Research Article

Age at first sex and adult mental health in Nicaragua

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Abstract

BACKGROUND
Research suggests age at first sex, particularly early sexual debut, is associated with mental distress in adolescence. However, we know little about whether mental health deficits related to age at first sex last into adulthood, and whether this differs by gender, in low-income settings.

OBJECTIVE
We estimate associations between age at first sex and adult mental distress in Nicaragua. Given the gendered nature of sexual norms and higher rates of mental distress among Nicaraguan women, we assess gender differences in associations. We consider number of sexual partners and births as potential mediators.

METHODS
We use data from the 2011/2012 Nicaragua Reproductive Health Survey (N = 10,893 women; N = 3,495 men) and negative binomial regression to assess how age at first sex is associated with adult mental distress.

RESULTS
Women and men whose first sex occurred during early adolescence had higher rates of adult mental distress than those who delayed sex until ages 15–17. Delaying first sex after age 17 was associated with decreased mental distress for women only. We found little evidence of mediation.

CONCLUSIONS
Early first sex is associated with increased adult mental distress in Nicaragua. This finding is particularly robust for women. In this setting, women whose sexual debut begins before adulthood (age 18) have higher rates of mental distress.

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CONTRIBUTION
Findings suggest that early first sex may contribute to long-term mental distress, and gender disparities, in low-income settings. Providing resources to help delay first sex beyond early adolescence may be critical for mental health in adulthood.

1. Introduction

Adolescence is a critical developmental period when sexual and other health behaviors begin and can have long-term consequences for individuals' well-being (Dixon-Mueller 2008; McLeod and Almazan 2003; Vasilenko, Lefkowitz, and Welsh 2014). One of the marking sexual health events during this period is first sex, or sexual debut. The advent of first sex is recognized as an important life course (Heywood et al. 2015) and developmental (Dixon-Mueller 2008) event in adolescence across settings.

One critical aspect of sexual debut is the age at which it occurs. The age at which key events, such as first sex, occur are important due to the social norms that govern the acceptability of the timing of such events (Elder Jr., Kirkpatrick Johnson, and Crosnoe 2003; Graber and Brooks-Gunn 1996). Nonconformity to these norms may result in mental distress in the case of first sex if individuals negatively interpret and evaluate their sexual debut (Vasilenko, Lefkowitz, and Welsh 2014). Age also captures the cognitive, emotional, and biological development of an individual. If sex occurs too early, it may alter the cognitive, physical, or emotional development that occurs afterwards (Dixon-Mueller 2008; Graber and Brooks-Gunn 1996). Early first sex is also more likely to be nonvoluntary and later be regretted, which may cause lasting negative emotions and related mental health problems (Dixon-Mueller 2008; Osorio et al. 2012). First sex that occurs too early may lead to later mental distress if it is socially deviant or developmentally inappropriate.

Research in developed countries finds mixed evidence as to whether an earlier age at first sex is associated with adolescent mental distress (Madkour et al. 2010; Meier 2007; Sabia 2006; Wesche et al. 2017), but any potential effect appears to attenuate by adulthood in these settings (Epstein et al. 2018; Kugler et al. 2017; Spriggs and Halpern 2008). We know little, however, about how age at first sex is associated with adult mental health in low- and middle-income countries (LMICs), where social norms differ (Gibbons and Luna 2015) and there are limited reproductive and mental health resources to cope with age at first sex and its cascade of consequences (Gibbons and Poelker 2019; Kieling et al. 2011; Patel et al. 2007; Thapar et al. 2012). Further, rates of mental distress are particularly high in LMICs (Lund et al. 2010; World Health Organization 2017). Thus, it

is of critical importance to public health that we better understand how key transitions, such as sexual debut, during adolescence may affect mental health in adulthood.

To begin to address this important gap in research, we ask whether early first sex is associated with mental distress among adult women and men in Nicaragua. Nicaragua is a low-income country with the highest prevalence of teenage pregnancy in Latin America (Campbell and Jenkins 2014) and a growing percent of women report having had sex during adolescence (Samandari and Speizer 2010). We also consider whether delaying first sex beyond a society's typical age influences mental distress – a question that has been neglected in both industrialized and LMIC settings.

Further, the gender norms of *marianismo* (virginity) for women and *machismo* (sexual dominance) for men are common in Latin America. These norms, which sanction early sexual debut differently for girls and boys, suggest that the consequences of age at first sex for adult mental health may vary by gender. We use comparable data for both women and men to assess gender disparities in how age at first sex is associated with adult mental distress. Finally, we consider two reproductive health pathways through which age at first sex may affect later mental distress: number of sexual partners and number of births. We assess these potential mediators separately for women and men, for whom these processes may work differently. Overall, our findings reveal how a key component of adolescent development and sexual health may be related to adult mental health in Nicaragua. We also contribute to research on gendered social norms surrounding sexuality by showing that early sexual experiences may contribute to gender disparities in adult mental distress.

2. Background

2.1 Age at first sex and adult mental distress

The question of age at first sex and mental distress in adulthood has not been addressed in LMICs, but research in the United States finds no association (Epstein et al. 2018; Kugler et al. 2017; Spriggs and Halpern 2008). This null finding is consistent when measuring mental health in one's early 20s (Kugler et al. 2017; Spriggs and Halpern 2008) or 30s (Epstein et al. 2018), and whether age at first sex was measured continuously (Epstein et al. 2018), as 14 and younger versus 15 and older (Kugler et al. 2017), or 15 and younger versus 16–18 (Spriggs and Halpern 2008).

Why, then, might we expect early first sex to affect adult mental health in LMICs when it does not in the United States? First sex that occurs too early – before individuals are developmentally and physiologically ready, a concern in LMICs (Dixon-Mueller 2008) – may alter adolescents' cognitive and emotional development (Graber and

Brooks-Gunn 1996), with potentially long-term consequences for mental distress. Additionally, in contexts with rigid sexual norms around age at first sex, adolescents may be especially vulnerable to negative evaluations of first sex timing if it is before or after the norm (Vasilenko, Lefkowitz, and Welsh 2014). Across LMICs, social constraints on sexuality are high while access to contraception and family planning resources are low (Decat et al. 2015; Gibbons and Luna 2015; Rani, Figueroa, and Ainsle 2003; Zuniga-Fajuri 2014). For example, contraceptive use ranges from less than 20% to 50% across Latin American countries (Ali and Cleland 2005). This means early first sex may be more detrimental to mental health if it is more likely to result in sexually transmitted infections or unwanted pregnancies. Mental health services to cope with the consequences of first sex are also limited in LMICs (Gibbons and Poelker 2019; Kieling et al. 2011; Patel et al. 2007; Thapar et al. 2012). For instance, across Latin America, 63% and 73% of individuals with depression and anxiety, respectively, do not receive any mental health treatment (Pan American Health Organization 2013). In short, we posit that the occurrence of very early first sex, social norms that govern sexual behavior, and limited reproductive and mental health services may allow for negative mental health effects of age at first sex to endure into adulthood in LMICs.

Several studies in LMICs find negative associations between early age at first sex and adolescent mental distress. Mexican adolescents who delayed sexual activity had lower levels of depression and anxiety than those engaging in sexual or committed relationships (Espinosa-Hernández and Vasilenko 2015). In Taiwan, those that reported having first sex before age 16 (relative to ages 16–19) had increased problem behaviors and increased depressive-like symptoms (Chan et al. 2015). One study in South Korea found that first sex by high school graduation was associated with greater aggression for boys and depressive symptoms for girls one year after high school graduation (Kim 2016), indicating a possible lasting effect by the end of adolescence. However, no known research has addressed whether early age at first sex is associated with mental distress in adulthood in LMICs.

There is little evidence as to whether delaying first sex beyond its typical age shapes adolescent or adult mental health in LMICs. On the one hand, delaying first sex may benefit adult mental health if it allows adolescents to pursue other opportunities, like completing school. This is especially important in LMICs where secondary schooling is not compulsory, and women are expected to drop out of school when pregnant (Grant 2012; World Health Organization 2014). Given expectations of virility in men, first sex that occurs too late may have social consequences that deter adult well-being. One US study finds that delaying sex beyond age 16 is not associated with depressive symptoms, but also finds suggestive evidence of increased depressive symptoms if first sex is delayed beyond age 24 (Vasilenko, Kugler, and Rice 2016).

On the other hand, delaying sexual debut past its typical age may not exert a lasting effect on mental distress. Developmental theory recognizes that not all events are necessarily impactful for individual development. Rather, when these important events occur during key transitions (e.g., the transition from childhood to adolescence), they may incur biological, cognitive, and social changes (Graber and Brooks-Gunn 1996). Although important for development at younger ages, first sex that occurs outside of a key transition period or later in adolescence may not be developmentally significant enough to affect mental health in adulthood. We build on past research by being the first to estimate associations between age at first sex – capturing early, on time, and delayed first sex – and adult mental distress in an LMIC setting (Nicaragua, detailed below) using a nationally representative sample.

We further hypothesize that the association between age at first sex and adult mental distress may vary by gender. Across Latin American countries, *machismo* and the *marianismo* (also known as modelo de Maria or the Virgin Mary Syndrome) are common constructions of gender that promote sexual abstinence before marriage among women and sexual virility among men (Baldwin and DeSouza 2001; Gibbons and Luna 2015). Though machismo and marianismo are primarily used to describe gender norms in Latin America, there is evidence of similarly gendered sexuality norms in other LMICs, where women are expected to delay sexual debut, but men are not similarly constrained (Clark and Mathur 2012; Eloundou-Enyegue 2004; Frye 2017; Grant 2012). Because interpretations of one's own sexual debut can have consequences for mental health (Vasilenko, Lefkowitz, and Welsh 2014), these sexual norms may lead women to evaluate the timing of first sex more negatively than men, potentially contributing to gender disparities in adult mental health.

Empirical research finds greater consequences of early first sex for female adolescent mental health – and in particular for depressive symptoms – across high-income and LMIC settings (e.g., Espinosa-Hernández and Vasilenko 2015; Madkour et al. 2010; Meier 2007). In Mexico, female adolescents who had sex but not in a relationship, compared to female adolescents in other relationship types, had higher levels of depressive symptoms, but this was not true for male adolescents (Espinosa-Hernández and Vasilenko 2015). In Taiwan and in South Korea, early first sex was associated with problem behaviors for both boys and girls but associated with depressive symptoms for girls only (Chan et al. 2015; Kim 2016). These studies suggest that early first sex may have greater consequences for women's mental health than for men's mental health. We build on this line of research by asking whether potential gender differences in the mental health effects of age at first sex extend into adulthood in the low-income setting of Nicaragua.

2.2 Age at first sex, adult mental distress, and gender differences in Nicaragua

Nicaragua is one of the poorest countries in the Western hemisphere, and an estimated 60% of the population suffers from multidimensional poverty including poor health, little education, low income, and a lack of access to basic necessities (Duryea and Robles 2016). Within LMICs, Nicaragua's public health context makes understanding the associations between age at first sex and adult mental distress a vital policy issue. Depressive and anxiety disorders account for 8.8% and 5% of the burden of disease in Nicaragua, respectively (World Health Organization 2017), yet only 25% of its citizens have access to mental health care (Sapag et al. 2013). Furthermore, Nicaragua allocates only 1% of national health spending to mental health services. These statistics illustrate limited access to, and little national support for, mental health care.

Sexual health among adolescents is also a critical public health problem in Nicaragua. Despite social norms against premarital sex (Berglund et al. 1997), the prevalence of sex among adolescents in Nicaragua has increased in the past 15 years. For example, women ages 15–19 surveyed in 2006–2007 were 24% more likely to report ever having sexual intercourse than their counterparts in 1992–1993 (Samandari and Speizer 2010). Nicaragua has the highest rate of adolescent fertility in Latin America (Campbell and Jenkins 2014; UNICEF 2013), and an estimated 45% of teenage pregnancies in Nicaragua are unplanned (Blandón et al. 2006). This is, in part, due to a lack of access to contraception, and abortion is banned under all circumstances (Zuniga-Fajuri 2014). Thus, the risk of an unplanned pregnancy and subsequent birth is high among adolescents (Campbell and Jenkins 2014), which may contribute to mental distress.

Importantly, the consequences of early sex may be distinct for women and men, given strong gender-based norms about sexuality. Similar to other countries in Latin America, in Nicaragua, *machismo* (society's expectation of masculinity and virility in men) encourages male sexual activity at a young age (Sternberg 2000). By contrast, *marianismo* (society's belief in a pure woman/mother) encourages abstinence from women (Berglund et al. 1997). Thus, in Nicaragua, women often face pressure for sex from men, yet pressure for abstinence from society (Decat et al. 2015; Rani, Figueroa, and Ainsle 2003). This may result in a significantly greater mental health penalty for women whose first sex occurs early (compared to those who delay) if their first sexual experience is earlier than they planned, condemned by their peers and family, or involuntary.

By contrast, Nicaraguan men may experience more pressure to engage in early sexual debut, with few consequences of early first sex for their mental health. It is also possible that waiting too long has negative consequences for male adolescents' expectations regarding sexual activity, and thus their mental health. In sum, the developmentally sensitive period of adolescence, limited provision of reproductive and mental health care, and strong gender-based social norms surrounding sexuality in

Nicaragua suggest that it is vitally important to understand the association between age at first sex and adult mental distress in this setting.

2.3 Mediators in the association between age at first sex and adult mental distress

To the extent that early first sex is associated with adult mental distress, we assess whether the association is mediated by two related reproductive behaviors: number of sexual partners and number of births. Early first sex increases one's number of sexual partners, which, in turn, may increase mental distress over the life course through exposure to stressful partnerships (Heywood et al. 2015; Son et al. 2016; Stöckl et al. 2013) and sexually transmitted infections (Hallett et al. 2007; Yaya and Bishwajit 2018). Those with more sexual partners may also have births from multiple partners, a phenomenon known as multipartner fertility, which is associated with educational and wealth disadvantages (for women) and family instability (for women and men) in Nicaragua (Schmeer and Hays 2017).

We also consider the role of number of births in the association between age at first sex and adult mental distress. More children means more mouths to feed and greater investments of resources and time in children's long-term well-being. Having more births may thus constrain household resources and lead to adult mental distress. A high number of births may also reflect lower rates of contraceptive use and abortion (Gottschalk and Ortayli 2014), limiting one's ability to plan pregnancies and births, which may also invoke mental distress. In LMICs, a higher number of total births may result from an early first birth (Obeng Gyimah 2003). However, an early birth may not deter mental health, especially in a low-income setting, if such a birth follows social norms or results from "structural constraints that shorten healthy life expectancy" (Geronimus 2003: 881; Geronimus and Korenman 1992).

Our proposed mediators – number of sexual partners and births – may work differently for men and for women. Gender norms surrounding sexuality, like *marianismo*, suggest that women will face greater social consequences than men for having more sexual partners over the life course. In terms of number of births, women are more likely to be responsible for children that are born out of unplanned, early sexual experiences than are men in Central America (Gibbons and Luna 2015). Though grandmothers and other female relatives play an important role in helping young mothers with caregiving in Nicaragua as elsewhere in Latin America (Aubel 2012), pregnancy among unmarried adolescent girls is not culturally supported and mothers have the main responsibility of providing for their children (Müller 2020). For these reasons, we test our mediators separately by gender.

2.4 Study contributions and research questions

In sum, age at first sex is associated with adolescent mental distress in LMICs (Chan et al. 2015; Espinosa-Hernández and Vasilenko 2015; Kim 2016), but it is not clear whether these effects last into adulthood. More research is needed to assess what ages may be "too early" and which "too late" for first sex (and differences in these thresholds by gender), particularly in LMICs. Given the importance of this topic in Nicaragua due to the high rates of mental distress and early, unplanned pregnancies, we build on this line of research by asking the following questions, using a nationally representative sample of Nicaraguan adults:

1. How is early (age 11 and younger; ages 12–14) and delayed (ages 18–19; ages 20 and older) first sex – compared with first sex that occurs "on time" (median age of 15–17) – associated with adult mental distress in Nicaragua?
2. How do these associations differ by gender?
3. Do number of sexual partners and number of births mediate these associations?

Our goal is to shed light on how first sex timing is related to adult mental health in Nicaragua, with potential to inform future research in this area in other LMICs. Of particular importance is our ability to consider these associations for both women and men given the gender-specific sexuality norms in this setting and other LMICs, with implications for how early sexual experiences may contribute to gender disparities in adult mental health.

3. Methods

3.1 Data and sample

We use data from the Encuesta Nicaragüense de Demografía y Salud (ENDESA) 2011/2012 (the Nicaraguan Reproductive Health Survey), a nationally representative survey of reproductive health behaviors among women ages 15–49 and men ages 15–59. Respondents were selected through multistage, stratified probability sampling based on household clusters from each census segment. The individual-level response rate for the dataset was 94% (National Institute for Development Information and Ministry of Health 2014)

We limit our study sample to adults, defined as those 18 and older in Nicaragua (Ministerio de La Familia, Adolescencia y Niñez 2014), to focus on mental distress in adulthood. We further limit our sample to those whose first sex occurred at least five

years prior to the survey. This ensures temporal ordering between the independent variable (age at first sex, reported retrospectively) and dependent variable (mental distress, measured at time of interview). It also allows us to consider the longer-term effects, after 5 years or more, of age at first sex.

Given our interest in assessing gender differences in the associations, we analyze samples of women (N = 15,266) and men (N = 4,499) separately. We excluded 1,632 women and 515 men who were younger than 18 at the time of the survey and 1,532 women and 333 men who reported having first sex within five years of the interview date. In our final analyses, we dropped 1,191 women and 153 men who report never having had sex because we could not test the potentially mediating influence of number of sexual partners and number of births on adult mental distress, nor could we include our controls of lifetime contraceptive use. (We conducted a supplementary analysis to ensure that excluding those who never had sex did not bias our results – see Sensitivity Analyses section and Appendix A). Finally, we dropped 18 women and 3 men who were missing on mental distress (the dependent variable). Our final analytic sample is 10,893 women and 3,495 men.

3.2 Measures

Our dependent variable is mental distress as measured by the Self-Report Questionnaire 20 (SRQ20), a 20-item survey developed by the World Health Organization to assess the presence of mental health disorders (Scholte et al. 2011). The questions ask respondents about potential mental distress symptoms they are currently experiencing, such as, "Do you often have headaches?" or, "Have you lost interest in things?" (World Health Organization 1994). Each response is coded 1 for yes and 0 for no and summed to compute a total score (out of 20) for each respondent (Cronbach's alpha: 0.88 for women; 0.83 for men). Because the SRQ20 was developed to assess the need for mental health care in places with only primary health care, it has primarily been used in LMICs. The SRQ20 is a valid measure of mental distress that predicts depression and anxiety (sensitivity ranges from 75%–95%) across settings (Chipimo and Fylkesnes 2010; Ghubash et al. 2001; Scazufca et al. 2009; Tuan, Harpham, and Huong 2004).

Our primary independent variable is respondent-reported at age at first sex. Although we theorize that earlier sexual debut will be negatively associated with mental distress, we do not assume a linear association. A linear association implies that a change in age at first sex has uniform effects on mental distress – e.g., delaying first sex from 11 to 15 is equivalent to delaying from 18 to 22. Past research on this topic in LMICs typically measures age at first sex dichotomously to consider early first sex before a certain age, often age 15 (e.g., Chan et al. 2015; Kim 2016). We provide a more nuanced

test of age at first sex by using four categories that capture three stages of adolescence: early adolescence (10–11, 12–14) middle adolescence (15–17), and late adolescence (18 and older; Dixon-Mueller 2008: 247). We include a fifth category, 20 and older, to test whether delaying first sex beyond adolescence and into adulthood provides any mental health benefit. We use middle adolescence as the reference category because it represents the median age at first sex in adolescence (16 for women, 15 for men; authors' calculations).

We assess number of lifetime sexual partners, measured by a direct question asking women and men to report on their number of sexual partners. Because respondents could answer with a specific number, or by indicating "less than 10" or "more than 10," we measure number of sexual partners categorically: 1 (reference), 2, 3–5, and 6 or more partners. We included those who answered "more than 10" in the 6 or more category. For those who answered "less than 10," we set their number of sexual partners to missing and impute their number of sexual partners using multiple imputation (see Analytic Approach section for more details).

Our final measure of reproductive behavior is a continuous measure of number of births. For women, this variable comes from a question asking total number of live births. For men, who were not asked this question directly, we created this variable by combining men's reports of the number of their biological children in the household, out of the household, and that have died.

We include control variables in the analysis to reduce confounding by sociodemographic characteristics, current marital and socioeconomic status, and lifetime contraceptive use. We include age of the respondent in years to account for potential cohort differences in sexual behavior norms and mental distress, and differential reporting bias to due older respondents' recall error. We control for the respondent's level of education categorically: primary or less (reference), secondary, or above secondary (Ellsberg et al. 1999; Lion, Prata, and Stewart 2009). We include a variable indicating whether the respondent grew up in an urban setting to capture potential differences in social norms around age at first sex and availability of partners, and whether the respondent grew up religious as a potential confounder of sexual behavior and adult mental health. Marital status is a categorical variable: married; cohabiting; divorced, separated, or widowed; and never married. Household wealth is a continuous variable of the number of assets owned by the household (range: 0 to 26) and is shown to be associated with age at first sex in this setting (Lion, Prata, and Stewart 2009). Finally, we control for four measures of lifetime contraceptive use. These dichotomous variables indicate whether the respondent has ever used sterilization as a contraceptive method, ever used traditional contraceptive methods, ever used modern contraceptive methods, and ever used the morning after pill. Unfortunately, ENDESA does not ask about

contraceptive use at first sex or for specific sexual experiences, nor do they ask about contraceptive knowledge or access.

3.3 Analytic approach

To avoid losing cases due to missing data, we conducted multiple imputation using the "mi impute chained" command in Stata 14.2 and 10 imputations (von Hippel 2007; Rubin 1987). We then used negative binomial regression to predict mental distress because our dependent variable, mental distress as indicated by the SRQ20, is an over-dispersed count variable. We weight the analyses to account for the complex survey design and account for clustering at the community level with robust standard errors. We assess statistical significance of the coefficients through two-tailed tests at p<0.05. We present exponentiated coefficients for the negative binomial regression for ease of interpretation, converting the coefficients into incidence rate ratios (IRR). An IRR above one represents an increasing rate, and an IRR below one represents a decreasing rate with a one-unit change in the independent variable.

We estimate gender differences by using an interaction term and predicted counts of SRQ20 scores. Recent methodological studies state that it is not appropriate to make conclusions about the nature of interactions when the model is categorical, as is the case with negative binomial regression (Mize 2019; Mustillo, Lizardo, and McVeigh 2018). Following Mize (2019), we first combine the samples of women and men and interact gender with age at first sex. We then use the "margins" command in Stata to estimate predicted counts of SRQ20 scores by gender and age at first sex. We use the "mlincom" command (part of "spost" package in Stata; Long and Freese 2014) to estimate whether predicted counts of SRQ20 score differ by gender for each age at first sex category (e.g., women, first sex at 11 and younger – men, first sex at 11 and younger). Next, we take the second difference to assess whether changes in age at first sex category differ by gender. For example, does the change in adult mental distress from "on time" first sex (ages 15–17) to "very early adolescent" first sex (ages 11 and younger) differ for women and men?

To assess whether our proposed reproductive pathways mediate the association between age at first sex and adult mental distress, we use seemingly unrelated estimation (SUEST). SUEST allows us to simultaneously estimate a model that includes age at first sex and controls only, as well as a model that includes age at first sex, controls, and a proposed mediator. SUEST is the preferred method for testing differences across models when the same observations are used – as is the case here – because SUEST estimates the cross-model covariance. Comparing effects across models without estimating the cross-model covariance can result in inaccurate estimates of the standard error of the difference, potentially leading to incorrect conclusions (Canette and Marchenko n.d.;

Mize, Doan, and Long 2019:169; Weesie 2000). We use these simultaneously estimated models to assess whether the association between an age at first sex (at each age category) and adult mental distress changes when we add a proposed mediator. We refer to our SUEST analyses as post-hoc mediation tests throughout the results (see Appendix B for full results from the SUEST models).

4. Results

4.1 Descriptive statistics

Table 1 shows the weighted descriptive statistics for the analytic sample of women (those ages 18–49 who whose first sex occurred at least five years prior to the survey). Compared with women whose first sex occurred on time (ages 15–17), women who had first sex earliest (ages 11 and younger) had higher mental distress scores, whereas women who were able to delay first sex until ages 18–19 and 20 and older had lower mental distress scores. Women whose first sex occurred latest (ages 18–19 and 20 and older) had fewer lifetime sexual partners, fewer live births, were older, had higher levels of education, were more likely to be married, and had higher levels of wealth than their counterparts whose first sex occurred during mid-adolescence (ages 15–17). By contrast, women whose first sex occurred early (ages 11 and younger and 12–14) had more lifetime sexual partners, lower levels of education, lower levels of wealth, and were less likely to use traditional contraception or the morning after pill compared to the reference group (first sex at ages 15–17).

Table 1: **Weighted descriptive statistics for women ages 18–49**

| Variables | Full Sample | Age at First Sex | | | | |
| | | 11 and Younger | 12–14 | 15–17 (reference) | 18–19 | 20 and older |
	Mean or Proportion	Mean or Proportion	Mean or Proportion	Mean or Proportion	Mean or Proportion	Mean or Proportion
SRQ20	4.42	7.29	4.73	4.55	4.01	3.85
Mean age at first sex	16.84	9.12	13.45	15.92	18.39	22.36
Potential mediators						
Number of lifetime sexual partners						
1	0.54	0.17	0.44	0.52	0.58	0.72
2	0.26	0.29	0.29	0.27	0.27	0.19
3–5	0.18	0.40	0.25	0.19	0.14	0.08
6 or more	0.02	0.13	0.02	0.01	0.01	0.01
Total live births	2.84	3.49	3.58	3.05	2.35	1.84
Controls						
Age	33.89	32.76	32.08	33.54	34.12	36.83
Grew up urban	0.64	0.69	0.54	0.62	0.69	0.73
Grew up religious	0.89	0.89	0.87	0.88	0.90	0.93
Union status						
Married	0.30	0.29	0.24	0.28	0.32	0.37
Cohabiting	0.42	0.45	0.50	0.45	0.38	0.28
Divorced, widowed, separated	0.23	0.20	0.22	0.23	0.24	0.24
Never in Union	0.06	0.06	0.03	0.04	0.07	0.11
Education						
Primary or less	0.51	0.63	0.76	0.55	0.35	0.27
Secondary	0.30	0.27	0.20	0.33	0.37	0.28
Above secondary	0.19	0.09	0.04	0.12	0.28	0.46
Household assets	6.77	6.07	5.28	6.51	7.71	8.34
Ever used sterilization as contraception	0.33	0.33	0.32	0.35	0.30	0.31
Ever used modern contraception	0.88	0.88	0.89	0.88	0.91	0.86
Ever used traditional contraception	0.30	0.29	0.26	0.29	0.34	0.33
Ever used morning after pill	0.12	0.11	0.08	0.11	0.17	0.14
N (number of individuals)	10,893	176	2,308	4,639	1,848	1,922

Table 2 shows the weighted descriptive statistics for the analytic sample of men (those ages 18–59 whose first sex occurred at least 5 years prior to the survey). Men whose first sex occurred earliest (ages 11 and younger) had higher mental distress scores than their counterparts who delayed first sex until ages 15–17. Unlike women, men who delayed sex beyond mid-adolescence did not report lower mental distress than men whose first sex occurred at ages 15–17. Men whose first sex occurred earlier had more lifetime sexual partners, and those whose first sex occurred later had fewer lifetime sexual partners compared to men whose first sex occurred during mid-adolescence. Additionally, men whose first sex occurred latest (20 and older) were older, less likely to grow up urban, more likely to be religious, and more likely to be married than those whose first sex occurred during mid-adolescence. We now turn to our main analysis to test whether age at first sex is associated with mental distress in adulthood, net of controls.

Table 2:   Weighted descriptive statistics for men

| | Full sample | Age at first sex | | | | |
| | | 11 and younger | 12–14 | 15–17 (reference) | 18–19 | 20 and older |
Variables	Mean or Proportion	Mean or Proportion	Mean or Proportion	Mean or Proportion	Mean or Proportion	Mean or Proportion
SRQ20	2.06	2.49	2.26	1.93	1.88	1.82
Age at first sex	15.43	10.11	13.43	15.80	18.25	22.53
Potential mediators						
Number of lifetime sexual partners						
1	0.06	0.01	0.02	0.05	0.14	0.37
2	0.10	0.07	0.07	0.11	0.17	0.18
3–5	0.28	0.15	0.20	0.34	0.38	0.29
6 or more	0.55	0.76	0.72	0.51	0.31	0.16
Total live births	2.43	2.34	2.48	2.44	2.29	2.28
Controls						
Age	35.00	30.86	33.69	35.22	36.51	40.01
Grew up urban	0.59	0.74	0.62	0.59	0.58	0.47
Grew up religious	0.77	0.68	0.76	0.77	0.81	0.86
Union status						
Married	0.35	0.28	0.32	0.35	0.39	0.47
Cohabiting	0.34	0.21	0.37	0.35	0.28	0.23
Divorced, widowed, separated	0.13	0.14	0.14	0.14	0.13	0.06
Never in union	0.18	0.36	0.17	0.16	0.20	0.24

Table 2: **(Continued)**

Variables	Full sample	Age at first sex				
		11 and younger	12–14	15–17 (reference)	18–19	20 and older
	Mean or Proportion	Mean or Proportion	Mean or Proportion	Mean or Proportion	Mean or Proportion	Mean or Proportion
Controls						
Education						
Primary or less	0.51	0.43	0.49	0.52	0.49	0.59
Secondary	0.30	0.31	0.34	0.30	0.27	0.22
Above secondary	0.19	0.26	0.17	0.18	0.24	0.19
Household assets	6.77	6.86	6.78	6.81	7.07	5.93
Ever used sterilization as contraception	0.29	0.18	0.29	0.29	0.29	0.27
Ever used modern contraception	0.92	0.92	0.95	0.91	0.92	0.82
Ever used traditional contraception	0.49	0.61	0.51	0.48	0.50	0.41
Ever used morning after pill	0.17	0.18	0.20	0.16	0.16	0.09
N (number of individuals)	3,495	101	1,334	1,472	346	242

4.2 Regression results for women

Table 3 shows the results from negative binomial regression predicting adult mental distress for Nicaraguan women. Results from Model 1 indicate that women whose first sex occurred at ages 11 and younger had 60% higher rates of mental distress in adulthood than those whose first sex occurred between ages 15 and 17, net of sociodemographic characteristics, family conditions, and lifetime contraceptive use. Those whose first sex occurred between ages 12 and 14 did not differ from the 15- to 17-year-old reference group in their rates of mental distress. However, women who delayed first sex until ages 18–19 and 20 or older had 11% and 13% lower rates of mental distress, respectively, than those whose first sex occurred at ages 15–17 (Table 3, Model 1).

Table 3: **Incidence rate ratios [with 95% confidence intervals] from negative binomial logistic regression predicting mental distress among women (n = 10,893)**

Variables	Model 1	Model 2	Model 3	Model 4
Age at first sex				
11 and younger	1.6	1.41	1.6	1.42
	[1.44 – 1.76]	[1.27 – 1.57]	[1.45 – 1.77]	[1.27 – 1.57]
12–14	1.05	1.01	1.06	1.03
	[0.97 – 1.15]	[0.94 – 1.11]	[0.97 – 1.16]	[0.95 – 1.12]
15–17	ref.	ref.	ref.	ref.
18–19	0.89	0.91	0.88	0.9
	[0.82 – 0.96]	[0.84 – 0.98]	[0.82 – 0.96]	[0.83 – 0.97]
20 and older	0.87	0.92	0.86	0.9
	[0.82 – 0.92]	[0.86 – 0.98]	[0.80 – 0.92]	[0.84 – 0.97]
Potential mediators				
Number of Sexual Partners				
1		ref.		ref.
2		1.16		1.16
		[1.09 – 1.23]		[1.09 – 1.23]
3–5		1.32		1.33
		[1.23 – 1.43]		[1.23 – 1.43]
6 or more		1.63		1.64
		[1.40 – 1.90]		[1.41 – 1.91]
Number of births			0.99	0.98
			[0.97 – 1.00]	[0.97 – 1.00]
Controls				
Age	1.01	1.01	1.01	1.01
	[1.00 – 1.02]	[1.00 – 1.02]	[1.00 – 1.02]	[1.00 – 1.02]
Grew up urban	1.08	1.06	1.08	1.05
	[0.99 – 1.19]	[0.97 – 1.15]	[0.99 – 1.18]	[0.97 – 1.15]
Grew up religious	1.04	1.05	1.04	1.05
	[0.95 – 1.13]	[0.96 – 1.14]	[0.95 – 1.13]	[0.96 – 1.14]

Table 3: **(Continued)**

Variables	Model 1	Model 2	Model 3	Model 4
Union status				
Married	ref.	ref.	ref.	ref.
Cohabiting	1.02	0.97	1.02	0.97
	[0.97 – 1.08]	[0.92 – 1.02]	[0.97 – 1.07]	[0.92 – 1.02]
Divorced, widowed, separated	1.11	1.02	1.11	1.01
	[1.04 – 1.19]	[0.96 – 1.08]	[1.04 – 1.18]	[0.95 – 1.07]
Never in union	0.94	0.87	0.93	0.85
	[0.82 – 1.07]	[0.77 – 0.98]	[0.82 – 1.06]	[0.76 – 0.96]
Education				
Primary or less	ref.	ref.	ref.	ref.
Secondary	1.01	1.01	1.01	1.01
	[0.96 – 1.07]	[0.96 – 1.07]	[0.95 – 1.06]	[0.95 – 1.07]
Above secondary	0.81	0.81	0.81	0.80
	[0.74 – 0.89]	[0.74 – 0.88]	[0.74 – 0.88]	[0.73 – 0.87]
Household assets	1.00	1.00	1.00	1.00
	[0.99 – 1.01]	[0.99 – 1.01]	[0.98 – 1.01]	[0.98 – 1.01]
Ever used sterilization	1.11	1.10	1.12	1.11
	[1.03 – 1.19]	[1.02 – 1.19]	[1.04 – 1.20]	[1.03 – 1.19]
Ever used modern contraception	0.99	0.97	0.99	0.97
	[0.92 – 1.07]	[0.90 – 1.05]	[0.92 – 1.07]	[0.90 – 1.05]
Ever used traditional contraception	1.17	1.17	1.18	1.18
	[1.12 – 1.22]	[1.12 – 1.23]	[1.13 – 1.23]	[1.12 – 1.23]
Ever used morning after pill	1.12	1.06	1.13**	1.06
	[1.04 – 1.21]	[0.98 – 1.15]	[1.04 – 1.21]	[0.98 – 1.15]
Constant	2.69	2.81	2.66	2.77
	[1.98 – 3.64]	[2.07 – 3.82]	[1.94 – 3.63]	[2.03 – 3.80]

Notes: Analyses weighted and adjusted for clustering.

    In Model 2 we considered the effect of number of lifetime sexual partners. Results indicated a 16% higher rate of mental distress among women who had two sex partners, 32% higher distress rates among those with 3–5 partners, and 63% higher distress rates among those with 6 or more partners, compared to women who reported only one sexual partner. Further, the association between very early first sex (ages 11 and under) and mental distress was attenuated by about one-third (IRR 1.60 $\rightarrow$ 1.41) when including number of sexual partners. Evidence of mediation was confirmed by the post-hoc

mediation test (estimated using SUEST). No other age at first sex effects were mediated by number of lifetime sexual partners

Model 3 includes number of live births as another potential mediator. As Model 3 shows, number of live births was not associated with mental distress in adulthood for women. Further, the association between age at first sex and adult mental distress remained the same when adding total births to the model. The full model (Model 4) includes all controls and both reproductive mediators. The results are substantively similar to the Model 2, indicating no additional change in age at first sex effects on women's mental distress when total births are included in the model.

Of the sociodemographic controls, age, union status, education, and three forms of lifetime contraceptive use (ever used sterilization, ever used traditional contraception, and ever used morning after pill) were associated with mental distress in adulthood for Nicaraguan women. Women of older ages (at the time of the survey) reported higher mental distress across all models. Women with more than a high school degree had lower mental distress rates compared to those with primary or less education.

4.3 Regression results for men

Table 4 displays the negative binomial regression results predicting adult mental distress for Nicaraguan men. Model 1 indicates that men whose first sex occurred very early (11 and younger) had higher rates of mental distress, though we note the small sample size of this group (n = 101). Men whose first sex occurred at ages 12–14 had a mental distress rate 18% higher than men whose first sex occurred during middle adolescence (ages 15–17). Unlike women, for men there was no difference in rates of mental distress when first sex occurred at ages 18–19, or 20 and older, compared with the reference group (ages 15–17).

Table 4: **Incidence rate ratios [with 95% confidence intervals] from negative binomial logistic regression predicting mental distress among men (n = 3,495)**

Variables	Model 1	Model 2	Model 3	Model 4
Age at first sex				
11 and younger	1.31	1.24	1.26	1.19
	[0.97 – 1.77]	[0.93 – 1.66]	[0.93 – 1.71]	[0.89 – 1.60]
12–14	1.18	1.12	1.16	1.11
	[1.05 – 1.32]	[1.00 – 1.26]	[1.03 – 1.31]	[0.98 – 1.25]
15–17	ref.	ref.	ref.	ref.
18–19	0.97	0.98	0.96	0.98
	[0.80 – 1.16]	[0.82 – 1.17]	[0.80 – 1.15]	[0.82 – 1.17]
20 and Older	0.92	0.95	0.95	0.98
	[0.74 – 1.15]	[0.75 – 1.21]	[0.77 – 1.17]	[0.77 – 1.25]
Potential mediators				
Number of sexual partners				
1		ref.		ref.
2		0.87		0.88
		[0.61 – 1.23]		[0.62 – 1.25]
3–5		0.91		0.93
		[0.68 – 1.22]		[0.69 – 1.25]
6 or more		1.08		1.10
		[0.81 – 1.46]		[0.82 – 1.48]
Number of births			1.04	1.04
			[1.01 – 1.07]	[1.01 – 1.07]
Controls				
Age	1.01	1.00	1.00	1.00
	[1.00 – 1.01]	[1.00 – 1.01]	[0.99 – 1.01]	[0.99 – 1.01]
Grew up urban	1.35	1.34	1.36	1.35
	[1.08 – 1.69]	[1.07 – 1.69]	[1.08 – 1.70]	[1.07 – 1.70]
Grew up religious	1.27	1.28	1.28	1.29
	[1.07 – 1.51]	[1.08 – 1.53]	[1.07 – 1.52]	[1.08 – 1.54]

Table 4:   (Continued)

Variables	Model 1	Model 2	Model 3	Model 4
Union status				
Married	ref.	ref.	ref.	ref.
Cohabiting	1.03	1.02	1.03	1.02
	[0.90 – 1.18]	[0.89 – 1.16]	[0.91 – 1.17]	[0.90 – 1.15]
Divorced, widowed, separated	1.28	1.27	1.32	1.30
	[1.01 – 1.63]	[1.01 – 1.58]	[1.05 – 1.67]	[1.05 – 1.62]
Never in union	1.15	1.12	1.22	1.18
	[0.97 – 1.36]	[0.94 – 1.32]	[1.03 – 1.44]	[1.00 – 1.39]
Education				
Primary or less	ref.	ref.	ref.	ref.
Secondary	0.85	0.85	0.86	0.85
	[0.70 – 1.05]	[0.68 – 1.05]	[0.70 – 1.05]	[0.69 – 1.05]
Above secondary	0.81	0.79	0.81	0.8
	[0.62 – 1.05]	[0.61 – 1.04]	[0.63 – 1.05]	[0.61 – 1.05]
Household assets	0.98	0.98	0.98	0.98
	[0.95 – 1.01]	[0.95 – 1.01]	[0.96 – 1.01]	[0.96 – 1.01]
Ever used sterilization	1.12	1.10	1.11	1.09
	[1.00 – 1.25]	[0.97 – 1.23]	[0.99 – 1.24]	[0.96 – 1.22]
Ever used modern contraception	0.95	0.93	0.94	0.92
	[0.71 – 1.26]	[0.70 – 1.23]	[0.70 – 1.26]	[0.69 – 1.23]
Ever used traditional contraception	1.07	1.06	1.06	1.05
	[0.96 – 1.19]	[0.96 – 1.17]	[0.95 – 1.18]	[0.94 – 1.16]
Ever used morning after pill	0.98	0.95	0.97	0.94
	[0.86 – 1.12]	[0.84 – 1.08]	[0.85 – 1.10]	[0.83 – 1.07]
Constant	1.24	1.41	1.31	1.47
	[0.84 – 1.83]	[0.92 – 2.18]	[0.89 – 1.94]	[0.95 – 2.27]

Notes: Analyses weighted and adjusted for clustering.

Model 2, which added number of lifetime sex partners, indicates that number of sexual partners was not associated with adult mental distress for men. Controlling for number of sexual partners did reduce the difference in mental distress rates between those whose age at first sex occurred at 12–14 (vs. ages 15–17); the magnitude of the IRR was reduced by about one-third (IRR 1.18 → 1.12). Despite this change in the association when adding number of sexual partners, number of sexual partners is not considered a mediator because it is not independently associated with adult mental distress.

Model 3, which adds number of live births, indicates that each additional birth was associated with a 4% increase in mental distress among men, controlling for other sexual behaviors, sociodemographic characteristics, and current family status. However, adding this variable only minimally reduced the coefficient for age at first sex for men and a post-hoc mediation test revealed that this change was not statistically significant. In terms of controls, growing up urban, growing up religious, and being divorced, widowed, or separated were each associated with increased mental distress for men across models.

4.4 Tests of gender differences

Our second research question asks whether the influence of age at first sex on mental distress varies by gender. Comparing the results from Tables 3 and 4 above, we see the following gender differences in the associations between age at first sex and adult mental distress: (1) first sex at ages 11 and younger was a significant predictor of adult mental distress for women, but not men, across models; (2) first sex at ages 12–14 was a significant predictor for men, but not women, in models 5 and 7; (3) first sex at ages 18–19 and 20 and older was associated with lower mental distress rates, compared with first sex at ages 15–17, for women but not men, across models.

We test these apparent gender differences by pooling the female and male samples, and then estimating predicted counts of mental distress scores from a full model (including both proposed mediators and all controls) that includes an interaction between gender and age at first sex (Mize 2019). Findings from this analysis are presented in Figure 1, revealing that, at every age at first sex category, women have higher levels of mental distress than men (all gender gaps, $p < 0.001$). However, this partially reflects broader gender differences in displays of mental health; women typically report higher overall levels of mental distress than do men (Rosenfield and Mouzon 2013; World Health Organization 2002).

We also assessed whether the consequences of early or delayed first sex for adult mental distress were different for women or men (i.e., second differences). That is, how does the gap between women and men's adult mental distress differ as age at first sex changes? We found that the gender gap in the association between age at first sex and adult mental distress was greatest at earlier ages of first sex. This is evident, visually, in the larger gaps between men and women at younger ages at first sex (Figure 1). The gender gap in adult mental distress was larger for those who had very early first sex (ages 11 and younger), than it was for those whose first sex occurred at ages 15–17, 18–19, or 20 and older. We also found a gender gap comparing "on time" first sex (ages 15–17) to those who delayed first sex to ages 20 and older (second differences, $p < 0.01$). Taken together, these differences indicate that the mental distress consequences of early first

sex are gendered in ways that disadvantage women. (All gender gaps and second differences are presented in Appendix Table C-1.)

Figure 1:   **Predicted count of mental distress score (with 95% confidence intervals) by age at first sex and by gender**
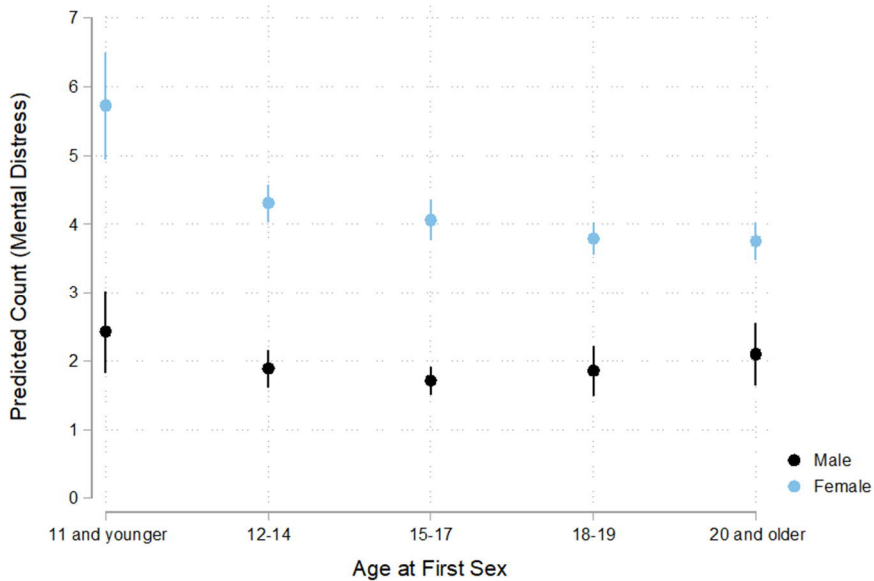
Note: Analyses come from full models (with all controls) that include an interaction between gender and age at first sex. Margins command in Stata is used to calculate predicted counts. Analyses adjusted for clustering, but not weighted due to different sampling weights for men and for women.
Source: The Encuesta Nicaragüense de Demografía y Salud 2011/2012

4.5 Sensitivity analyses

We conducted additional sensitivity tests to ensure the robustness of our results. We first addressed how our decision to exclude those who report never having had sex might bias our results. To test this possibility, we ran regression models including those who have never had sex as a separate group. Our age at first sex results did not change for women or men when we included "never had sex" as a category (Appendix Table A-1 compared with Table 3, Model 1 for women, and Table 4, Model 1 for men).

To further check the robustness of our results, we ran models with various age at first sex functional forms – linear, quadratic, and binary – presented in Appendix Table A-2. These results are consistent with our main analysis: Earlier first sex was positively associated with mental distress for men and for women. We found a negative association when age at first sex is modelled linearly or quadratically, and a positive association when we create a dichotomous variable indicating first sex below the median age (16 for women, 15 for men). Although testing these alternate functional forms strengthens the reliability of our results, our categorical approach reveals more information about the association between age at first sex and adult mental distress than does a linear or binary approach. For example, measuring age at first sex categorically showed that women whose first sex occurs at ages 18–19 and 20 and older had lower rates of adult mental distress compared to women whose first sex occurs at ages 15–17. This was not true for men, whose adult levels of mental distress were similar across these ages at first sex. This finding would be completely missed by a linear modelling approach and obscured by an analysis that measures age at first sex as dichotomous.

5. Discussion and conclusion

We used nationally representative data to estimate associations between age at first sex and adult mental distress in Nicaragua, a low-income country with high teenage pregnancy rates, low contraceptive use, and limited mental health care services. We estimated gender differences in associations between age at first sex and adult mental distress given sexual social norms that work differently for men and women, potentially disadvantaging women in this setting. We also asked whether number of sexual partners and births explained the associations between age at first sex and adult mental distress.

We found that early sexual debut was associated with increased mental distress in adulthood. For Nicaraguan women, first sex that occurred very early in adolescence (under age 12) was associated with increased levels of mental distress compared to first sex that occurred during middle adolescence. Men whose first sex occurred in early adolescence – both at ages 11 and younger and 12–14 – also had greater levels of mental distress.

Overall, these results are consistent with research in LMICs that links early first sex to heightened mental distress during adolescence (Chan et al. 2015; Espinosa-Hernández and Vasilenko 2015; Kim 2016). Our findings further extend this research by suggesting that early first sex may be associated with mental distress into adulthood. This finding runs in contrast to US studies that suggest the mental health consequences of early first sex are attenuated by adulthood (Epstein et al. 2018; Kugler et al. 2017; Spriggs and Halpern 2008). Thus, it may be that in this context, where constraints on sexuality are

high and adolescents have limited access to reproductive and mental health resources, individuals are at higher risk for long-term consequences of early sexual debut (Campbell and Jenkins 2014; Sapag et al. 2013).

We lack data on circumstances surrounding first sex, but we recognize that sexual debut before age 12 is more likely to be nonvoluntary (representing coerced sex or rape) than first sex at older ages (Cáceres, Vanoss Marín, and Sid Hudes 2000; Dixon-Mueller 2008). Coerced early first sex is associated with regret just a few years later for boys and girls in LMIC settings (Osorio et al. 2012), and the trauma associated with rape has lifelong consequences for mental health (Jejeebhoy and Bott 2005; Roberts et al. 2004). Therefore, it is crucial to understand how first sex reported as very early (younger than age 12) is associated with mental distress later in the life course given the traumatic nature of these experiences.

Importantly, we found gender differences in the associations between age at first sex and adult mental distress. Women had higher counts of mental distress at each age at first sex, consistent with international findings of higher displays of mental distress among women compared to men (World Health Organization 2002). Further, we found that first sex in early adolescence (ages 11 and younger) was more consequential for women's adult mental distress than it was for men's. Delaying first sex to age 18 was associated with reduced rates of mental distress for women but not for men. This suggests a late sexual debut threshold effect – an age beyond which delaying first sex will not improve mental health – occurs for men but not for women. If adolescent girls delay sex into adulthood (ages 18 or older), they seem to reap mental health benefits. This may be due to social norms surrounding sexuality like *marianismo* that stigmatizes women, but not men, who have first sex during mid-adolescence (Berglund et al. 1997; Sternberg 2000). These gender gaps could also result from the cascade of consequences that ensue for women, but not men, who have sex during adolescence within this context.

We hypothesized that one of the ensuing processes that worsened women's mental health was an increasing number of sexual partners after an early age at first sex. We did find that number of sexual partners was negatively associated with adult women's mental distress. This may be due to gender norms condemning women's nonmarital sex (Baldwin and DeSouza 2001; Gibbons and Luna 2015), or due to the stressful experiences of partner transitions, which disadvantage women more than men in this setting (Schmeer and Hays 2017). However, number of sexual partners mediated only the association between very early first sex (ages 11 and younger) and mental health. This indicates that other processes are at work for determining how delaying first sex beyond early adolescence enhances women's mental health.

For men, we found that number of sexual partners was not related to mental distress. However, including number of sexual partners in the model attenuated the association between early sexual debut and adult mental distress. This suggests that number of sexual

partners may be picking up on some unobserved factor that is associated with both age at first sex and adult mental distress for men.

We found no evidence that number of births was associated with mental distress for women, while the magnitude of the effect was quite small for men. We also did not find that total number of births mediated the associations between age at first sex and adult mental distress. To the extent that number of births is associated with an earlier first birth, this may not be problematic for Nicaraguan adults' mental health given research indicating that early childbearing makes sense for low-income groups, for example in the United States (Geronimus 2003; Geronimus and Korenman 1992). However, more research is needed on this topic in LMICs like Nicaragua.

There are limitations to our findings that provide avenues for future research. As previously mentioned, using cross-sectional data prevents us from making directional or causal claims. We tried to mitigate this problem by considering only those who reported first sex occurring at least 5 years prior to the survey. However, it is possible that early sexual debut was higher among those who had more mental health issues before the onset of first sex. Nationally representative longitudinal data on sexual and mental health do not exist for Nicaragua (and many other LMICs); this should be a future research priority.

We also were unable to include the circumstances of first sex in our analyses, which may have modified the effect of age at first sex on adult mental health. ENDESA asks questions about the first sexual partner and first sex experiences among women ages 15–19 only. Thus, most women and all men in our sample were not administered these questions. Including these variables in our analyses would prevent us from examining mental distress in adulthood and would not allow for gender comparisons. Future research should consider the context of first sex and mental health among women and men in LMICs.

Another concern is misreporting (or misremembering) about adolescent sexual behaviors among adults (Poulin 2010). Concern regarding the accuracy of retrospective reporting for sexual behaviors exists in both high- and low-income settings and differs by respondent characteristics like gender and education (Beguy et al. 2009; Wu, Martin, and Long 2001). Regarding misreporting in this context, men may report earlier ages at first sex and more sexual partners, as is supported by gender norms and expectations. This may partially explain why we did not find associations for older ages at first sex (18 and older) and number of sexual partners with mental distress for men. In contrast, women may report later ages at first sex and fewer sexual partners for similar reasons (Rani, Figueroa, and Ainsle 2003). This could explain why we found no difference between first sex at ages 12–14 and 15–17 with mental distress. It may also mean that we have underestimated the association between number of sexual partners and adult mental distress for women.

These limitations notwithstanding, our study provides evidence that age at first sex has potentially important implications for mental health in adulthood, particularly for women, in Nicaragua. These findings are important for research and policy given increasing reports of first sex among Nicaraguan adolescents (Samandari and Speizer 2010), concerns about mental health in LMICs (Lund et al. 2010; Patel et al. 2007), and the importance of adolescence for individual development across settings (Dixon-Mueller 2008; Graber and Brooks-Gunn 1996). Future research should investigate early sexual debut in other LMICs and potential processes through which age at first sex works to affect mental distress in adulthood. Our research suggests the critical importance of estimating these effects and processes separately for women and men. Increasing access to resources and services that support healthy sexual behavior among adolescents, as well as the agency to delay first sex, may reduce mental distress throughout the life course in low-income settings, particularly for women.

6. Acknowledgements

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Appendix A – Sensitivity tests

Table A-1: Incidence rate ratios [with 95% confidence intervals] from negative binomial logistic regression predicting mental distress among women and men

Variables	Women	Men
Age at first sex		
Never had sex	0.98	1.02
	[0.85 – 1.13]	[0.72 – 1.44]
11 and younger	1.61	1.32
	[1.46 – 1.78]	[0.97 – 1.79]
12–14	1.06	1.18
	[0.97 – 1.15]	[1.05 – 1.33]
15–17	ref.	ref.
18–19	0.89	0.97
	[0.82 – 0.96]	[0.81 – 1.16]
20+	0.86	0.93
	[0.81 – 0.91]	[0.75 – 1.14]
Constant	2.83	1.16
	[2.07 – 3.88]	[0.86 – 1.57]
Number of Individuals	12071	3633

Notes: Both models control for: age, grew up urban, grew up religious, current union status, education, and household assets. Analyses weighted and adjusted for clustering.

Table A-2: IRRs [with 95% confidence intervals] from negative binomial logistic regression predicting mental distress among women and men – various functional forms

Variables	Women (n = 10,893)			Men (n = 3 495)		
	Linear	Quadratic	Threshold	Linear	Quadratic	Threshold
Functional forms of age at first sex						
Age at first sex	0.98	0.93		0.98	0.92	
	[0.97 – 0.98]	[0.91 – 0.96]		[0.96 – 0.99]	[0.85 – 0.99]	
Age at first sex squared		1.00			1.00	
		[1.00 – 1.00]			[1.00 – 1.00]	
Below median age at first sex			1.10			1.13
			[1.04 – 1.16]			[1.01 – 1.26]
Constant	3.91	5.75	2.70	2.18	3.83	1.42
		[3.68 – 8.99]	[1.99 – 3.66]	[1.30 – 3.64]	[1.79 – 8.22]	[0.95 – 2.13]

Notes: All models presented here control for: number of sexual partners, number of births, age, grew up urban, grew up religious, marriage, education, household assets, ever used sterilization, ever used modern contraception, ever used traditional contraception, ever used morning after pill. Analyses weighted and adjusted for clustering

Appendix B – Mediation tests

Table B-1: **Coefficients [with 95% confidence intervals] from seemingly unrelated negative binomial logistic regression estimating model differences in controlling for potential mediators**

	Panel A: Women			
	Age at first sex category (ref: 15–17)			
Equations	11 and younger	12–14	18–19	20 and older
[Controls for number of partners] – [does not control for number of partners]	–0.11 [–.07, –.15]	–0.03 [–.04, –.02]	.02 [.02 – .03]	.06 [0.05 – .07]
	Panel B: Men			
[Controls for number of partners] – [does not control for number of partners]	–0.05 [–.09, –.01]	–0.04 [–.07, –.02]	0.03 [–.002, .06]	0.07 [–.01, .15]
[Controls for number of births] – [does not control for number of births]	–0.02 [–.05, .01]	–0.01 [–.02, .00]	–.00 [–.01, .01]	0.01 [–.01, .03]

Note: Confidence intervals in brackets. Analyses adjusted for clustering, but not weighted due to limitations of the SUEST command.

Appendix C – Gender differences

Table C-1:   Differences and second differences in age at first sex by gender

Panel A: Gender gap (Women – Men)

	Estimate	Standard error	P-value
11 and younger	3.306	0.461	0.000
12–14	2.424	0.171	0.000
15–17	2.355	0.141	0.000
18–20	1.941	0.211	0.000
20 and older	1.656	0.243	0.000

Panel B: Contrasts (Second Differences)

	Estimate	Standard Error	P-Value
11 and Younger – 12–14	0.882	0.473	0.062
11 and Younger – 15–17	0.951	0.434	0.029
11 and Younger – 18–19	1.365	0.502	0.007
11 and Younger – 20 and older	1.649	0.486	0.001
12–14 – 15–17	0.069	0.185	0.708
12–14 – 18–19	0.483	0.208	0.02
12–14 – 20 and older	0.768	0.276	0.005
15–17 – 18–19	0.414	0.231	0.073
15–17 – 20 and older	0.698	0.261	0.007
18–19 – 20 and older	0.285	0.293	0.331

Notes: Analyses come from full models (with all controls) that include an interaction between gender and age at first sex. Margins are used to calculate gender gaps and second differences (see Mize 2019). Analyses adjusted for clustering, but not weighted due to different sampling weights for men and for women.