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Unraveling the Interplay: Religiosity, Sexual Health Knowledge, and Sexual Behaviors

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UNRAVELING THE INTERPLAY: RELIGIOSITY, SEXUAL HEALTH KNOWLEDGE, AND SEXUAL BEHAVIORS

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By

Erinmarie Travis

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ABSTRACT

Limited research exists on the longitudinal effects of religiosity and sexual health education on adolescents' sexual risk behaviors and their transition into adulthood. This study used The National Longitudinal Study of Adolescent to Adult Health data to investigate these effects in a nationally representative sample. Linear regression analyses explored associations between religiosity, sexual health knowledge (SHK), and sexual risk behaviors (SRBs) during adolescence and emerging adulthood. Findings revealed significant associations between adolescent religiosity and SRBs, predicting SRBs during adolescence. However, religiosity's influence diminished in emerging adulthood, and SHK did not mediate the relationship between adolescent religiosity and SRBs. These results highlight the complex interplay between religiosity, SHK, and SRBs across developmental stages, offering practical implications and avenues for future research.

KEYWORDS: religiosity, sexual health knowledge, sexual behaviors, adolescents, emerging adults

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

It is estimated that in the United States approximately 65% of 18-year-olds and 93 % of 25-year-olds will have had sexual intercourse (Guttmacher Institute, 2022a), marking the age of sexual debut occurring between adolescence and early adulthood. To ensure that adolescents and emerging adults were both knowledgeable about sex and engaging in safe and healthy sexual practices, sexual education programs were created to address "the biological, sociocultural, psychological, and spiritual dimensions of sexuality within the cognitive learning domain (information), the affective learning domain (feelings, values, and attitudes), and the behavioral learning domain (communication, decision-making, and other skills; Sexuality Information and Education Council of the United States, 2018)." Sex education programs should be designed to promote safe-sex behaviors along with providing factual knowledge (FoSE, 2020; Walcott et al., 2011). One of the objectives for these programs is to reduce *sexual risk behaviors* (SRBs), which are any sexual behaviors that put an individual at risk for a negative health outcome, such as an undesirable pregnancy or contracting a sexually transmitted infection (STI; Senn, 2013). This fosters positive sexual health outcomes that increase quality the quality of life of the individual by decreasing the probability of negative sexual health outcomes.

Current literature suggests that sexual and reproductive health education courses may reduce SRB in a variety of ways; prolonging age of sexual debut, increasing rates of contraception use, and decreasing unintended pregnancy rates (Advocates for Youth, 2019; Feigenbaum et al., 1995; FoSE, 2020; Lindberg & Maddow-Zimet, 2012;). There are, however, latent elements that can either encourage or discourage SRB, regardless of sex education. Kirby

(2001) best explains these underlying influences, or antecedents to sexual risk-taking as categorical factors such as "…community disadvantages; family structure and economic disadvantage; family, peer, and partner attitudes and behavior; and characteristics of teens themselves, including biology, attachment to school, other behaviors that put young people at risk, emotional distress, and sexual beliefs, attitudes, and skills (p.350)." Taking into account these antecedents allow psychologists, educators, and lawmakers to gain a better causal awareness of SRB, thereby allowing for more effective sexual education programs.

Many of the categories that Kirby (2001) discussed involve the social context of the individual, where family, friends, and community play a role in not only sexual behaviors but also general attitudes and behaviors as. One such social context that is prevalent in American culture is religion, where 70% identify as Christian, and only 23% having no religious affiliation (The 2020 Census of American Religion, 2022). Religion accounts for a wide variety of social influence both directly and indirectly; parents can directly influence how one practices their religion, while religious identity can indirectly influence the type of career one has; for example, a Catholic against abortion is less likely to work in a doctor's office that provides abortions (Hood et al., 2018). *Religiosity* refers to the amount of social influence of an individual's religion; measured by the level of devotion to the beliefs and practices of an organized group on the dimensions of religious identity, public religious attendance, and private religious adherence (Koenig et al., 2015). Previous research has indicated that religion and religious communities influence the format of sex education programs (Regnerus, 2007), and religiosity may influence the quality and quantity of one's sexual health knowledge (Coleman & Testa, 2008; Crosby & Yarber, 2001; Martin et al., 2017).

Religiosity levels can provide a unique socio-cultural perspective as to the strength and magnitude of religious social influence on SRB (Hall et al., 2016). Religiosity can influence contraception use (Coleman & Testa, 2008; Gillum & Holt, 2010; Kramer et al., 2007; Moreau et al., 2013; Peltzer et al., 2016), age of sexual debut (Rostosky et al., 2004; Whitehead et al., 2001), and general participation and frequency of sexual acts (Burdette & Hill 2009; Nonnemaker et al., 2003; Penhollow et al., 2005; Penhollow et al., 2007). While research has shown that connections exist between SRB and sexual health knowledge, religiosity and sex education, and religiosity and SRB, limited research exists demonstrating the interconnection of all three constructs. The purpose of this study is to examine the relationship between religiosity, risky sexual health behaviors, and sexual health knowledge. This study will include a cross-sectional examination of sexual health knowledge, religiosity, and SRB in adolescence (grade 7th-12th) as well as a longitudinal investigation of the effects of adolescent sexual education and religiosity on the sexual health behaviors of emerging adults (age 18-28).

LITERATURE REVIEW

Sexual Risk Behaviors

SRBs are behaviors that increase the risk of negative outcomes related to sex and reproduction (Senn, 2013). Sexual health risks faced by American adolescents include unintended teen pregnancy and contracting an STI/HIV, both of which have life-altering effects. Frequency of contraception use, number of sexual partners, alcohol consumption, drug use, sexual health knowledge, and utilizing community sexual health resource all contribute to an individual's sexual health (Advocates for Youth, 2019; Centers for Disease Control and Prevention, 2019; FoSE, 2022). Recent trends in adolescent sexual behavior exhibit a lack of clarity of the trajectory of sexual health outcomes in the U.S. among young people. According to a 2019 Centers for Disease Control and Prevention (CDC) report, from 2009 to 2019 there has been a decrease in the percentage of high school students that have ever had sexual intercourse from 46% to 38%, a decrease in HIV testing among adolescents from 12.7% to 9.4%, and a decrease in reported condom usage during last sexual intercourse from 61.1% to 54.3%. It was revealed that 21% of all new HIV diagnoses in 2018 were amongst adolescents and emerging adults aged 13 to 24, and almost half of the 20 million new STI/HIV diagnoses occurred among those aged 15 to 24 (CDC, 2019). This increase in STI/HIV rates recently prompted the U.S. Department of Health and Human Services (HHS) to develop a national plan that addresses the current STI epidemic (2020). The first goal of the STI plan is to prevent new transmissions by way of increasing education, expanding prevention programs, increasing human papillomavirus (HPV) and increasing resources for health care professionals (HHS, 2020).

The ways in which an individual increases or decreases sexual risk varies based on community, socioeconomic status, gender, age, race, and sexual orientation (Advocates for Youth, 2019; CDC, 2019; Guttmacher Institute, 2022a; HHS, 2020). For example, the recommended protection method for sexual intercourse is the dual method of protection, which includes using a condom and a hormonal birth control such as and IUD or birth control pills. The 2019 CDC report on sexual behavior found variance not only between males and females, but also between white, black, and Hispanic high school students (see Figure 1). Understanding these variances in SRB trends is integral for the implementation of health-promoting plans such as the HHS STI plan.

Sexual Health Education

Sexual and reproductive health education programs seek to provide adolescents with the tools to promote life-long positive sexual health attitudes and behaviors. The difficulty is that not all parents, school systems, and local governments agree on the structure and content of sex education. Presently, there exists no federal laws dictating the content and format of sex education, leaving local governments to decide on the scope of the sex education for their citizens (Stidham Hall et al., 2016; Planned Parenthood, 2022). Although, currently the only U.S. federal funding for sex education is awarded for abstinence-only sex education programs, where abstinence is stressed and other forms of contraception are discredited, poorly discussed, or omitted from the curricula altogether (Guttmacher Institute, 2022b). This was the result of nationwide campaigns by Christian rights groups in the 1990's to promote the teaching of Christian values on sex, specifically that abstinence is the best moral and healthy choice (Calterone Williams, 2011). As of 2020, only 29 states and the District of Columbia mandate sex

education in schools, 16 states require instructing students on proper condom and contraception use when STI/HIV instruction is provided, and 15 states do not require that their sex education courses or STI/HIV instruction to be medically factual, based on evidence, or age appropriate (Sex Ed for Social Change, 2020). Consequently, the differences in state sex education requirements allow for sex education programs to vary wildly in duration, content, and efficacy.

With standardizing sex education in mind, in 2012 an assembly of three national sex education organizations knows as Future of Sex Education (FoSE) released the *National Sexuality Education Standards* (NSES). The updated second edition proposes a theoretical framework of comprehensive sex education (CSE) that focuses on functional knowledge and skills related to healthy sexual behaviors, while incorporating social learning theory, social cognitive theory, and the social ecological model of prevention (FoSE, 2020). CSE provides medically and factually accurate knowledge while addressing the social influences, attitudes, and beliefs of the individual that contribute to positive health behaviors and outcomes. Research suggests that abstinence-only programs are less effective than CSE at reducing the risk of negative health outcomes (Chin et al., 2012; Goldfarb & Lieberman, 2021; Kohler et al., 2008; Stanger-Hall & Hall, 2011), in striking contrast to the ever-increasing federal funding for abstinence-only sex education (Guttmacher Institute, 2022b). A systematic review of research regarding CSE and abstinence-only sex education found that CSE was significantly effective at decreasing all SRB measures (e.g. sexual frequency, contraception use etc.), while abstinence-only education found a significant effect on sexual activity but no impact on secondary outcomes related to reducing SRB (Chin et al., 2012). Kohler et al. (2008) found no significant

effects on delaying sexual debut or reducing teen pregnancy and STI rates, whereas CSE is associated with a reduced risk of teen pregnancy. While one of the federal funding programs, the Title V SRAE, awards grantees in 44 states and five U.S. territories (Guttmacher Institute, 2022b), national data reveals that teen pregnancy and teen birth rates are positively correlated with the degree of abstinence education, where the more strongly that state laws and policies stress abstinence, the higher the average teen pregnancy and birth rates in that state. This is regardless of socio-economic status, education attainment, ethnicity, and access to family planning services (Stanger-Hall & Hall, 2011). It is noteworthy to acknowledge that while much research portrays sex education as a positive influence in reducing sexual risk behaviors (SRBs) and promoting sex-positive behaviors, Sabia's (2006) analysis of the National Longitudinal Study of Adolescent to Adult Health (Add Health) data revealed contrasting findings. Sabia's study suggested that sex education might be associated with an increased risk of virginity loss, higher pregnancy rates, and a greater likelihood of non-contracepting behaviors. However, it is essential to consider the context in which schools implement various types of sex education. It is plausible that schools with higher rates of SRBs among teenagers are more inclined to prioritize sex education programs. Consequently, these schools may have a higher proportion of teenagers exhibiting high SRB rates. Therefore, before implying causality, researchers should strive to comprehend the contextual factors surrounding the implementation of sex education programs.

Religiosity

The modern understanding of religion regards it as the “organized and institutional components of faith traditions, as opposed to the more inward and personal sides, often now

referred to as spirituality" (Paloutzian & Park, 2013, p.28); and the way in which someone perceives their own sense of religion or spirituality is known as *religious identity* (Etengoff & Rodriguez, 2020). While first used within the context of feminist theories, *intersectionality* has been adopted by a variety of academics, referring to the understanding that there exists a network of connected identities that shape how people experience social systems (Hankivsky, 2014). In essence, this means that inequities in the human experience are never the outcome of a single factor, but instead as a combination of many factors. Religious identity from the context of intersectionality can help to explain some of the variance in the efficacy of sex education and efforts to reduce SRB. The effect that religiosity has on sexual health behaviors is unclear, with variances in strength and direction of association depending on gender, religiosity, and race/ethnicity to name a few; marking the importance of considering the effect religiosity has from an intersectional perspective.

Sex education programs are often designed with community perceptions in mind. Abstinence education programs, in particular, frequently incorporate a morality aspect, using terms like 'chaste' and framing sexual behavior as a moral choice. This may involve having students pledge their commitment to abstinence, reflecting the moral attitudes prevalent in certain cultures and religions (Wiley, 2002). This may explain the disparities in sexual health knowledge between different religious affiliations. A UK study found that adolescents with a religious affiliation had poorer sexual health knowledge than those with no affiliation, with Muslim males having the least amount of knowledge (Coleman & Testa, 2008). Emerging adults from a U.S. university displayed knowledge gaps based on religion, specifically for women, with frequent religious service attenders having lower scores of sexual health knowledge than those

women who rarely if ever attend religious services (Martin et al., 2017). One analysis of Add Health data indicated that misconceptions about condom usage were found to be 20% more likely for adolescents with a religious affiliation (Crosby & Yarber, 2001). These findings suggest a theme of religious affiliation having a negative effect on sexual health knowledge, however the same is not true when it comes to the topic of religiosity and sexual behaviors.

The effects of religiosity on sexual behavior varies from positive effects, negative effects, and no effects, although the latter is few in comparison. Regarding contraception use, individuals less than 30 years old that reported any religious association were found to be less likely to use a condom during first sexual intercourse (Moreau et al., 2013). Similarly, religious affiliation was found to be significantly related to adolescents not using contraception, with Catholics being 15 times more likely not to use contraception, fundamentalist Protestants five times more likely, and those with no religious affiliation nine times more likely (Kramer et al., 2007).While in contrast, Whitehead et al. (2001) observed that males who were frequent religious attenders were more likely to use contraception, while females were less likely to use contraception with frequent attendence. In addition to that study, a literature review identified research that utilized Add Health data and discerned no association between religiosity and contraception (Bearman & Bruckner, 2001, as cited in Rostosky et al., 2004). And even though sexually active students reported lower overall levels of intrinsic and extrinsic religiosity, those sexually active students who did have greater intrinsic and extrinsic religiosity were less likely to use condoms (Zaleski & Schiaffino, 2000).

While investigating the relationship between religiosity and HIV risk factors, Gillum and Holt (2010) found that more-than-weekly religious attendence by women increased their risk

for HIV due to sexual factors (e.g., condom usage and number of sexual partners), and that men with the religious affiliation of fundamentalist, non-denominational protestant, and other non-Christian denominations had an increased sexual risk of HIV compared with mainline Christian denominations. When examining SRB across 26 countries, higher religiosity was found to increase the risk behaviors of: *two or more sexual partners in the past 12 months, ever had sexually transmitted infection, inconsistent condom use,* and *never contraceptive use* (Peltzer et al., 2016). Contrarywise, an Add Health analysis found that higher religiosity reduced an adolescent's probability of having sexual intercourse (Meier, 2003), while another Add Health analysis found the same significant association for ever having sex, but also found that public religiosity was protective for adolescents ever having been pregnant (Nonnemaker et al., 2003). Despite the array of anticipated SRB outcomes related to religiosity, there seems to be a consensus regarding age of sexual debut, where having any religious affiliation promotes delaying the age of first sexual intercourse, typically referred to as a protective factor (Burdette & Hill, 2009; Meier, 2003; Nonnemaker et al., 2003; Rostoskey et al., 2003; Whitehead et al., 2001; Young, 2011).

The variance in the effects of religiosity on sexual health behaviors is somewhat baffling, as research regarding religiosity and sexual attitudes alludes to a predictable trend. Rostosky et al. (2003) used the Add Health data to investigate attitudes relating to sexual health and found that adolescent females who reported more religiosity levels anticipated more negative emotional outcomes from partaking in sexual intercourse, while males who were more religious anticipated more positive emotional outcomes yet more negative health outcomes from engaging in sexual intercourse. Consistent with identified trends, religiosity has been linked to

more permissive attitudes towards sexuality (Regnerus, 2007; Rew & Wong, 2006; Whitehead et al., 2001; Young, 2011). This may elucidate findings by Penhollow et al. (2007) regarding "hooking up" behaviors. Their study indicated that females were less likely to engage in sexual intercourse while "hooking up" the more religious services they attended, while males were more likely to do so the less often they attended religious services. There may also be a link between religiosity and seeking sexual and/or reproductive health services, with women participating in weekly religious observances being 50% less likely to utilize those health services than women who had less-than weekly religious service participation (Hall et al., 2012).

Current Study

The purpose of sex education is to promote positive sexual health attitudes that decrease health risks thereby increasing quality of life. It is no surprise that most of the research concerning sex education and sexual health focus on adolescents, being that 70-90% of adolescents report having had their first sexual intercourse by the age of 18 (Zimmer-Gemback & Helfand, 2008). There is limited research on the longitudinal effects of sex education and religiosity as adolescents transition into adulthood. Understanding these long-term effects may elucidate the influence of religiosity and sexual health knowledge on adult sexual behavior. A systematic literature review on the subject found, out of the 43 studies they identified, ten longitudinal studies; however, none of those studies examined longitudinally across age groups. To achieve this, the current study will employ longitudinal Add Health data (Harris, 2018). Identified studies that previously examined the Add Health data as it relates to sex education, sexual health and reproductive knowledge, and religiosity, observed the relationship between Wave I and Wave II of the data, which occurred between 1994 and 1995,

and again in 1996, respectively (Bearman & Bruckner, 2001, as cited in Rostosky et al., 2004; Crosby & Yarber, 2001; Meier, 2003; Nonnemaker et al., 2003; Rostosky et al., 2003; Sabia, 2006). Since Wave I and Wave II were only one to two years apart, and adolescents who had been in 12th grade at Wave I were excluded from Wave II, the longitudinal analyses were conducted while the participants remained within the same age group. This study will examine the effects of religiosity and sexual health knowledge during adolescence, both cross-sectionally between adolescent groups, and longitudinally as those same adolescent's transition into adulthood. This will be done through examining data from Wave I and Wave III, which was conducted from 2001 to 2002, thereby allotting for the examination of religiosity and sexual health knowledge across age groups and during the adolescent to adult transitional period. This provided the opportunity to answer the following research questions:

1. What is the relationship between religiosity and SRBs during adolescence and during adulthood?
2. Does sexual health knowledge mediate the relationship between religiosity and sexual health behaviors during adolescence?
3. What effect does an adolescent's religiosity have on the rates of SRBs exhibited as an adult?
4. Does sexual health knowledge mediate the relationship between religiosity during adolescence and SRBs during adulthood?
5. What effect do SRBs during adolescence and adulthood have on the religiosity of adults?

Method

Sample

This study (IRB-FY2023-284) was approved by the Missouri State University Institutional Review Board on December 07, 2022. The study was determined as exempt from further review due to minimal risk and meeting exemption requirements, as stated in Appendix. The data analyzed was obtained from the National Longitudinal Study of Adolescent to Adult Health (Add Health; Harris, 2008) data set, Wave I and Wave III. Wave I data consisted of over 90,000

students grades 7-12 collected between September 1994 and December 1995. Wave III was conducted between 2001 and 2002 and was administered to 15,170 of the Wave I respondents.

For the purposes of this study, those participants under the age of 15 during the first data collection were omitted, as the majority of sexual behavior items were administered to those aged 15 and over. Participants that did not complete the survey during adolescence and again as emerging adults were also omitted for the purpose of longitudinal analysis, leaving 3321 participants included in sample size. Participants representing adolescence during Wave I and emerging adulthood during Wave III varied slightly in demographic identity between the two developmental phases, with 1582 (47.6%) emerging adult participants identifying as male and 1739 (52.4%) identifying as female during the same period. The differences in demographic identity between developmental phases could be due to developmental changes and an increased awareness of demographics by participants (see Table 1.). Participant ages were calculated based on the reported year and month of birth with the year of the interview, with mean age during adolescent data collection of 16.54 (*SD* = 1.21) and a mean age during emerging adulthood data collection of 22.8 (*SD* = 1.27).

Variables

Data Reduction. Data reduction was conducted to prepare the variables for analysis using the Add Health dataset. This process involved refining and transforming the variables of interest: sexual health knowledge (SHK), sexual risk behaviors (SRBs), and religiosity across two waves of data collection.

Sexual Health Knowledge. Sexual health knowledge was assessed in Wave I utilizing the Add health dataset's knowledge quiz. The quiz consisted of 10 true or false questions relating to

sexual and reproductive health. For example, “When using a condom, the man should pull out of the woman right after he has ejaculated.” Each question includes a secondary question asking participants to rate their confidence in answering the questions. These secondary questions were omitted as the purpose of the use of this section is to gauge the participant’s knowledge level and not the confidence in their knowledge level. Understanding participants’ sexual knowledge was essential, as it provided insight into their understanding of key concepts and information relevant to sexual health, thereby serving as a foundational component for exploring associations between religiosity, SHK and SRBs. As this variable was derived from a comprehensive assessment provided by Add Health, no further refinement was necessary. See Table 2.

Sexual Risk Behaviors. SRBs are any behaviors that increase the risk of adverse health effects resulting from sexual contact (Senn, 2013). Both waves of data included items throughout the questionnaire that related to a behavior considered risky to one’s sexual health. For example, “*Were you drunk when you had sexual intercourse for the first time?”* relates to whether a participant engaged in an SRB by including potentially impaired judgments regarding sex during their first sexual experience. Another example, “*Have you ever paid someone to have sex with you?*” pertains to engaging is risky sexual behavior, as it involves transactional sex, which can increase the risk of exposure to STIs and other adverse health outcomes. A series of these items pertaining to various SRBS were identified that ranged in responses from dichotomous to Likert-scale. These items were transformed so all were dichotomous responses, indicating whether participants engaged in each behavior. Subsequently, the SRB variable for

each participant was calculated as the sum of reported risk behaviors at both waves. See Table 2. for adolescents and Table 3. for emerging adulthood.

Religiosity. There currently is no universal definition to religiosity and it is therefore measured in a variety of ways, all of which are currently through self-report survey. Koenig et al., (2015) identified more than 10 dimensions of religiosity and therefore recommend religious scales to include dimensions of public, and private religiosity. Limited to what was administered to participants, the religiosity items chosen for analysis incorporate questions related to both public and private religious practices. For instance, the question "*How often do you pray*?" pertains to private religiosity, as it focuses on personal religious practices. Conversely, "*In the past 12 months, how often did you attend religious services?*" relates to one's public religiosity, as it pertains to participation in communal religious activities. To create a composite measure of religiosity, responses to these Likert-scale items from Wave I and Wave III were aggregated. The mean score was then calculated for each participant, providing a quantitative representation of participants' religiosity at each time point. See Table 2. for adolescents and Table 4. for emerging adulthood.

Results

Data Screening

Outliers were assessed by examining the standardized z-scores for the averages scores, outliers for SRBs during adolescences were identified and determined to be retained in the data, as these outlier scores represented all risk scores over 3. The normality for the data was assessed using the Shapiro-Wilk test. For adolescent SRB, the Shapiro-Wilk statistic was found to be .576 (df = 2445, p < .001), indicating a departure from normality. Similarly, adolescent

Religiosity showed a Shapiro-Wilk statistic of .913 (*df* = 2445, *p* < .001), suggesting non-normality. The variables Religiosity and SRB during emerging adulthood also exhibited significant departures from normality, with Shapiro-Wilk statistics of .971 (*df* = 2445, *p* < .001) and .872 (*df* = 2445, *p* < .001) respectively. Given the non-normal distribution of the data and the retention of outliers, bootstrapping techniques were employed to ensure robust statistical analysis. Bootstrapping involves resampling with replacement from the original dataset to generate multiple samples, allowing for the calculation of reliable standard errors and confidence intervals. See Table 4.

Primary Analysis

Research Question 1. A linear regression analysis was performed to explore whether religiosity during adolescence could affect SRBs during adolescence. Positive skewness = 2.391, (*SE* = .043), and departure from normality indicated the need for bootstrapping. The bootstrapped linear regression model exhibited an effect size of r^2 = .017, denoting that religiosity during adolescence makes up 1.7% of the variance in sexual risk behaviors during adolescence. The Durbin-Watson statistic indicated no significant autocorrelation (DW = 1.920). Overall model was significant *F*(1,3277) = 56.843, *p* < .001, providing support for the relationship between adolescent religiosity and emerging adulthood SRBs. Bootstrapped coefficient indicated that adolescent religiosity (B = .035, *SE* = .001, *p* < .001) significantly affect adolescent SRBs. For each one unit increase in religiosity during adolescence, SRBs during adolescence increase by .035. The bootstrap analysis revealed a significant bias-corrected and accelerated (BCa) 95% confidence interval ranging from [-.008] to [.005] with a bias of .000 (*SE*

= .003). These results suggest that religiosity during adolescence is associated with SRBs during that same period.

Another linear regression analysis was performed to explore if religiosity had an effect on SRBs during emerging adulthood. The bootstrapped linear regression model exhibited explanatory power with an effect size close to zero (r = .009, r^2 = .000), indicating that the observed relationship between religiosity and SRBs during this period is minimal. A Durbin-Watson statistic of 2.028 indicated no first-order autocorrelation. Bootstrap analysis of coefficients showed no significant effects for emerging adulthood religiosity on emerging adulthood SRBs, (B = -.002, p = .662) yielding nonsignificant results. See Table 5.

Research Question 2. Mediation analysis examined the effect of SHK during adolescence on the relationship between religiosity and sexual risk behaviors during adolescence. A significant relationship was previously identified between adolescent religiosity and adolescent SRBs (B = .035, *SE* = .001, p < .001). The examined bootstrapped relationship between religiosity and the mediator variable SHK was found to be significant (B = .273, *SE* = .077, p < .001), indicating that for every one-unit increase in religiosity during adolescence, SHK during adolescence increase by .273 units. Effect size (r^2 = .005) denotes .5% of the variance in SHK is explained by religiosity. No significant relationship was found between SHK and adolescent SRBs (B = .002, *SE* = .001, p < .077), with an effect size (r^2 = .001), SHK accounted for .1% of the variance. The overall model, incorporating adolescent religiosity and SHK as factors influencing adolescent SRBs, demonstrated explanatory capability with an adjusted R-squared value of .015, explaining 1.5% of the variance. The Durbin-Watson statistic for the model was 1.981, indicating no first-order autocorrelation. Bootstrap analysis of coefficients revealed that both

adolescent religiosity (B = .034, $p < .001$) and SHK (B = .002, $p = .194$) failed to significantly affect adolescent SRBs. These results imply that while religiosity during adolescence is associated with higher levels of SHK, and religiosity during adolescence is associated with SRB's, SHK did not mediate the relationship when controlling for religiosity. See Table 6.

Research Question 3. Bootstrapped linear regression analysis was performed to explore whether religiosity during adolescence affects SRBs during emerging adulthood. The bootstrapped model exhibited explanatory power with a small effect size ($r = .022$, $r^2 = .000$). A Durbin-Watson statistic of 2.002 indicated no first-order autocorrelation. Bootstrap analysis of coefficients showed no significant relationship of adolescent religiosity on emerging adulthood SRBs, (B = .005, *SE* = .005, $p = .307$) yielding nonsignificant results. These findings suggest that religiosity during adolescence does not significantly affect emerging adulthood SRBs among the study participants. See Table 5.

Research Question 4. Bootstrapped mediation analysis was conducted to examine the effect of SHK during adolescence on the relationship between religiosity during adolescence and SRBs as emerging adults. No significant relationship was found between religiosity during adolescence and SRBs in emerging adulthood (*B* = .005, *SE* = .005, $p = .307$), therefore no mediation could occur, with a small effect size ($r = .009$, $r^2 = .000$). These findings suggest that the relationship between religiosity and SRBs may vary across developmental stages. See Table 6.

Research Question 5. A linear regression analysis explored whether SRBs during adolescence have an impactful relationship with religiosity during emerging adulthood. The bootstrapped linear regression model yielded an effect size of $r^2 = .007$, indicating that SRBs

during adolescence account for .07% of the variance in religiosity as an emerging adult. The overall model was found to be significant ($F(1, 3213) = 21.515$, $p < .001$). Bootstrap analysis of coefficients revealed a significant negative effect of adolescent SRBs on emerging adulthood religiosity ($B = -.438$, $p < .001$). The bootstrap analysis also provided a bias-corrected and accelerated (BCa) 95% confidence interval for the coefficient, ranging from [-.619] to [-.256]. These findings suggest that higher levels of SRBs during adolescence were associated with lower levels of religiosity in emerging adulthood.

A final bootstrapped linear regression was performed to explore whether SRBs as an emerging adult affected religiosity of participants during the same period. The bootstrapped linear regression model exhibited explanatory power with an effect size close to zero ($r = .009$, $r^2 = .000$). A Durbin-Watson statistic of 1.935 indicated no first-order autocorrelation. Bootstrap analysis of coefficients exhibited no significant effects for emerging adulthood SRBs on emerging adulthood religiosity, ($B = -.049$, $p = .674$) yielding nonsignificant results. These findings suggest that SRBs as an emerging adult are not associated with participants' religiosity during the same period. See Table 5.

Discussion

The purpose of this study was to examine the relationship between religiosity, risky sexual health behaviors, and sexual health knowledge. The aim is to shed light on the longitudinal effects of religiosity and SHK on SRBs, while also exploring potential bidirectional relationships across transitional stages. Religiosity, encapsulating an individual's level of devotion to religious beliefs and practices, alongside SHK, are pivotal factors in shaping sexual

behaviors. Understanding the interplay between these variables holds significant implications for promoting positive sexual health outcomes among young populations.

To examine the relationship between religiosity during adolescence and SRBs during adolescence for research question one, findings revealed a significant association between religiosity and SRBs among adolescents, aligning with previous research (Burdette & Hill, 2009; Meier, 2003; Nonnemaker et al., 2003; Rostosky et al., 2003; Whitehead et al., 2001; Young, 2011). This underscores the enduring influence of religious upbringing on sexual behaviors during adolescence. However, as individuals transition into emerging adulthood, the influence of religiosity diminishes, reflecting the increasing autonomy and exposure to diverse influences in social environments such as college, work, and peer relationships (Arnett, 2015). Recent studies highlight the impact of this transition, suggesting that emerging adults prioritize personal autonomy and exploration over adherence to traditional religious beliefs and practices (Arnett, 2015; Smith & Denton, 2005; Twenge et al., 2015). Moreover, the expansion of social networks, exposure to diverse worldviews, and pursuit of higher education contribute to a broader range of influences on emerging adults' beliefs and behaviors, thereby weakening the singular impact of religious upbringing (Arnett, 2015; Twenge et al., 2015). Thus, the diminishing predictive power of religiosity during this developmental stage may be attributed to the complex interplay between individual autonomy, social influences, and evolving religious identities among emerging adults.

Research question 2 examined the mediating role of SHK in the relationship between religiosity and SRB and found that SHK does not affect the religiosity and SRB relationship during adolescence. Previous research suggests that SHK may serve as a protective factor

against engaging in SRBs by equipping individuals with accurate information and skills necessary for making informed decisions about their sexual health (Advocates for Youth, 2019; Chin et al., 2012; Kohler et al., 2008). However, these findings indicate that while there is a significant relationship between religiosity and SRBs during adolescence, this relationship is not mediated by SHK. This suggests that religiosity exerts a direct influence on SRBs among adolescents, independent of their level of SHK. These results are consistent with studies that have found religiosity to be associated with specific sexual attitudes and behaviors, such as delaying sexual debut and promoting abstinence (Burdette & Hill, 2009; Meier, 2003; Nonnemaker et al., 2003; Rostosky et al., 2003; Whitehead et al., 2001). Nevertheless, the lack of mediation by SHK highlights the need for further research to explore other potential mechanisms through which religiosity influences SRBs among adolescents. Additionally, it underscores the importance of considering religiosity as a multifaceted construct that encompasses not only beliefs and practices but also social and cultural influences, which may directly shape individuals' sexual attitudes and behaviors (Pargament, 2001).

The results pertaining to research question three indicated that there was no significant association between religiosity during adolescence and sexual SRBs during emerging adulthood. This result diverges from some previous studies which have found religiosity to be associated with sexual behaviors across this developmental stage, such as Meier (2003) and Nonnemaker et al., (2003) who observed a significant relationship between religiosity during adolescence and sexual behaviors during the same developmental period. However, these findings are consistent with a growing body of research suggesting that the influence of religiosity on sexual behaviors may vary across different life stages (Regnerus, 2007; Rew & Wong, 2006). It is

possible that other factors become more salient in shaping sexual behaviors during emerging adulthood, such as peer influences, educational attainment, and romantic relationships. Moreover, the transition to adulthood is characterized by increased autonomy and exploration, which may weaken the influence of religiosity on sexual behaviors (Arnett, 2015). These findings emphasize the intricate nature of the link between religiosity and sexual behaviors, indicating the necessity for additional research to clarify the underlying mechanisms driving this link.

The examination of the mediation effect of SHK on the relationship between religiosity during adolescence and SRBs during emerging adulthood yielded noteworthy insights into research question four. Contrary to expectation, the results did not reveal a significant mediating effect of SHK in this relationship. This finding diverges from previous research that suggests SHK could potentially mediate the association between religiosity and SRBs (Coleman & Testa, 2008; Martin et al., 2017). One plausible explanation for this disparity could be the multifaceted nature of religiosity, which encompasses not only personal beliefs and practices but also broader social and cultural influences (Pargament, 2001). Therefore, the absence of a mediating effect of SHK in this study emphasized the intricate nature of the relationship between religiosity and SRBs, suggesting again that other factors beyond SHK play a significant role in influencing sexual behaviors among emerging adults.

Finally for question five, the investigation into the bidirectional relationship between religiosity and SRBs across the transitional stage revealed significant insights. The findings suggest that while religiosity during adolescence shows a significant association with SRBs during the same developmental stage, this connection weakens during emerging adulthood.

Although the exact nature of this variation across different life stages remains less clear in existing literature, this study underscores the dynamic interplay between religiosity and SRBs during critical transitional periods. Moreover, the observed bidirectional influences between religiosity and SRBs highlight the dynamic nature of this relationship. These findings resonate with studies emphasizing the reciprocal nature of the relationship between religiosity and sexual behaviors, indicating that religiosity can both influence and be influenced by sexual behaviors over time (Lefkowitz et al., 2004, Vasilenko & Lefkowitz, 2014).

Implications

The findings of this study hold practical implications for a diverse range of stakeholders invested in promoting the sexual health and well-being of adolescents and emerging adults. Firstly, understanding the influence of religiosity on sexual behaviors can inform the design and implementation of sexual health education programs. Given the significant association between religiosity and SRBS among adolescents, educators should tailor their curriculum to acknowledge and address the diverse religious beliefs and values of students. By integrating discussions on religious beliefs and practices into sexual health education, educators can foster a more inclusive and respectful learning environment while provided accurate and comprehensive information on sexual health (Burdette & Hill, 2009; Nonnemaker et al., 2003).

Furthermore, healthcare professionals working with adolescents and emerging adults should consider the role of religiosity when providing sexual health counseling and interventions. Recognizing the influence of religious beliefs on individuals' attitudes and behaviors regarding sexual health can facilitate more effective communication and rapport between healthcare providers and their clients. Healthcare settings should strive to be sensitive

to the religious backgrounds of patients and offer culturally competent care that respects individuals' religious beliefs while promoting evidence-based sexual practices (Pargament, 2001).

Policymakers can similarly benefit from the findings, as they should consider the complex relationship between religiosity, SHK and SRBs when developing public health initiatives aimed at reducing SRBs among youth. While promoting sexual health education in schools and communities is essential, policymakers should also consider strategies to engage religious institutions and leaders in promoting positive sexual health outcomes. Collaboration between public health agencies and religious organizations can facilitate the dissemination of accurate information on sexual health within religious communities and help address cultural and religious barriers to accessing sexual health services (Kohler et al., 2008; Martin et al., 2017).

Lastly, parents play a crucial role in shaping adolescents' attitudes and behaviors related to sexuality. Parents should be encouraged to have open and non-judgmental discussions about sexual health with their children, taking into account their religious beliefs and values. Providing adolescents with accurate information about sexual health within the context of their religious upbringing can help empower them to make informed decisions and navigate sexual relationships responsibly (Advocates for Youth, 2019; Rostosky et al., 2003)

Addressing the influence of religiosity on sexual health behaviors requires a multi-faceted approach involving educators, healthcare professionals, policymakers, and parents. Educators who are tasked with delivering sexual health education can benefit from understanding the complex interplay between religiosity and sexual behaviors. Healthcare

professionals can use these findings to enhance their interactions with young people. Policymakers have an opportunity to shape public health initiatives that address the unique needs of religious communities, and parents have a crucial role in fostering open and supportive environments for discussing sexual health within the family. Ultimately, collaboration among all these stakeholders is essential to promote an approach to sexual health that respects individual beliefs and values while impowering young people to make informed decisions about their sexual well-being.

Limitations and Future Directions

Several limitations should be considered when interpreting the findings of this study. Firstly, the sexual health knowledge questionnaire used in this study primarily focused on condom usage and knowledge, with half of the questions related to this topic. This narrow focus may have limited the comprehensive assessment of participants' sexual health knowledge, potentially overlooking other crucial aspects such as STI prevention, alternative contraception methods, and communication skills. Future studies should employ a more diverse and comprehensive sexual health questionnaire to ensure a thorough evaluation of participants' knowledge across various domains of sexual health.

Additionally, the predominance of zero responses among the adolescent SRB variable warrants consideration. Upon examining outliers via standardized z-scores, it became evident that the outliers identified were solely comprised of responses of 4 and above, within a response range of 0-8. Notably, a large majority of all responses were 0, indicating an absence of engagement in any sexually risky behaviors at that time. While the prevalence of zero

responses underscores a commendable adherence to safe sexual practices among a significant portion of the study population, it also presents a noteworthy observation for consideration.

The disproportionate representation of zero responses raises questions regarding the distribution and variability of SRBs within the sample. While it is encouraging to observe a prevalent trend towards risk avoidance, the skewed distribution of responses may potentially limit the generalizability of findings, particularly in exploring the predictors and correlates of SRBs. Moreover, the dominance of zero responses could impact the statistical analyses and interpretation of results, potentially attenuating the observed associations and effect sizes.

Addressing this observation is essential for ensuring the robustness and accuracy of the study's findings. Future research endeavors may benefit from employing sampling strategies or data collection methods that facilitate a more balanced representation of SRB frequencies, thereby enabling a comprehensive exploration of the factors influencing sexual risk behaviors. Additionally, efforts to understand the underlying reasons for the prevalence of zero responses, such as cultural norms, educational interventions, or social influences, could provide valuable insights into the determinants of sexual health practices among adolescents and emerging adults.

Acknowledging and addressing this observation contributes to a nuanced understanding of SRBs and underscores the importance of considering the distributional characteristics of variables in research on sexual health behaviors. By recognizing the complexities inherent in the reporting of SRBs and striving for methodological rigor, researchers can enhance the validity and applicability of findings, ultimately contributing to the development of more targeted and

effective interventions aimed at promoting positive sexual health outcomes among adolescents and emerging adults.

Another notable limitation is inherent in the nature of self-report data. While efforts were made to minimize social desirability bias by Add Health data collectors administering sensitive question via computer-based surveys, the reliance on self-reported measures introduces the possibility of response bias and inaccurate reporting. Participants may underreport or overreport their behaviors and beliefs due to social stigma, memory recall errors, or other subjective factors (Tourangeau et al., 2000). To mitigate this limitation, future research could incorporate multiple methods of data collection, such as observational measures or biological markers, to complement self-report data and provide a more holistic understanding of participants' sexual behaviors and attitudes.

Additionally, this study was limited to the range of responses gathered by the Add Health investigators. The variables utilized in this research were derived directly from the items presented in the Add Health questionnaire. While this approach provided a standardized framework for data collection, is also imposed constraints on the range and depth of the responses available for analysis. The Add Health dataset's predefined survey items may not fully capture the complexity and nuances of individuals' beliefs, behaviors, and experiences related to religiosity and sexual health. Consequently, the study's findings may be limited by the specificity and scope of the questions included in the Add health survey instrument. Future research endeavors could benefit from incorporating a broader array of measures that encompass a more comprehensive range of religious beliefs, sexual health knowledge domains,

and sexual behaviors, thereby offering a more nuanced understanding of the dynamics under investigation.

Moving forward, future research should also explore longitudinal trajectories of religiosity, SHK and SRBs across different developmental stages. Longitudinal studies with multiple time points can provide valuable insights into the dynamic interplay between these variables over time, shedding light on how religiosity and SHK evolve and influence sexual behaviors from adolescence into emerging adulthood. Moreover, qualitative research methods could be employed to probe deeper into individuals' lived experiences and perceptions regarding the intersection of religiosity, sexual health, and behavior. By addressing these limitations and pursing these future directions, researchers can advance our understanding of the complex relationship between religiosity and sexual health outcomes, ultimately informing more effective interventions and policies aimed at promoting positive sexual health outcomes among adolescents and emerging adults.

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Table 1. Descriptive Statistics and Frequencies for Demographics

		Wave I			Wave III		
Demographics	Option	%	*n*	*M*	%	*n*	*M*
Age		-	3321	16.54	-	3321	22.80
Biological Sex	Female	52.30	1738	-	52.40	1739	-
	Male	47.70	1583	-	47.60	1582	-
Race	White	66.20	2194	-	69.20	2299	-
	Black	24.70	820	-	24.80	824	-
	American Native	3.70	123	-	4.40	145	-
	Asian	4.40	146	-	4.70	155	-
	Other	6.50	215	-	-	-	-
Hispanic		10.50	348	-	10.70	357	-

Table 2. Add Health Question Items used in analysis from Wave I

Variable	Wave I Items
Religiosity	In the past 12 months, how often did you attend religious services? How important is religion to you? How often do you pray? Many churches, synagogues, and other places of worship have special activities for teenagers—such as youth groups, Bible classes, or choir. In the past 12 months, how often did you attend such youth activities?
Sexual Health Knowledge	When a woman has sexual intercourse, almost all sperm die inside her body after about six hours. When using a condom, the man should pull out of the woman right after he has ejaculated. Most women's periods are regular, that is, they ovulate (are fertile) fourteen days after their periods begin. Natural skin (lamb skin) condoms provide better protection against the AIDS virus than latex condoms. When putting on a condom, it is important to have it fit tightly, leaving no space at the tip. Vaseline can be used with condoms, and they will work just as well. The most likely time for a woman to get pregnant is right before her period starts.

Table 2. continued Add Health Question Items used in analysis from Wave I

Variable	Wave I Items
Sexual Health Knowledge	Even if the man pulls out before he ejaculates (even if ejaculation occurs outside of the woman's body), it is still possible for the woman to become pregnant.
	In general, a woman is most likely to get pregnant if she has sex during her period, as compared with other times of the month.
	As long as the condom fits over the tip of the penis, it doesn't matter how far down it is unrolled.
Sexual Risk Behaviors	Did you or your partner use any method of birth control the first time you had sexual intercourse?
	Did you or your partner use any method of birth control when you had sexual intercourse most recently?
	Thinking of all the times you have had sexual intercourse, about what proportion of the time {HAVE YOU/HAS A PARTNER OF YOURS} used a condom?
	Have you ever given someone sex in exchange for drugs or money?
	The first time you had sexual intercourse, had you been drinking alcohol?
	Were you drunk when you had sexual intercourse for the first time?
	Were you drunk when you had sexual intercourse most recently?
	The first time you had sexual intercourse, had you been using drugs?
	The most recent time you had sexual intercourse, had you been using drugs?

Table 2. continued Add Health Question Items used in analysis from Wave I

Variable	Wave I Items
Sexual Risk Behaviors	The most recent time you had sexual intercourse, had you been drinking alcohol?

Table 3. Add Health Question Items used in analysis from Wave III

Variable	Wave III Items
Religiosity	How often have you attended [CHURCH/SYNAGOGUE/TEMPLE/MOSQUE/RELIGIOUS] services in the past 12 months? In the past 12 months, how often have you taken part in special activities for young adults (in churches, synagogues etc.)? How important is your religious faith to you? How often do you pray privately, that is, when you're alone? How important is your spiritual life to you?
Sexual Risk Behaviors	How old were you the first time you had vaginal intercourse? On how many of these occasions of vaginal intercourse in the past 12 months did you or your partner use some form of birth control or pregnancy protection? The most recent time you had vaginal intercourse, did you or your partner use some form of birth control? Which, if any, of the following sexually transmitted diseases you have been tested for in the past 12 months? Have you ever paid someone to have sex with you? Have you ever had sex with someone who paid you to do so? Have you ever had sex with someone who takes or shoots street drugs using a needle?

Table 4. Scale Frequencies

Scales	*n*	*M*	*SD*	*SE*	Range LL, UL
Wave I Sexual Risk Behaviors	3279	0.57	1.134	0.043	0, 8
Wave I Religiosity	3321	9.6110	4.295	0.042	4, 32
Wave I Sexual Health Knowledge	2716	64.42	16.947	0.047	0, 100
Wave III Sexual Risk Behaviors	2522	1.814	1.289	0.049	0, 6
Wave III Religiosity	3255	9.534	6.098	0.043	0, 25

Table 5. Linear Regression Analyses of Research Questions One, Three, and Five

	Bootstrap*					
Predictor	B	Bias	SE	B 95% CI [LL, UL]	R^2	ΔR^2
Research Question 1						
Wave I R ➔Wave I SRB					0.017	0.017
Constant	0.243***	0.001	0.047	[.150, .339]		
Adolescent Religiosity	0.035***	-3.239E-05	0.005	[.026, .004]		
Wave III R ➔Wave III SRB					0.000	0.000
Constant	1.236***	-0.001	0.038	[1.163, 1.308]		
Emerging Adult Religiosity	-0.002	0.000	0.003	[-.008, .005]		
Research Question 3						
Wave I R ➔Wave III SRB					0.000	0.000
Constant	1.173***	0.000	0.053	[1.063, 1.269]		
Adolescent Religiosity	0.005	2.779E-05	0.005	[-.004, .015]		
Research Question 5						
Wave I SRB ➔Wave III R					0.007	0.006
Constant	9.798***	0.002	0.120	[9.566, 10.042]		
Adolescent SRB	-0.438***	0.000	0.093	[-.619, -.256]		
Wave III SRB ➔Wave III R					0.000	0.000
Constant	9.566***	-0.007	0.186	[9.221, 9.918]		
Emerging Adult SRB	-0.049	-0.002	0.112	[-.269, .158]		

Notes. CI = confidence interval; Wave I R ➔ Wave I SRB = adolescent religiosity effect on adolescent sexual risk behaviors; Wave III R ➔ Wave III SRB = emerging adult religiosity effect on emerging adult sexual risk behaviors; Wave I R ➔ Wave III SRB = adolescent religiosity effect on emerging adult sexual risk behaviors; Wave I SRB ➔ Wave III R = adolescent sexual risk behaviors effect on emerging adult religiosity; Wave III SRB ➔ Wave III R = emerging adult sexual risk behaviors effect on emerging adult religiosity.

*Bootstrap results are based on 1000 bootstrap samples

*** $p < .001$

Table 6. Mediation Analysis of Research Questions Two and Four

			Bootstrap*				
	Variable	B	Bias	SE	B 95% CI [LL, UL]	R^2	ΔR^2
		Research Question 2					
Step 1						0.017	0.017
	Constant	.243***	-0.002	0.046	[.114, .325]		
	Adolescent Religiosity	0.035***	0.000	0.005	[.026, .044]		
Step 2						0.016	0.015
	Constant	0.184	0.002	0.09	[.013, .374]		
	Adolescent Religiosity	0.034***	3.22E-05	0.006	[.023, .045]		
	SHK	0.002	-2.77E-05	0.001	[-.001, .004]		
		Research Question 4					
Step 1						0.000	0.000
	Constant	1.173***	0.000	0.053	[1.071, 1.272]		
	Adolescent Religiosity	0.005	-8.73E-05	0.005	[-.004, .015]		
Step 2						0.000	-0.001
	Constant	1.192***	0.000	0.109	[.979, 1.419]		
	Adolescent Religiosity	0.002	9.19E-05	0.005	[-.008, .013]		
	SHK	-2.64E-05	-2.19E-05	0.001	[-.003, .003]		

Notes. CI= Confidence interval; Dependent variable for research question 2 is adolescent SRB and dependent variable for research question four is emerging adult SRB.

*Bootstrap results are based on 1000 bootstrap samples

*** $p < .001$

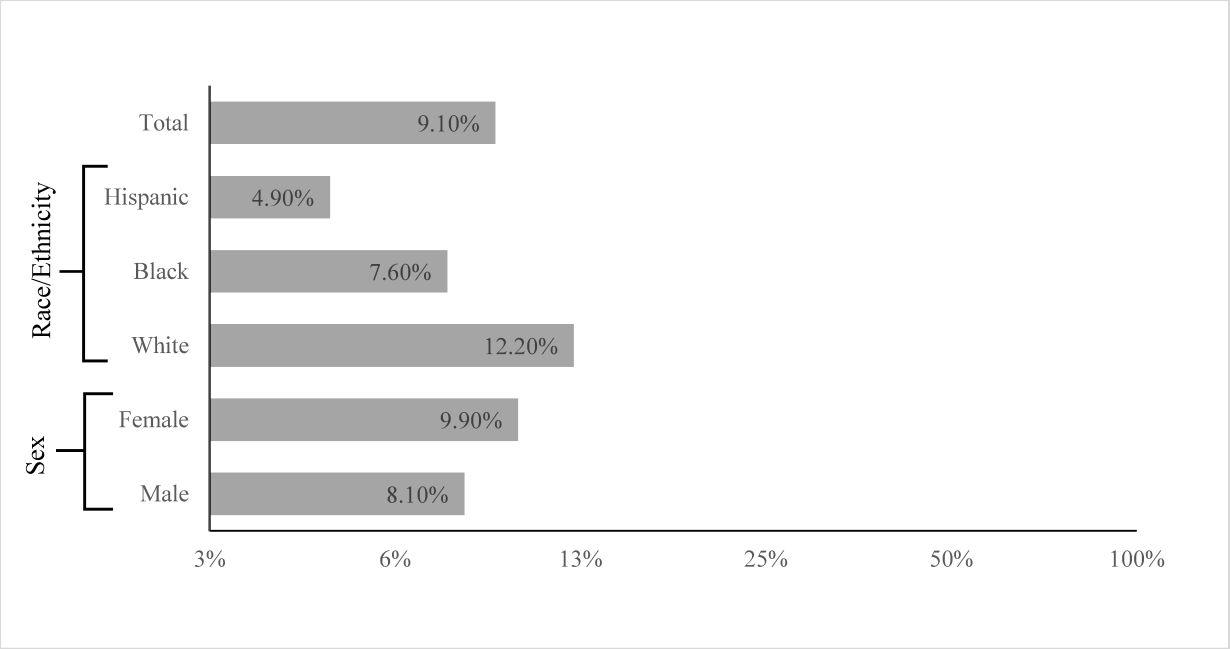

Figure 1. Percentage of High School Students who used the Dual Method the Last Time They Had Sexual Intercourse. Data used in this graph was obtained from "Condom and Effective Hormonal Birth Control Use (Dual Method Use)" by Centers for Disease Control and Prevention. (2019). *Youth risk behavior survey data summary & trends report 2009-2019*. U.S. Department of Health and Human Services. https://www.cdc.gov/healthyyouth/data/yrbs/pdf/YRBSDataSummaryTrendsReport2019-508.pdf

APPENDIX

Date: 4-30-2024

IRB #: IRB-FY2023-284
Title: RELIGIOUS EFFECTS ON SEXUAL HEALTH: EXAMINATION OF THE INTERCONNECTIONS BETWEEN RELIGIOSITY, SEXUAL HEALTH KNOWLEDGE, AND SEXUAL RISK BEHAVIORS
Creation Date: 11-30-2022
End Date:
Status: Approved
Principal Investigator: Ashley Payne
Review Board: MSU
Sponsor:

Study History

Submission Type Initial	Review Type Exempt	Decision No Human Subjects Research

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