. MIDUS was conceived by a multidisciplinary team, and thus can be used to examine adult development from a variety of research disciplines (Radler & Ryff, 2010). This approach is useful in studying an ecological model of sexual satisfaction.

There are also several limitations as a result of the utilization of this dataset. A comprehensive discussion of limitations is detailed in the discussion, but of note, the use of MIDUS data led to constricted choices of measures for proposed study variables. The benefits of having such a large sample size of middle-aged women were considered more pertinent.

### Participants

Participants in the present study were 1,411 females selected from the second wave of MIDUS data. MIDUS-II data were collected between 2004 and 2006 and chosen for this study because of the inclusion of select variables and considerations of sample size. Participants were eligible for this present study if they reported being in a committed marriage or marriage-like relationship, and were also between the ages of 40– 70 at the time of data collection. The selection of 40 and 70 as the age limits was due to considerations outside of this current set of analyses (i.e., allowing for ease of later linking with MIDUS-I and MIDUS-III data).

### Procedures

MIDUS data and documentation are available to the public at the Inter-university Consortium for Political and Social Research (ICPSR) website (Ryff et al., 2007).

Participants were recruited with random digit dialing (RDD) in order to obtain a nationally representative sample. Participants were eligible for recruitment at each MIDUS wave if they were non-institutionalized, English speaking adults, aged 25– 74. All participants completed 2 self-administered questionnaires and a phone interview at each wave.

Preliminary analyses involved completing a missing value analysis, removal of multivariate outliers, and transformation of variables with large skew and/or kurtosis. Correlations were used to analyze multicollinearity and potential confounding variables. Main analyses utilized hierarchical regression analyses, controlling for confounding variables.

### Materials

Participants completed all the selected measures as part of the self-administered questionnaire and phone interview. After describing demographics and eligibility criteria, variables are listed as they appear in the ecological model.

#### Demographics and relationship status

Information was collected on a number of descriptives; this study reports participants' sexual orientation, ethnicity, employment status, number of children, and sexual frequency. These variables were then examined as potential covariates.

Relationship status was determined by two items. One question asked participants if they were currently married, separated, divorced, widowed, or never married. Another question asked unmarried participants whether they were currently living with someone in a steady, marriage-like relationship. Participants who responded "Married" to the first question or "Yes" to the second item were coded as in a relationship (1 = in a relationship; 0 = not in a relationship).

### Macrosystem level

***Religiosity.*** Religiosity was measured using a Religious Identification scale (Ryff et al., 2017). Participants rated how important religion is to them on a seven-item scale with response options that range from (1) Very to (4) Not at all. This scale includes items such as "How religious are you?" and "How important is religion in your life?" All items were reverse-coded, such that a higher score represents higher religiosity. A total score was constructed by calculating the sum of the values in the scale, with missing values imputed with the mean value of completed items. This scale showed good reliability in this study's sample ($\alpha = .89$).

### Exosystem level

***SES.*** Socioeconomic status was measured by two individual items assessing (1) the participant's total household income and (2) highest level of education completed.

***Social support.*** Social support was measured using a revised version of the Friend Support scale (Schuster et al., 1990). This four-item scale asked participants to rate the amount of care and understanding they receive from their friends. Items include statements such as, "How much do your friends really care about you?" Responses range from (1) A lot to (4) Not at all. Responses were reversed coded so that higher scores reflect greater social support, and a total score was constructed by calculating the mean of the items. This scale demonstrated high reliability in the current study's sample ($\alpha = .89$).

***Parenthood.*** The presence of children in the home was evaluated by items assessing the number of children living at home and the number of adult children living at home. A Yes/No variable was created to signify the presence of any children in the home (Ahlborg et al., 2005; Lawrance & Byers, 1995; Leavitt et al., 2017). Due to distribution issues detailed later, this variable only included the presence of adult children in the home for hypothesis testing.

### Mesosystem level

***Affectual solidarity.*** Affectual solidarity was measured with the Spouse/Partner Affectual Solidarity scale, which is comprised of revised versions of the Partner Support subscale and a Partner Strain subscale (Schuster et al., 1990). The Partner Support subscale is made up of six items assessing partner support, such as "How much does your spouse or partner really care about you?" Respondents answered on a scale from (1) A lot to (4) Not at all. All items have been reverse-coded, so that high scores reflect high support. The Partner Strain scale is made up of six items such as "How often does your spouse or partner make too many demands on you?" Respondents answered on a scale from (1) Often to (4) Never. A total Affectual Solidarity score was created by calculating the mean of all items, with higher scores reflecting higher levels of partner affectual solidarity. The Spouse/Partner Affectual Solidarity scale showed high reliability ($\alpha = .91$) in the current study's sample and is a specific measure of relationship satisfaction.

This variable was chosen as opposed to the single-item measure of relationship satisfaction available in the MIDUS data for several reasons: there was a high correlation between these two variables ($r = .782$, $p < .001$); affectual solidarity was available as a multi-item scale with greater reliability and validity than the single item of relationship satisfaction; and the items in this scale reflect an important, and more specific, component of overall relationship satisfaction.

***Relationship length.*** Married participants identified the date they were married. Participants who were not married, but who were living with someone in a "steady, marriage-like relationship" were asked for the length of cohabitation. Marriage length was calculated by subtracting the date of marriage from the date of MIDUS data, and a new "Cohabitation Length" variable was created that identified length of marriage or length of cohabitation in years.

***Sexual functioning.*** Sexual functioning was determined by two items. One item asked how often pain or discomfort is experienced in sexual interactions on a four-point scale, from (1) Never to (4) Always. The other item asked how often pleasure is experienced in sexual interactions, on a four-point scale from (1) Never to (4) Always. Answers to the first item were reverse-coded, and a total sexual functioning score was determined by the mean of these two responses.

### *Microsystem level*

***Age.*** Participants entered their date of birth, and an age variable was created from subtracting the date of birth from the date of respondent data entry.

***Negative affect.*** Negative affect was measured using the Negative Affect scale (Mroczek & Kolarz, 1998). This scale is comprised of six items that ask the respondent how much of the time they feel certain emotions, such as "hopeless," "worthless," or "nervous." Participants answered on a scale from (1) All of the time to (5) None of the time. Items have been reverse-coded so that higher scores reflect greater negative affect, and a total score was constructed by calculating the mean of item values. This scale demonstrated high reliability in the current study's sample ($\alpha = .85$).

***Physical health and functioning.*** Physical health was evaluated using a single item that asked participants to rate their physical health from (1) Excellent to (5) Poor. This item was reverse coded so that higher scores represent greater perceived health.

### *Sexual satisfaction*

Sexual satisfaction was measured using a sexual quality of life (SQoL) single item that asked participants to rate "the sexual aspect of your life these days" on a scale from (0) The worst possible situation to (10) The best possible situation. This item is based on Campbell, Converse, and Rodgers' (1976) theoretical model of life quality and is a domain-specific item from a broader Life Satisfaction scale (Prenda & Lachman, 2001). Although the use of a single-item to measure sexual satisfaction is not ideal, research has demonstrated that single-item measures of sexual satisfaction do exhibit convergent validity with scales of sexual satisfaction (Mark et al., 2014).

## Results

Analyses were conducted using the Statistical Packages for the Social Sciences (SPSS). A priori power analyses using G*Power 3.1 indicated that detection of a moderate effect would require a sample size of at least 127 participants.

### *Preliminary analyses*

A Missing Value Analysis was used to perform Little's MCAR test; this test rejected the null hypothesis that the missing data were missing completely at random (MCAR). Complete information on missing data is presented in Table 1. Due to the nature of missing data, multiple imputation was used to replace missing data with substituted values. This method was used for all proposed hypothesis testing analysis variables. Mahalanobis' distances were calculated to identify multivariate outliers, resulting in the removal of six cases. The final sample resulted in 1,405 participants. A square root transformation was used on total household income and a log 10 transformation was used to transform negative affect

**Table 1.** Missing data for study variables.

| Variable | Missing *n* | Missing % |
|---|---|---|
| Sexual Satisfaction | 246 | 17.4 |
| Religious Identification | 213 | 15.1 |
| Total Household Income | 274 | 19.4 |
| Highest Level of Education Completed | 3 | 0.2 |
| Social Support | 215 | 15.2 |
| Children in the Home | 0 | 0 |
| Adult Children in the Home | 108 | 7.7 |
| Affectual Solidarity | 224 | 15.9 |
| Cohabitation Length | 4 | 0.3 |
| Sexual Functioning | 369 | 26.2 |
| Age | 0 | 0 |
| Negative Affect | 216 | 15.3 |
| Physical Health and Functioning | 0 | 0 |

*N* = 1,411

**Table 2.** Sample demographics.

| Characteristic | *M* (range) | *SD* | N (%) |
|---|---|---|---|
| Age (years) | 53.32 (40–70) | 8.60 | |
| Year survey taken | 2004.08 ('04-'05) | 0.27 | |
| Race | | | |
| Caucasian/White | | | 1,310 (93.2) |
| African American/Black | | | 39 (2.8) |
| Native American/Alaskan | | | 14 (1.0) |
| Asian | | | 7 (0.5) |
| Native Hawaiian | | | 2 (0.1) |
| Latinx | | | 19 (1.4) |
| Other | | | 4 (0.3) |
| Highest Level of Education | | | |
| No Diploma/No GED | | | 69 (5) |
| High school Diploma/ GED | | | 404 (28.8) |
| Some college, no degree | | | 324 (23.1) |
| Associate's Degree/Vocational/2 yr | | | 115 (8.2) |
| Graduated college (4–5 yrs) | | | 268 (19.1) |
| Some graduate school | | | 40 (2.8) |
| Master's Degree | | | 146 (10.4) |
| Doctoral Degree | | | 36 (2.6) |
| Employment Status – Employed | | | 770 (54.8) |
| Religious (Yes/No) – Religious | | | 1055 (75.1) |
| Number of Children (total) | 2.61 (0–11) | 1.60 | |
| Sexual Orientation | | | |
| Heterosexual | | | 1150 (81.9) |
| Homosexual | | | 12 (0.9) |
| Bisexual | | | 10 (0.7) |
| Cohabitation Length (in years) | 25.49 (.02–54.00) | 13.42 | |
| Married to current partner | | | 1323 (94.2) |
| Characteristic | *M* (range) | *SD* | N (%) |
| Sexual Frequency | | | |
| Never/Not at all | | | 184 (13.1) |
| Less often than once a month | | | 139 (9.9) |
| Once a month | | | 107 (7.6) |
| Two or three times a month | | | 230 (16.4) |
| Once a week | | | 282 (20.1) |
| Two or more times a week | | | 216 (15.4) |

*N* = 1,405 (Age only variable reflecting imputed data)

**Table 3.** Correlations among relevant variables (N = 1,411).

| Measure | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | 12. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Sexual Satisfaction | - | | | | | | | | | | | |
| 2. Religious Identification | .07** | - | | | | | | | | | | |
| 3. Total Income | −.04 | −.11** | - | | | | | | | | | |
| 4. Highest Education | .01 | −.01 | .33** | - | | | | | | | | |
| 5. Social Support | .14** | .15** | .05 | .11** | - | | | | | | | |
| 6. Adult Children in Home | −.01 | .03 | .03 | −.05 | −.14** | - | | | | | | |
| 7. Affectual Solidarity | .50** | .-.01 | −.00 | −.01 | .21** | −.03 | - | | | | | |
| 8. Cohabitation Length | −.04 | .19** | −.18** | −.16** | .04 | .04 | .05 | - | | | | |
| 9. Sexual Functioning | .42** | .02 | .03 | .01 | .13* | −.01 | .36** | −.07 | - | | | |
| 10. Age | −.06 | .14** | −.25** | −.14** | .10** | −.16** | .11** | .64** | −.07 | - | | |
| 11. Negative Affect | −.23** | −.06* | −.06 | −.12** | −.26** | .07* | −.32** | −.09** | −.16** | −.11** | - | |
| 12. Physical Health and Functioning | .12** | −.03 | .24** | .26** | .18** | −.06* | .07* | −.12** | .08** | −.13** | −.38** | - |

*p < .05, **p < .001

to address skewness and kurtosis. The variable of children in the home was dropped due to its extreme skew and kurtosis, and a resulting lack of confidence that this variable was trustworthy. The presence of children in the home was changed to only be assessed with the variable of adult children in the home.

Participants' mean age was 53.32 years. The majority of the sample (93.2%) identified as Caucasian or White, as well as heterosexual (81.9%), although it should be noted that a sizable portion of participants (16.6%) did not report their sexual orientation. Seven hundred and seventy participants (54.8%) reported being currently employed. One thousand and fifty-five participants (75.1%) reported being religious. Participants reported having anywhere from zero to eleven children in total, with the average number of children being three. The mean length of partner cohabitation was 25.49 years. The majority of the sample reported being married to their partner (94.2%). With regard to sexual frequency, 20.1% of the sample reported "having sex with someone" once a week. A detailed description of sample characteristics can be seen in Table 2.

The correlations among all study variables were analyzed for multicollinearity using bivariate correlations and these are presented in Table 3. Bivariate scatterplots suggested that most variables, with the exception of affectual solidarity, did not have linear relationships with sexual satisfaction. Religiosity was found to have a curvilinear relationship with sexual satisfaction, and further analyses use the transformed variable of religiosity squared to account for this. The following linear analyses may have underestimated the strength of the relationships between all other variables proposed and sexual satisfaction.

Relationships between sexual satisfaction and demographic variables were analyzed to search for potential confounding variables. Only one variable, sexual frequency, appeared to be strongly associated with sexual satisfaction ($r = .634$, $p < .001$). Given the high correlation between sexual frequency and sexual satisfaction, analyses controlled for sexual frequency.

## Main analyses

***Our primary hypothesis was that an ecological model – including the macrosystem level variable of religiosity, the exosystem level variables of SES, social support, and parenthood, the mesosystem level variables of affectual solidarity, cohabitation length, and sexual functioning, and the microsystem level variables of age, negative affect, and physical health and functioning – together significantly predict sexual satisfaction in a national sample of women in midlife***

This hypothesis was tested using hierarchical regression analyses with a split sample. The sample was split according to even or odd numbered participant identification numbers. The split sample was used to reduce potential Type I errors given the large sample size, and a regression analysis was chosen due to its ability to determine the strength of this proposed model and to identify which variables were

**Table 4.** Summary of hierarchical regression analysis for sexual satisfaction in odd sample (N = 571).

| Step and Predictor Variables | *B* | *SE B* | *R* | $R^2$/*Adjusted* $R^2$ | *ΔR2* | *F* | *ΔF* |
|---|---|---|---|---|---|---|---|
| Step 1 | | | .60 | .36/.36 | | 243.79** | |
| *Sex Frequency* | 1.01** | .05 | | | | | |
| Step 2 | | | .74 | .55/.54 | .19** | 43.14 | 16.28 |
| *Sex Frequency* | .85** | .05 | | | | | |
| *Religious Identification* | .00 | .00 | | | | | |
| *Income* | −.00* | .00 | | | | | |
| *Education* | −.01 | .04 | | | | | |
| *Social Support* | .09 | .14 | | | | | |
| *Adults in the Home* | −.03 | .19 | | | | | |
| *Affectual Solidarity* | 1.59** | .19 | | | | | |
| *Cohabitation Length* | .01 | .01 | | | | | |
| *Sexual Function* | .90** | .22 | | | | | |
| *Age* | −.01 | .01 | | | | | |
| *Negative Affect* | −.66 | .67 | | | | | |
| *Physical Health and Functioning* | .10 | .09 | | | | | |

*$p < .05$. **$p < .001$

significant. As discussed previously, SES included the specific variables of income and highest education, and parenthood was represented by the variable of adult children in the home. The first block of each regression for both odd and even samples contained the variable of sex frequency, and the second block included the proposed ecological variables. Thus, the contribution of the proposed ecological variables is examined while controlling for sex frequency. Sex frequency had a large portion of missing data (17.6%), so results should be interpreted with some caution.

In the odd sample, the first block resulted in a significant model with a large effect size, $F(1,432) = 243.791$, $p < .001$, $R^2 = .361$, Adjusted $R^2 = .359$. The ecological model variables were added to the second block of the regression, and a hierarchical regression revealed that this final model was significant, $F(11,421) = 43.136$ $p < .001$, $R^2 = .551$, Adjusted $R^2 = .539$. The addition of ecological model variables resulted in a significant increase in the variance accounted for in sexual satisfaction while controlling for sexual frequency, $\Delta R^2 = .191$, $p < .001$. Specifically, pooled analyses revealed that in the final model, sexual frequency ($B = .854$, $SE\ B = .049$, $p < .001$), income ($B = -.002$, $SE\ B = .001$, $p < .05$), affectual solidarity ($B = 1.588$, $SE\ B = .186$, $p < .001$), and sexual function ($B = .904$, $SE\ B = .216$, $p < .001$) were all significant in predicting sexual satisfaction. Results of the regression analyses for the odd sample are presented in Table 4.

**Table 5.** Summary of hierarchical regression analysis for sexual satisfaction in even sample (N = 587).

| Step and Predictor Variables | *B* | *SE B* | *R* | $R^2$/*Adjusted* $R^2$ | *ΔR2* | *F* | *ΔF* |
|---|---|---|---|---|---|---|---|
| Step 1 | | | .58 | .33/.33 | | 221.42** | |
| *Sex Frequency* | 1.07** | .06 | | | | | |
| Step 2 | | | .75 | .57/.56 | .24** | 48.20** | 22.07 |
| *Sex Frequency* | .92** | .05 | | | | | |
| *Religious Identification* | .00 | .00 | | | | | |
| *Income* | −.00* | .00 | | | | | |
| *Education* | .00 | .04 | | | | | |
| *Social Support* | .04 | .13 | | | | | |
| *Adults in the Home* | .09 | .20 | | | | | |
| *Affectual Solidarity* | 1.37** | .15 | | | | | |
| *Cohabitation Length* | −.00 | .01 | | | | | |
| *Sexual Function* | .95** | .15 | | | | | |
| *Age* | .04* | .01 | | | | | |
| *Negative Affect* | −1.60* | .66 | | | | | |
| *Physical Health and Functioning* | .08 | .09 | | | | | |

*$p < .05$. **$p < .001$

In the even sample, the first block resulted in a significant model, as well, $F(1,449) = 221.421$, $p < .001$, $R^2 = .330$, Adjusted $R^2 = .329$. As described above, the proposed ecological model variables were added into the second block, and a hierarchical regression analysis revealed that this final model was also significant, $F(11,438) = 48.201$, $p < .001$, $R^2 = .569$, Adjusted $R^2 = .557$. Again, the addition of the ecological model variables resulted in a significant increase in variance accounted for in sexual satisfaction, $\Delta R^2 = .239$, $p < .001$. Pooled analyses revealed that in the final model, sex frequency ($B = .924$, $SE\ B = .051$, $p < .001$), income ($B = -.002$, $SE\ B = .001$, $p < .05$), affectual solidarity ($B = 1.368$, $SE\ B = .149$, $p < .001$), sexual function ($B = .954$, $SE\ B = .153$, $p < .001$), negative affect ($B = -1.596$, $SE\ B = .664$, $p < .05$), and age ($B = .039$, $SE\ B = .012$, $p < .05$) were all significant predictors of sexual satisfaction. Results of this regression analysis are presented in Table 5.

In sum, both odd and even samples yielded significant final models, and significant increases in the variance accounted for with the addition of ecological level variables, suggesting support for an ecological approach to examining sexual satisfaction in midlife women. The specific ecological variables that were significant in both odd and even samples were income, affectual solidarity, and sexual function. Variables that were significant in one sample, but not the other, included age and negative affect. Between the two samples, variables from every level of the ecological model, except for the macrosystem, were found to be significant in predicting sexual satisfaction in this population.

## Discussion

Support was partially found for the hypothesis that an ecological model – including the macrosystem level variable of religiosity, the exosystem level variables of SES, social support, and parenthood, the mesosystem level variables of affectual solidarity, cohabitation length, and sexual functioning, and the microsystem level variables of age, negative affect, and physical health and functioning – would together significantly predict sexual satisfaction in a national sample of women in midlife. In sum, the predicted model was significant across both odd and even samples while controlling for sex frequency, suggesting the usefulness of this framework in predicting sexual satisfaction. Both samples yielded similar results with regard to the variance accounted for in sexual satisfaction (Odd sample: Adjusted $R^2 = .539$; Even sample: Adjusted $R^2 = .557$). Findings highlight that sexual frequency is an important piece of understanding sexual satisfaction in this population, but that ecological level variables remain critical in this process.

Across both odd and even samples, income, affectual solidarity, and sexual function all significantly predicted sexual satisfaction while controlling for sex frequency; income had a slightly negative relationship with satisfaction, whereas affectual solidarity and sexual function had positive relationships with satisfaction. These variables spread across the exosystem and mesosystem levels of an ecological framework. Relationship satisfaction is one of the most studied factors in women's sexual satisfaction and has been shown to be highly positively related with sexual satisfaction across a range of female samples (Byers, 2005; Byers & Rehman, 2014; Calvillo et al., 2020; Impett et al., 2014; Lawrance & Byers, 1995; Sprecher, 2002). This study expanded on the previous research by studying affectual solidarity in midlife women specifically, and within the context of other ecological variables. Sexual function as a positive predictor of satisfaction is also supported by the previous research, and may carry significant weight for middle-aged women, given that sexual dysfunction is most common in midlife (Thomas & Thurston, 2016). Income as a predictor of sexual satisfaction is also supported by previous findings, and highlights the importance of the more peripheral levels of the ecological model (Sánchez-Fuentes et al., 2014; Velten & Margraf, 2017).

When considering both odd and even samples, variables from almost every ecological level predicted sexual satisfaction, including negative affect and age in addition to the predictors described above. Although these variables are less certain predictors of sexual satisfaction, they are worth drawing attention to. Negative affect was found to contribute to sexual satisfaction in the even sample ($B = -1.596$, $SE\ B = .664$, $p < .05$), but not in the odd sample. Negative affect may decrease in importance as other more specific factors are taken into account, such as sexual function and relationship

satisfaction (Henderson et al., 2009). Finally, age was significant in the even sample only, $B$= .039, $SE$ $B$= .012, $p$< .05. This finding reflects the varied research regarding age and sexual satisfaction, and the likelihood that age, in part, contributes to sexual satisfaction due to its effects on other age-related factors.

Although age was only significant in the even sample, it is worth noting that age's relationship with sexual satisfaction was positive when controlling for sexual frequency, $B$= .039 $SE$ $B$= .012, $p$< .05. It appears that when frequency remains equal, there is a slight indication that older age predicts higher satisfaction, suggesting that older age leads to *heightened* satisfaction due to aspects like sexual wisdom or changes in expectations (Forbes et al., 2017).

Contrary to hypothesis, there were also predictors that did not contribute to sexual satisfaction in either sample, including religiosity, parenthood, social support, education, relationship length, and physical health and functioning. With regard to religiosity, it is possible that other religious constructs are more important in this population, such as religious upbringing, specific practices, or specific religious schemas (e.g., fundamentalism). The lack of support for parenthood was likely due to measurement difficulties in this study. Of note, social support was significantly correlated with sexual satisfaction ($r$ = .15, $p$ < .001), but did not remain a significant predictor of sexual satisfaction when taking other ecological variables into account. It is possible that social support may be an indication of overall relationship quality with others, and that affectual solidarity itself was a much more important predictor of sexual satisfaction.

With regard to education, it is possible that income plays a much larger role in satisfaction as an SES variable due to its effects on stress, relationships, and wellbeing. Within this study's sample, the mean length of cohabitation was 25 years, and it is possible that different inclusion criteria may have yielded different results. Finally, it is possible that the specific item used in this study for physical health and functioning did not capture the most relevant aspects of this construct for sexual satisfaction, such as exercise frequency or body image (Penhollow & Young, 2008; Weaver & Byers, 2006). Body image may be especially relevant given research indicating that body image remains a lasting concern for most women as they age and that it may be associated with decreased sexual function and satisfaction during the menopausal period specifically (Cameron et al., 2019; Séjourné et al., 2019).

This study does have some limitations. The use of phone interviews and self-administered questionnaires did not ensure complete anonymity and may have increased the likelihood of skipping questions. These methods may have contributed to the large portions of missing data in this study. Additionally, sexual satisfaction was measured with a single sexual quality of life (SQoL) item that asks the respondent to rate "the sexual aspect of their life these days." It would have been preferable to have a scale that utilizes a theory specific to sexual satisfaction.

A major limitation in the current study is the lack of diversity in the sample. The current study's sample was predominantly Caucasian/White (93.2%) and heterosexual (81.9%). Results would likely look different in a more diverse sample, and this may be particularly true when considering macrosystem-level factors. Study findings are also limited by some of the data issues described previously, most notably the lack of linear relationships between many of the ecological variables and sexual satisfaction. It is likely that these results underestimated the strength of these variables' relationships with sexual satisfaction. Future research can utilize expanded approaches to examine these relationships, including the possibility of curvilinear relationships.

A better understanding of sexual satisfaction can guide intervention efforts for women struggling with sexual concerns. Women tend to report decreased sexual satisfaction and activity as they age, and therefore, middle age is a crucial developmental stage to target sexual satisfaction in (Dundon & Rellini, 2010). Results support the consideration of an ecological framework in interventions and a need to pay attention to contextual factors. Results also reveal that interventions must directly address relationship components, including the aspects that make up affectual solidarity, such as feelings of appreciation and support (Schuster et al., 1990). Finally, results suggest that interventions

can use the strengths that come with age to address satisfaction concerns. A client's own "sexual wisdom" can be explored or bolstered by identifying increased knowledge, skills, and understanding of expectations (Forbes et al., 2017).

Future research should examine an ecological model of satisfaction in more diverse samples, as it is likely that predictors of sexual satisfaction vary among different populations. Similarly, research should aim to reach women of different sexual orientations within the distinct period of midlife. Future research efforts may also benefit from a more detailed examination of the relationship between age and sexual satisfaction. Additionally, more research is needed on macrosystem-level variables such as political ideology and climate. Future research would also benefit from exploring personal beliefs about sex, body image, and sexual communication; this study did not include these constructs due to the variables available in the dataset, as well as mixed findings on the specific components of menopause that may contribute most to satisfaction.

This study used regression analyses due to the overarching aim to examine predictors as they fit within ecological levels, as well as the nature of variables chosen. Previous research examining ecological levels have used structural equation modeling to support this model and examine the relationships between levels, however, none have done so in midlife, specifically. Future research, therefore, will benefit from the use of structural equation modeling to more formally assess the fit of an ecological model in midlife women. This study utilized regression analyses as this was an initial exploration focused on differing constructs within ecological levels, rather than understanding overarching latent constructs of sexual satisfaction; this study provides the groundwork for future research to examine these relationships more closely.

This study contributes to the research on sexual satisfaction by testing an ecological model in midlife women, and examining the specific predictors of SES, social support, parenthood, affectual solidarity, relationship length, sexual functioning, age, negative affect, and physical health and functioning. Results reinforce the use of an ecological framework in understanding sexual satisfaction in this population. Results also support the particular relevance of income, affectual solidarity, and sexual functioning in predicting sexual satisfaction in this population.

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## ORCID

Katherine Arenella http://orcid.org/0000-0002-3963-644X
Ann Steffen http://orcid.org/0000-0003-4530-8204

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