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## The Effects of Mating Strategy on Religiosity: Church Attendance as a Mating Strategy Component and the Role of Religious Belief.

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The effects of mating strategy on religiosity: church attendance as a mating strategy component and the role of religious belief.

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Thesis presented to the Graduate Faculty of The College of William & Mary in  
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Master of Arts

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## APPROVAL PAGE

This Thesis is submitted in partial fulfillment of  
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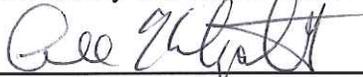
Master of Arts



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## ABSTRACT

Contrary to traditional theories that religious morals influence sexual attitudes, recent research has found that controlling for sexual attitudes largely reduces associations between various moral views and religiosity. Based on these findings, the reproductive religiosity model was proposed in which being sexually restricted leads individuals to increase their religious involvement. However, the model a) does not account for religious belief and b) claims that sexual behavior mediates the effect of various variables on church attendance without employing a mediation model. To address these points, this study tests reproductive variables in a multiple regression to examine their ability to independently predict church attendance and belief in God. Further, this study tests a unique hypothesis that sexual behavior mediates the relationship between belief and attendance in both men and women. Among a sample obtained from the National Opinion Research Center (NORC) database (N=13636), sexual variables predicted church attendance and religious belief after controlling for other known predictors. Further, sexual behavior fully mediated the relationship between sex and church attendance but attendance did not mediate the relationship between sex and sexual behavior. This study illustrates the unique role of sexual behavior in mediating religiosity and how reproductive variables are independently related to church attendance.

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This thesis is dedicated to my mother, Lorraine, my father, John, and my friend and research partner Kyle. Thanks for never letting me give up.

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## **Chapter 1: Introduction and Research Hypotheses**

### *Overview*

Religious institutions in the U.S. are well known for regulating behaviors in favor of monogamy through condemning promiscuity and infidelity (Meier, 2003; Shariff & Norenzayan, 2007) or facilitating family-oriented lifestyles through teachings and programs such as childcare and Sunday school (Hardy & Raffaelli, 2003; Schmitt, 2003; Thornton & Camburn, 1989). Accordingly, much effort has been devoted to examining the underlying reasons for this association (Buss, 2002; Kirkpatrick, 2005; Li, Cohen, Weeden, & Kenrick, 2009; Weeden, Cohen, & Kenrick, 2008; Weeden, Kurzban, & Kenrick, 2016). One of the most counterintuitive theories as to why religious institutions regulate sexual behavior so closely is the reproductive religiosity model. The primary claim of this model is that individuals seeking monogamous and long-term mates may attend of modern day, mainline (e.g., Protestant, Catholic, Christian) religious services as a means to this end (Weeden et al., 2008). Specifically, service attendance is said to bolster an individual's chance of successfully pursuing a monogamous relationship because churches maintain a strong stance against promiscuity and thus repel those that would threaten the chances of finding a monogamous mate (Weeden et al., 2016). While studies investigating the reproductive religiosity model have found interesting supporting evidence (i.e., reproductive variables qualify the correlation between measures of moral views and religious attendance; Weeden et al., 2008), analyses of the relationship between sexuality and religiosity have largely focused on singular components of these measures.

Thus, interplay between the many measures of these constructs remains ripe for exploration. By reviewing the association between religiosity and sexuality in an evolutionary and modern sense and analyzing measures of these constructs in a more integrated fashion, I plan to broaden the reach of this model and aim toward a more comprehensive understanding of the association between mating behavior and differences in religious attendance.

At first glance the reproductive religiosity model seems to contradict the common narrative of the literature addressing the relationship between religion and sexuality (e.g., Hardy & Rafaelli, 2003; Thornton & Camburn, 1989; Zaleski & Schiaffino, 2000). Specifically, religious involvement leads individuals to learn and adopt the church's strong moral stance against sexual promiscuity, thus causing these individuals to maintain more monogamous and family-centered lives (Cohen & Rozin, 2001). However, research domains such as religion and sexuality are multifaceted and therefore even this narrative does not fully encompass the relationship between the two. In this sense, the reproductive religiosity model may be thought of as an addendum that addresses unexplained aspects of the modern-day association between religion and sexuality. This review will not only cover the dominant theories of religion and sexual behavior but will also address the ways in which they are, alone, insufficient to explain individual-level differences in religiosity in the modern-day United States. These theories and findings will then be integrated into the context of reproductive religiosity model, highlighting the ways in which the model fills the aforementioned gaps as well as ways this study expands the reach of the model.

### **Evolutionary Psychology of Religion**

Evolutionary psychology assumes adaptations to be modular (Barrett & Kurzban, 2006; Rozin & Kalat, 1971; Sherry & Schacter, 1987) and abundant (Kaplan & Gangestad, 2005; Kenrick, Giskevicius, Neuberg, & Schaller, 2010) solutions to ancestral adaptive problems that are present across a species (Tooby & Cosmides, 1992). Accordingly, much of the literature on the evolutionary psychology of religion proposes that adaptive cognitive mechanisms that facilitate cooperative and prosocial behavior laid the groundwork for religion to emerge (e.g., Atran & Henrich, 2010; Bourrat, 2015; Graham & Haidt, 2011). Building from this, some do not conceptualize religion as an adaptation per se, but rather that it has emerged and been maintained as a byproduct of multiple pre-evolved cognitive mechanisms; primarily those facilitating in-group cooperation and behavioral cohesion (Atran & Henrich, 2010; Bourrat, 2015; Graham & Haidt, 2011; Saroglou, 2011; Schmitt & Fuller, 2015). Metaphorically, no one would argue that there is an adaptation or genes that code for baking desserts. Yet the act is facilitated by our evolved preference for sweets and ability to use tools in the same way that cognitive processes such as prosociality and in-group cooperation are believed to have facilitated the wide presence of religion (Atran & Henrich, 2010; Norenzayan, et al., 2016; Gervais & Norenzayan, 2012; Norenzayan & Shariff, 2008).

Initially, it may be tempting to attribute the wide presence of religion to religion itself being an adaptation. Research has suggested that competition for resources and habitats favored cooperation toward a common goal and resource

sharing (Van Vugt & Schaller, 2008). These same selective pressures are believed to have fostered “religious adaptations” as a solution to the question of how to bind unrelated individuals into groups (Johnson & Bering, 2006; Sosis & Alcorta, 2003). Indeed, humans can often accomplish much more when working in a group (Rand & Nowak, 2013) and anthropological evidence suggests that group sizes exceeding 150 typically either divide or collapse without a force to galvanize group solidarity (see Dunbar, 2003; Norenzayan et al., 2016).

However, the adaptationist view has been criticized for not providing a compelling explanation of why religion, if it were an adaptation, exists in such a broad array of beliefs and behaviors across cultures and time (Kirkpatrick, 2005).

As a counter point, byproduct accounts suggest that religion is culturally ubiquitous because it is a more distal result of pre-adapted cooperative and prosocial tendencies that are therefore present across the human species (Atran & Norenzayan, 2004; Boyer, 2001; Gervais & Norenzayan, 2012). These accounts suggest that individually, humans are able to cooperate and that religion provides a vehicle for this in these large-scale groups in the form of structure and behavioral norms that promote cohesion (Norenzayan & Shariff, 2008; Wiltermuth, 2009). More specifically, religious doctrines involve rituals, service attendance, behavioral restrictions, and other tenets that publicly signify group commitment and who should be cooperated with, thereby solving anonymity problems in large groups (Atran & Henrich, 2010; Graham & Haidt, 2010; Gintis, Smith, & Bowles, 2001; Haidt, 2008; Henrich, 2009). In this manner, religion may be thought of as a social system that capitalizes on a variety of pre-

evolved mechanisms (loyalty, conformity, and others; Van Vugt & Schaller, 2008) to facilitate adaptive goals.

Another major critique of the adaptationist view is that religiously based cooperation seems to be a bounded phenomenon, thus contradicting the assertion that religion is primarily an evolved mechanism *for* promoting cooperation. Byproduct accounts maintain this critique on the basis that behavior of religious groups can be explained by in-group bias and coalitional psychology. Generally, evidence indicates that the association between religious beliefs and prosociality is contextual and occurs primarily when a reputation-related motivation has been activated (Batson et al. 1993) while other studies have found little effect of religiosity on giving and volunteering in nonreligious contexts (Hunsberger & Platonow, 1986; Lam, 2002; Park & Smith, 2000). For example, Rand and colleagues (2014) found that explicit religious primes promote cooperative behavior only when the participants were followers of the religion used in the prime. It has also been demonstrated that both religious and non-religious participants behave more prosocially in religious contexts (Ruffle & Sosis, 2010). Additionally, members of non-religious organizations are at least as likely to give to charity as members of religious ones (Putnam, 2000), implying that cooperation and prosociality may be more closely tied with coalitional processes than religion in general. Further, a recent cross-cultural study revealed that religiosity (e.g., frequency of religious attendance, prevalence of beliefs in heaven/hell, belief in God) was unrelated to variation in in-group favoritism in a non-religious trust game across cultures, indicating that religiosity and

cooperation are independent (Romano, Balliet, Yamagishi, & Liu, 2017). Also, a multinational analysis of religiosity and cooperative morals found no association between religious beliefs and moral views (e.g., cheating, stealing, lying) relating to cooperation (Weeden & Kurzban, 2013). If religion were an adaptation that facilitates cooperation, one would expect differences in religious attitudes to fluctuate in tandem with differences in cooperative attitudes. However, as others have noted, cooperation seems to depend more on in-group solidarity (Norenzayan & Shariff, 2008).

While in-group processes feasibly explain the contextual basis of religious prosociality, it does not quite explain the mass appeal of religion when there are other theoretically likely vehicles for forming a cooperative group (e.g., fraternities, sports teams, gangs, clubs, secret societies; Weeden et al., 2016). Some suggest that belief in a morally concerned higher power uniquely promotes charity, altruism, benevolence, and other forms of social engagement which in turn promotes trust and resource sharing (Galen, 2012; Graham & Haidt, 2010; Norenzayan & Sharif, 2008). Indeed, many of the world's largest religions (e.g., Christianity, Catholicism, Islam, Judaism) center their teachings around goodwill or a moral imperative to "help thy neighbor" (Norenzayan et al., 2016) as well as beliefs in moral evaluation by a higher power (Batson, Schoenrade, & Ventis, 1993; Baumeister, Bauer, & Lloyd, 2010; McCullough & Willoughby, 2009; Monsma, 2007; Norenzayan et al., 2016). This appears to confer benefit at some level as prosocial religions regularly outlast secular ones, presumably due to better resource sharing (McKay, Efferson, Whitehouse, & Fehr, 2011; Koenig &

Larson, 2001; Rowthorn, 2011; Sosis & Alcorta, 2003). However, belief in an evaluative higher power seems equally likely to lead to negative judgements of others. Outgroup members (non-religious or otherwise affiliated) in particular are often reported to receive less prosocial support than and even hostility from religious individuals (Hall, Matz, & Wood, 2010; Saroglou, 2006; Rowatt, Franklin, & Cotton, 2005). In fact, stronger religious identity has been tied to stronger outgroup derogation, implicating social conformity and respect for tradition as central to religious fundamentalism (Hall et al., 2010; Schwartz & Huismans, 1995). In light of this, some have suggested that religious motivations may be more strongly tied to group policing rather than humanitarian tendencies (Bushman, Ridge, Das, Key, & Busath, 2007; Saroglou, 2011). Furthermore, it seems that religion itself does not serve an adaptive benefit but rather that religion capitalizes on cooperative psychological mechanisms that have likely developed over the course of human history (Bloom, 2012; Norenzayan, 2014).

While cooperative behavior enhances group cohesion in a general sense and religious belief/affiliation acts as a cue for religiously motivated prosociality, byproduct and adaptationist accounts alike (e.g., Atkinson & Bourrat, 2011; Johnson & Bering, 2006; Johnson & Kruger, 2004; Schloss & Murray, 2011) only go as far as to explain the presence of religion in a broad context (Weeden & Kurzban, 2013). The psychological processes outlined establish ways in which religion has come to serve means other than providing a system of belief, but they do not fully explain much of religion's modern landscape (Norenzayan et al., 2016; Schmitt & Fuller, 2015; Weeden et al., 2016). However, as many have

noted, the degree to which individuals engage in particular social behaviors is likely to be based on the degree to which they meet individually relevant needs or self interests (DeScioli & Kurzban, 2012; Kurzban et al., 2010; McCullough, Carter, DeWall, & Corrales, 2012; Petersen, 2017; Weeden & Kurzban, 2017). Additionally, humans are sensitive to information about an individual's prosocial reputation (Fehr & Fischbacher, 2003), which informs decisions on who to cooperate with (Gintis, Bowles, Boyd, & Fehr, 2003; Henrich et al., 2006). In this sense, religious membership or beliefs are believed to act as a reputational cue in what would otherwise be an absence of reputational information about a stranger (Gervais & Norenzayan, 2012). This is in line with the assertion of the reproductive religiosity model that individuals who are seeking to buttress their monogamous mating strategy may preferentially embed themselves within religious communities that are well known to support this strategy (Weeden et al., 2016). Additionally, if religion has come to facilitate pre-existing adaptations such as cooperation, then it follows that religion may have also come to serve other means over time. Given the extreme preoccupation of modern-day religions in the U.S. with regulating sexual behavior, the domain of human mating strategy seems to be a particularly strong candidate (Buss, 2002; Weeden & Kurzban 2014). Thus, by reviewing evolutionary literature on human mating and the ways in which religious affiliation solves related challenges, we may better understand the nature of individual differences in religious attendance.

### **Mating Strategy and Reproductive Religiosity**

According to the reproductive religiosity model, individuals attend religious services to the degree that they pursue a long-term mating strategy, thus resulting in observed patterns of individual differences in attendance (Weeden et al., 2008). Leading theories of human mating vary in which factors they attribute to causing individual differences in mating strategy. However, they tend to agree that humans can strategically utilize a diverse repertoire of behaviors to maximize chances of successfully meeting mating and reproductive goals (Buss, 2007; Buss & Schmitt, 1993; Gangestad & Simpson, 2000; Kaplan & Gangestad, 2005). Given the propensity of religious institutions for regulating mating and reproductive behavior (Hardy & Raffaelli, 2003; Meier, 2003; Thornton & Camburn, 1989; Weeden & Kurzban, 2013), the reproductive religiosity model presupposes that attending religious services may be a behavior that facilitates reproductive goals (Weeden et al., 2008). This relies on the notion that some aspects of people's varying reproductive and mating behaviors produce strategic conflicts. Specifically, many promiscuous individuals in a population can make long-term mating harder to achieve or maintain (Kenrick, 2011; Kurzban, 2010; Kurzban et al., 2010). According to the model, regularly attending a religious service solves this problem because it embeds the individual in a religious community where promiscuous individuals are ostracized and rejected (Weeden, 2015; Weeden et al., 2008; Weeden & Kurzban, 2014).

Although the reproductive religiosity model does not claim sole allegiance to any particular mating strategy theory, it should be noted that there are

conflicting points within the literature. Proponents of the model also hypothesizes that, as a result of sex differences in mating behavior, the model may also explain sex differences in attendance (Weeden et al., 2008). Indeed sex differences in religiosity are well documented (Buss, 2002) and several prominent theories report that women have a greater evolved preference for the monogamous and high-commitment lifestyle (Symons, 1979; Trivers, 1974). However, some accounts emphasize moderate sex differences in short-term domains while attributing within sex variation to environmental factors (e.g., Gangestad & Simpson, 2000) while others emphasize large sex differences overall (e.g., Buss & Schmitt, 1993). Further, there are reports that the sexes may be differently attracted to religion because of gender socialization or differences in non-reproductive characteristics (Miller & Hoffman, 1995; Schwartz & Rubel, 2005, Stark, 2002). In addition, research on human mating published since the model suggests that there may be substantial sex-differences in psychological (e.g. mate preferences, temporal orientation; Castro, Hattori, & Lopes, 2015; Kennair, Grøntvedt, Mehmetoglu, Perilloux, & Buss, 2015; Li & Kenrick, 2006) as well as behavioral (e.g., observed sexual behavior; Pedersen, Putcha-Bhagavatula, & Miller, 2010; Schulz, 2009; Smiler, 2011) domains of mating strategy. If individuals are attending or not attending church because attendance does or does not facilitate their reproductive goals as the reproductive religiosity model claims, then individual differences in attendance should mirror individual differences in reproductive goals. In light of this, literature

regarding mating strategy and sex must be reexamined within the context of the reproductive religiosity model.

### **Theories of Human Mating Strategy**

Evolutionary psychology principles suggest that humans have evolved psychological mechanisms that process adaptive challenges and facilitate behaviors that meet individual goals with minimal cost on average (Kaplan & Gangestad, 2005; Kenrick, Griskevicius, et al., 2010; Kenrick, Neuberg, Griskevicius, Becker, & Schaller, 2010; Tooby & Cosmides, 1992). As Buss (2007) noted, because those who fail to mate also fail to reproduce, some of these mechanisms are likely to have evolved as a solution to reproductive challenges (Buss, 2004; Kenrick, Griskevicius, et al., 2010). Some examples of reproductive challenges are attracting a mate, out-competing members of one's own sex for a mate, retaining a mate, and then engaging in the behaviors necessary to reproduce and care for offspring (Buss, 2007; Fernandes, of Menie, Hutz, Kruger, & Figueredo, 2016; Kappeler, 2012; Gangestad & Simpson, 2000). Thanks to these mechanisms, a variety of behaviors that solve these challenges can be flexibly and strategically employed (Buss, 1998; Buss, 2007; Buss & Schmitt, 1993; Hill & Kaplan, 1999; Gangestad & Simpson, 2000).

Frequently encountered challenges over the course of our evolutionary history are believed to have led to behavioral strategies that most efficiently solve them (Buss & Schmitt, 1993; Dominey, 1984; Gangestad & Simpson, 2000). In the domain of reproductive behavior, these sets are categorized as either short-term or long-term strategies. Those who pursue long-term mating strategies seek

monogamous partnerships with the goal of lifetime commitment (i.e., marriage), investment in offspring, and a high degree of selectivity in mate choice (Buss, 2004; Buss & Schmitt, 1993). Alternately, those pursuing short-term mating strategies lack commitment to partners (i.e., brief sexual encounters), have a higher average number of mates over their lifetime, and do not seek to invest in offspring (Buss, 2007; Buss & Schmitt, 1993). To date, most of the literature on human mating conceptualizes reproductive and sexual behavior as existing in long-term or short-term dimensions. However, although leading theories (viz, Buss & Schmitt, 1993; Gangestad & Simpson, 2000; Hill & Kaplan, 1999; Schmitt, 2005) tend to agree on this conceptualization, they differ in accounts of which individuals use these strategies and under what contexts.

Sex-specific accounts report that men primarily desire short-term mates but will alternately adopt long-term strategies to meet the preferences of women, who prefer long-term strategies almost universally (e.g., Buss, 1998; Buss, 2007; Buss & Schmitt, 1993). More specifically, they claim that women prioritize long-term mates because they seek to offset the disproportionate cost of child bearing and rearing through an investing mate (Trivers, 1972), but may pursue short-term mates who are willing to invest resources (Malinowski, 1929). Men, on the other hand, prioritize short-term mating to maximize reproductive output (Betzig, 1986; Dawkins, 1986). Additionally, men secondarily adopt a long-term strategy either because they were unable to fulfill women's short-term desires (Buss, 1988) or upon finding a high quality mate (i.e., attractive, good genes; Gangestad, 1989; Gangestad & Simpson, 1989; Symons, 1979). These theories emphasize that

while both sexes are capable of enacting short and long-term strategies, sex-specific characteristics make particular strategies more adaptive.

Sex specific accounts also predict that men should prioritize short-term strategies while women should prioritize long-term strategies except in uncommon instances in which pursuing an alternate strategy is opportunistic (Buss & Schmitt, 1993). Evidence partially supports this prediction, as sex accounts for 16% of the variance in intent to seek short-term mates and between 8% and 20% of the variance in seeking sex without commitment by some reports (Buss & Schmitt, 1993; Gangestad & Simpson, 2000; Oliver & Hyde, 1993; Simpson & Gangestad, 1991). As some have noted (e.g., Kirkpatrick, 2005) sex differences commonly observed in religious attendance may derive from these sex differences in mating strategy. However, although these effect sizes are noteworthy by conventional standards (Cohen, 1977), the sexes appear to be more similar than different in mating orientation (Smiler, 2011).

While similarities between the sexes are not a main focus of the previously discussed theories, data suggesting that a substantial degree of overlap between the sexes cannot be ignored. One analysis of sexual behaviors across 56 countries found that only a minority of men (25%) and women (5%) desired more than one sex partner in the next 30 days (Schmitt & International Sexuality Description Project Team, 2003). The mode for number of desired sex partners was 1 for men and women, which has been replicated in other studies (McBurney, Zapp, & Streeter, 2005; Miller & Fishkin, 1997). In terms of partners attained, studies generally confirm that men and women have few partners with a

positively skewed distribution (mode of one partner, median of two partners; Jackson & Kirkpatrick, 2007; Oliver & Hyde, 1993; Smiler, 2008). Further, the 2006 wave of the General Social Survey (GSS) reported that approximately 29% of Americans between the ages of 40 and 50 have had no more than two sex partners since age 18 while 32% have had 10 or more (Weeden et al., 2008). These data suggest that a substantial portion of men and women desire and have low numbers of sex partners, seemingly in conflict with claims that mating strategy is sex-dependent. However, studies that adopt this narrative concede this to an extent by focusing primarily on between-sex variation in measures of short-term strategy (Buss, 1998; Buss, 2007; Buss & Schmitt, 1993). Indeed, these theories make no specific account of between-sex similarities or even within-sex differences and give much less attention to long-term mating behavior, which appears to be highly similar between sexes (Pederson et al., 2011). These omissions and conflicting data may contradict the hypothesis (derived from the reproductive religiosity model) that sex differences in mating strategy underlie sex differences in attendance. Subsequent theories seek to fill this gap by providing claims and evidence that the sexes are largely similar, with sex differences largely resulting from contextual factors.

Studies reporting within and between-sex variation note that short and long-term strategies are used by both sexes, but that different sexes respond to different contexts (e.g., Eagly & Wood, 1999; Gangestad & Simpson, 2000; Kaplan & Gangestad, 2005). That is, both sexes prioritize long-term strategies because biparental care increases offspring survival rates, but will seek short-

term mates for reasons that are unique to each sex (Gangestad & Simpson, 2000; Harpending, Draper, & Pennington, 1990). In environments where offspring genetic quality is more crucial to offspring survival (e.g., pathogen laden environments; Buss, 1989; Kaplan, 1996; Kirkpatrick & Ryan, 1991), women value attractive short-term mates more than in environments where offspring survival relies primarily on biparental care (e.g., resource poor environments; Eagly & Wood, 1999; Low, 1990). Whereas women are believed to track their environment to judge the viability of short-term mating, men are believed to track women's preferences to assess the viability of pursuing a particular strategy (Gangestad & Simpson, 2000; Thiessen, 1994; Trivers, 1972). Gangestad and Simpson (2000) specifically note that most men are unable to fill standards for a short-term mate and therefore only the most genetically fit (i.e., attractive) are likely to successfully achieve a high number of short-term mates. There is some data to support these theories; measures of bilateral asymmetry, a common negative measure of attractiveness (Perusse, 1993) has been found to correlate with lifetime number of partners in men but not in women (Gangestad & Thornhill 1997a, 1997b; Thornhill & Gangestad, 1994). For women, those who are more willing to engage in uncommitted sex (i.e., casual sex without attachment; Simpson & Gangestad, 1991) rate physical attraction as more important than women who are less willing to engage in uncommitted sex (Simpson & Gangestad, 1992). Additionally, in regions with more pathogens, men and women placed greater importance on attractiveness (Buss, 1989) and women placed less value on qualities (e.g., "dependable", "desire for home and children")

associated with parenting quality (Gangestad, 1993). While the data do not imply a causal relationship, they provide a plausible source of variability that sex-specific accounts do not.

Contextual as well as sex-specific narratives acknowledge that one's mating strategy is not likely to be intractable and is likely the product of multiple factors (Kenrick, Li, & Butner, 2003; Schmitt & Buss 2001; Stearns, 1992; Stearns, 2000). In fact, a variety of factors (e.g., age; Charnov, 1993, mate value; Castro et al., 2015, mate availability; Kenrick, Griskevicius, et al., 2010, childhood experience; Marzec & Lukasik, 2017, mortality rate; Griskevicius, Delton, Robertson, & Tybur, 2011) are known to relate to mating strategy. Based on the evidence outlined above it seems that while sex plays a role in mating strategy, its role may be overstated in the reproductive religiosity model (Weeden et al., 2008). Further, based on evidence that mating strategy is contextually and individually variable, it is plausible that one's mating strategy represents a tradeoff between the most optimal (i.e., preferred) strategy and what is most likely to lead to reproductive success in the face of constraints (Buss, 1995; Kaplan & Gangestad, 2005; Parker & Maynard Smith, 1990). Accordingly, if contextual factors determine the viability of a preferred strategy, and men and women are capable of assessing those factors at some level, it follows that they are be able to enact behaviors that increase the viability of their preferred strategy.

### **Reproductive Religiosity**

Religious institutions are well known for heavily regulating mating behavior in favor of long-term mating through moral doctrines and enforcing beliefs in a higher power (Lefkowitz, Gillen, Shearer, & Boone, 2004; Meier, 2003; Petersen, 2017; Rowatt & Schmitt, 2003; Van Slyke & Wasemiller, 2017; Whitbeck, Yoder, Hoyt, & Conger, 1999; Zaleski & Schiaffino, 2000). Thus, the reproductive religiosity model claims that long-term strategists embed themselves within this community to facilitate this strategy. Indeed, expressed beliefs such as religious beliefs and morals are self-presentational (Kurzban, et al., 2010; Weeden & Kurzban, 2014), while behavior is goal oriented and specific (DeScioli & Kurzban, 2009; Kenrick, Neuberg, & Cialdini, 2014; Kenrick, Neuberg, et al., 2010). Therefore the models proponents have claimed that to an extent, religious beliefs of long-term strategists may only be espoused as far as to meet their self-interests (DeScioli & Kurzban, 2013; Weeden & Kurzban, 2017; Weeden et al., 2016). However, this claim contrasts with a common assertion that religious beliefs foster monogamous sexual and reproductive lifestyles and beliefs (Landor, Simons, Simons, Brody, & Gibbons, 2010; Rostosky, Regnerus, & Wright, 2003; Paul, Fitzjohn, Eberhart-Phillips, Herbison, & Dickson, 2000; Zaleski & Schiaffino, 2000).

Historically, a religious upbringing was believed to familiarize children with religious beliefs and behaviors, making them more likely to remain religiously involved and strengthening religious moral views over time (Atkinson & Bourrat, 2011; Iannaccone, 1990; Myers 1996; Ozorak 1989; Regnerus, Smith, & Smith,

2004; Smith & Denton 2005). Of the plethora of espoused moral views, religious institutions seem to have particularly strong interest in reproductive morals (e.g., views on monogamy, abortion, premarital sex; Burris, Smith, & Carlson, 2009; Hardy & Raffaelli, 2003; Meier, 2003; Schmitt, 2005; Shariff & Norenzayan, 2007; Thornton & Camburn, 1989). Religious institutions encourage their followers to strive toward a sexually restrictive (i.e., monogamous, high fertility, high commitment; Weeden et al., 2008) lifestyle and heavily condemn or ostracize individuals that do not, even those who are not religiously affiliated (Burris et al., 2009; Davies & Davis, 2013; Hardy & Raffaelli, 2003; Kurzban, 2010; Schmitt & Fuller, 2015; Thornton & Camburn, 1989). As a result, it is widely believed that attending religious service exposes individuals to these teachings and beliefs which causes them to be restrictive in their sexual (Fitzjohn et al., 2000; Hardy & Raffaelli, 2003; Rostosky, Wilcox, Wright, & Randall, 2004; Zaleski & Schiaffino, 2000) as well as reproductive behavior (Petts, 2009; Regnerus & Uecker, 2006; Sherkat & Wilson, 1995; Stolzenberg, Blair-Loy, & Waite, 1995; Uecker, Regnerus, & Vaaler, 2007).

At first glance, the relationship between attendance and belief seems straightforward; birth cohort (McCullough et al., 2005), strength of religious upbringing (Eggebeen & Dew, 2009; Petts, 2009; Sherkat & Wilson, 1995), age (Argue, Johnson, & White, 1999), marital status (Petts, 2009; Stolzenberg et al., 1995), gender (McCullough, Worthington, Maxey, & Rachal, 1997; Stark, 2002), and number of children (Uecker et al., 2007; Wilson & Sherkat, 1994) are all associated with religious behavior and beliefs. However, statistically controlling

for sexual morals (e.g., casual sex, abortion, divorce; Weeden et al., 2008; Weeden et al., 2016) substantially reduces associations between religious attendance and cooperative morals (e.g., views on lying, stealing, bribery; Kurzban et al., 2010; Tybur, Merriman, Caldwell Hooper, McDonald, & Navarrete, 2010; Weeden et al., 2008; Weeden & Kurzban 2013) Also, controlling for reproductive and sexual variables (i.e., number of children, number of sex partners, marital status) qualifies the relationship between religious attendance and age, cohort, and gender (Li et al., 2009; Weeden et al., 2008; Weeden et al., 2016). This evidence suggests that there is reason to doubt the narrative that moral views sexual or otherwise, stem from religious beliefs.

In addition to restrictive sexual morals being more strongly correlated with religious attendance than cooperative morals (Weeden et al., 2008; Weeden & Kurzban, 2013.), marriage and having children consistently emerge as factors that predict a subsequent increase in religious attendance (Petts, 2007; Petts, 2009; Stolzenberg et al., 1995). This implies that individuals who “settle down” may join religious groups to support their change in lifestyle. Furthermore, these factors do not seem to influence religious *belief* (e.g, belief in God, belief in a higher power, belief in life after death), which remains fairly stable throughout adolescence and even into late adulthood (McCullough et al., 2005; Sherkat & Wilson, 1995). This suggests that individuals may increase attendance because it supports their monogamous lifestyle instead of an increase in religious belief. Theoretically, individuals may fully engage, disengage, or take a middle of the road approach to religion to meet individually relevant goals (Wilson & Sherkat,

1994). Although these views have been widely explored in the context of how they relate to one's lifestyle, they have not yet been integrated into the reproductive religiosity model. Religious institutions also have many incentives for married couples and parents with children such as childcare, social/community interaction, personal support, and a large social network that is pre-established as opposed to a social group that has to be actively sought out (Galen, 2012). Due to these benefits, it is likely that those pursuing a long-term strategy may be particularly attracted to the act of attending a religious service.

What are called typically called "family values" within religion (i.e., nuclear families, birth in wedlock, anti-homosexuality; Wilcox, Chaves, & Franz 2004), could alternately be described as a set of values conducive to producing larger families (Norenzayan et al., 2016). Encouraging commitment and biparental care ensures paternity certainty (Simpson & Gangestad, 1992; Weeden & Kurzban, 2013) and promotes child welfare (Buss, 2000). This may even confer adaptive benefit at the population level; monogamy keeps the mate pair ratio high (Kanazawa & Still, 1999; Schmitt & Rohde, 2013), increases fertility rates in the general population (Henrich et al., 2012; Fincher & Thornhill 2012; Rand et al., 2014), and religious countries tend to outbreed secular ones (Blume, 2009; Inglehart & Norris, 2004). Collectively, these findings lend credit to theories that, regardless of the adaptive benefits that gave rise to religion, one of its *current* primary adaptive benefits came to be promoting monogamy and family formation (Boyer, 2003; Kirkpatrick, 1999; Kirkpatrick, 2005).

According to theories of human mating in which the reproductive religiosity model is based, long-term mating strategy typically involves forgoing extra mating opportunities as a tradeoff to committing to one mate and resulting offspring (Buss, 2007; Simpson & Gangestad, 2000). Investment in both of these is risky in populations with high amounts of non-mated or promiscuous individuals due to increased chances of losing a mate to a non-mated individual and in turn undermining investments of time, energy, and resources (Buss & Schmitt, 1993; Buss, 2002; Weeden et al., 2016). Religious participation bolsters against this by imposing social costs such as condemnation, ostracization, and reputational damage to those with a conflicting (i.e., short-term) mating strategy (Eggebeen & Dew, 2009; Gintis, Smith, & Bowles, 2001; Kurzban et al., 2010; McCullough et al., 2012; Petersen, 2017; Weeden & Kurzban, 2013; Weeden et al., 2016). Specifically, the act of religious attendance places one within a community of people that is publicly hostile to individuals who are not pursuing a long-term mating strategy (DeScioli & Kurzban, 2013; Kirkpatrick, 2005; Kirkpatrick, 2006; Kurzban, 2010; Robinson & Kurzban, 2007; Weeden & Kurzban 2017; Van Slyke & Wasemiller, 2017).

Although the literature reviewed thus far provides an account of how individuals may use religious attendance as a component of their mating strategy, several theoretical points of reproductive religiosity model remain unaddressed. First, the model suggests that commonly reported correlates of religious attendance (i.e., age, cohort, and gender; McCullough, Enders, Brion, Jain, 2005; Regnerus & Uecker, 2006; Petts, 2009) are spuriously correlated with

attendance through mating strategy (i.e., few sex partners, multiple children, married; Weeden et al., 2008; Weeden, et al., 2016). While sex likely plays a role in mating strategy, it is not likely to be the sole determinant as the sexes appear to be more similar than different in their mating behavior (Pederson et al., 2011; Schulz, 2009; Smiler, 2011). Further, the reproductive religiosity model does not test for the effect of religious belief, which likely plays a role in religious behavior (Kenrick, Griskevicius, et al., 2010; Weeden et al., 2008). Lastly, the reproductive religiosity model does not claim that mating strategy is the *sole* reason that individuals may attend religious services (Weeden et al., 2008; Weeden et al., 2016). To a large extent, it is also orthogonal to religious origin theories such as in-group cooperation or prosociality. Yet, it may be a useful for explaining variance not associated with those factors.

### **Current Study**

This study finds common ground with many aspects of the reproductive religiosity model with a few important additions. First, it is likely that presently (within the United States), one of the main roles of religious attendance rather than religious belief is to advance high commitment, monogamous, mating strategies. However, based on the results of partial correlation tests, discussions of the reproductive religiosity model (see Weeden et al., 2016; Weeden & Kurzban, 2013) have claimed that sexual and reproductive behaviors substantially mediate associations between religious attendance and age, year of birth, and sex. These discussions do not test the “traditional model” in which demographic variables influence religious attendance, which in turn influences

mating strategy. Therefore, my principal aim is to compare the traditional model with the reproductive religiosity model using mediation analyses in order to establish which model is a better fit. Further, partial correlation tests performed by Weeden and colleagues (2008) reportedly demonstrate that sex differences in religious attendance are reflective of sex differences in mating strategy.

However, these tests do not clearly demonstrate that sex differences in religious attendance are entirely the result of sex differences in mating strategy. In light of literature that suggests the sexes are similar in their mating strategy and that sex accounts for a relatively small amount of variance, it is plausible that other factors may contribute to sex differences or overall differences in religious attendance.

Therefore, I aim to examine the role of belief in the reproductive religiosity model by testing religious belief in place of attendance in partial correlation and regression models. Furthermore, I aim to clarify whether sex is a dominant predictor of attendance when controlling for other reproductive, demographic, and religiosity measures in a regression model. This aim follows the suggestion of Weeden et al. (2008) and includes a measure of religious belief. Most studies that examine religiosity measure religious belief as well as behavior in some capacity (e.g., intrinsic vs. extrinsic religiosity; Allport & Ross, 1967; belief vs. affiliation; Voas, 2007; adaptation vs. socialization; Atran & Norenzayan, 2004; Boyer, 2001). While proponents of the model focus on service attendance as the main strategic component, they acknowledge that measures of religious belief (e.g., belief in a higher power or belief in God; Weeden et al., 2008) remain

untested within the context of the model and therefore are a prime domain for further study.

In light of previous findings, it is predicted that sex, marital status, age, year of birth, number of children, and number of sexual partners will all be significantly correlated with religious attendance as well as belief in God. In partial correlation analyses, the correlations between attendance and reproductive variables are predicted to remain significant when controlling for sex, age, and year of birth. However, when controlling for reproductive variables, the correlations between attendance and demographic variables are expected to no longer be significant. As noted by the reproductive religiosity model, espoused beliefs are subject to self-presentational cues and attendance, as a social behavior, may more directly serve ones underlying reproductive goals (Weeden et al., 2008; Weeden & Kurzban, 2013). Therefore it is hypothesized that reproductive variables will be weaker correlates of belief than attendance but will still remain significant when controlling for demographic variables in the corresponding partial correlation analysis. Further, contrary to the attendance partial correlation, controlling for marital status, number of children, and number of sexual partners is not expected to significantly reduce the correlation between demographic variables and belief. In regression models, reproductive variables are predicted to be significant predictors of religious attendance as well as religious belief, with more sexual partners, less children, and being unmarried all predicting *less* religiosity. Reproductive variables are also expected to be weaker predictors of religious belief than attendance in corresponding regression

models. Lastly, mediation analysis of the reproductive religiosity model is predicted to be significant and a better fit than the traditional model proposed by common accounts.

## **Chapter 2: Methods and Results**

### **Methods**

#### **Participants**

The final sample contained 13,636 adults (6004 male; 7632 female) who participated in the General Social Survey (GSS) of the University of Chicago National Opinion Research Center (NORC). The GSS is a nationally representative household survey that samples individuals in the United States above the age of 18. Participants ranged from 18 to 89 years of age with a mean age of 45 ( $sd=16.85$ ). The sample was 81.2% white: 11072 self identified as white, 1664 self identified as black, and 900 self identified as “other”. Regarding religious affiliation, 7950 identified as Protestant, 3341 as Catholic, 531 as other, and 273 as Jewish. Non-religious participants comprised 11.3% of the sample ( $n=1541$ ). Demographics are summarized in Table 1.

#### **Data Set**

All data for the study was downloaded as an SPSS file from the GSS website. Questions were asked of participants by researchers at the University of Chicago NORC in the form of 90 minute face to face interviews. Data from these interviews is released in “waves” corresponding to the time period in which the data was collected and is posted in open source format on the GSS website. These survey waves are conducted with novel participants each year and are thus non-longitudinal. All data for this study was downloaded directly from the survey website and cleaned as described. Due to a large sample size, the

significance threshold for analyses was set at  $\alpha = .001$  in order to reduce type 1 error rate.

### **Data Treatment**

For the purposes of this study, survey waves of years 1989 through 2014 (N=45963) were used because the GSS began to take data on past sexual partners within these years. Given the ambiguity of self-reporting virginity (see Byers, Henderson, & Hobson, 2009; Uecker, Angotti, & Regnerus, 2008) and that having no sexual partners may be the result of an inability to find partners (see Donnelly, Burgess, Anderson, Davis, & Dillard, 2001), those who reported having no sexual partners (N=1189) were excluded from analyses. Respondents who did not provide their number of sexual partners (N= 30542) were also excluded from analyses. Responses to this item were non-normally distributed with a skewness of 16.18 (SE= .015) and a kurtosis of 402.85 (SE= .031). Thus, data were log transformed prior to analyses.

Six items (“Which statement comes closest to what you believe about God?”, “How often do you pray?”, “How much truth is in religion?”, “How important is God in your life?”, “Do you find strength and comfort in religion?”, and “Do you ask for God’s help in daily activities?”) that were present on GSS surveys from 1989 through 2014 were identified as potentially assessing religious attitudes. All items but one, “Please look at this card and tell me which statement comes closest to expressing what you believe about God?”, were dropped from analyses because they contained more than 80% missing data. Participants who

did not provide a response for attendance, belief, and number of sexual partners ( $n=595$ ) were excluded from analyses.

### **Measures**

**Demographics.** Measures were included for which participants answered items assessing age, birth cohort, race, sex, and religious affiliation. Sex was coded so that 0 = “male” and 1 = “female”. Thus, in analyses including sex as a variable, coefficients indicate the strength of association to being female. See Table 1 for summarized sample demographic information.

**Religious Belief.** In this study, religious belief was measured with a single item that assessed participants’ belief in the existence of God through the question, “Please look at this card and tell me which statement comes closest to expressing what you believe about God.” Belief was rated on a six-point Likert scale with higher scores indicating stronger belief. Responses were coded as follows: 1 = “I don’t believe in God”, 2 = “I don’t know whether there is a God and I don’t believe there is any way to find out”, 3 = “I don’t believe in a personal God, but I do believe in a Higher Power of some kind”, 4 = “I find myself believing in God some of the time, but not at others”, 5 = “While I have doubts, I feel that I do believe in God”, and 6 = “I know God really exists and I have no doubts about it”

**Religious Behavior.** Following Weeden et al. (2008), religious behavior was measured using a single item that assessed the frequency of participants’ religious attendance through the prompt, “How often do you attend religious services?” Attendance was rated on an 8-point Likert-type scale with higher scores indicating more frequent attendance. Responses were coded as follows:

1 = "Never", 2 = "About once or twice a year", 3 = "Several times a year", 4 = "About once a month", 5 = "2-3 times a month", 6 = "Nearly every week", 7 = "Every week", 8 = "Several times a week".

**Mating Behavior.** Several items pertaining to mating behavior were included based on Weeden et al.'s (2008) research. Number of children was assessed through the question, "How many children have you ever had? Please count all that were born alive at any time (including any you had from a previous marriage)" Participants indicated their number of children on a nine point Likert scale (0 = "None" to 8 = "Eight or more"). Participants also indicated their marital status in response to the question "Are you currently--married, widowed, divorced, separated, or have you never been married?" Responses were originally coded as follows: 1= "Married", 2 = "Widowed", 3 = "Divorced", 4 = "Separated", and 5 = "Never Married". In this study, this item was dummy coded so that 1= "Married" or "Widowed" and 0= "Divorced", "Separated", or "Never Married" in order to more directly assess ones desire to marry and not divorce. Thus, in analyses including marital status as a variable, coefficients indicate the strength of association to being married. Participants indicated their total number of sexual partners in response to the prompt, "Now thinking about the time since your 18th birthday (including the past 12 months) how many partners have you had sex with?"

### **Statistical Analyses**

Descriptive statistics including mean, median, mode, minimum, and maximum values for belief, attendance, number of sexual partners, and number

of children were calculated. Preliminary correlations and partial correlations were run in order to examine relationships between variables and whether they were associated as expected.

Two multiple regression models were performed to examine the unique contribution of one's number of sexual partners in predicting religious attendance beyond other predictors and the unique contribution of number of sexual partners in predicting belief in God beyond other predictors.

Two mediation analyses were performed using Hayes (2013) PROCESS macro for SPSS (Version 2). For the first model, analyses were conducted using one independent variable (sex), one mediator (number of sexual partners), and one dependent variable (church attendance). The second mediation model also tested sex as the independent variable, but tested church attendance as the mediating variable and number of sexual partners as the dependent variable. Given that the reproductive religiosity model makes specific predictions regarding sex rather than other demographic and reproductive variables, sex was chosen as the independent variable while controlling for marital status, number of children, age and cohort. Belief in God was also controlled in order to more directly assess individual differences in attendance that were related to reproductive goals rather than religious belief. Simple mediation was tested for using PROCESS model 4. The number of bootstrap samples for bias corrected bootstrap confidence intervals was 10,000.

## Results

### Pearson correlations

Descriptive statistics were calculated first and displayed in Table 2.

Correlation results demonstrate that attendance was significantly correlated with age ( $r = .132, p < .001$ ), year of birth ( $r = -.149, p < .001$ ), number of children ( $r = .188, p < .001$ ), marital status ( $r = .203, p < .001$ ), sex ( $r = .121, p < .001$ ), number of sexual partners ( $r = -.253, p < .001$ ), and belief in God ( $r = .444, p < .001$ ). Correlations between belief in God and age ( $r = .077, p < .001$ ), year of birth ( $r = -.103, p < .001$ ), number of children ( $r = .183, p < .001$ ), marital status ( $r = .117, p < .001$ ), and number of sexual partners ( $r = -.190, p < .001$ ), were also significant. As predicted, correlations between these variables and belief were weaker than their correlations with attendance. As an exception, the correlation between belief and sex ( $r = .183, p < .001$ ), was stronger than the correlation between sex and attendance. Full correlation results are displayed in Table 3.

### Partial correlations

Following Weeden et al. (2008), associations between reproductive and demographic variables were investigated using partial correlation, the results of which are shown in Table 4. Partial correlation results demonstrate that controlling for number of sexual partners, marital status, and number of children substantially reduced the correlation between religious attendance listed above for age ( $r = .033, p < .001$ ), birth year ( $r = -.046, p < .001$ ), and sex ( $r = .047, p < .001$ ). As expected, controlling for birth year, age, and sex did not substantially

reduce the correlation between attendance and number of sexual partners ( $r = -.218$ ,  $p < .001$ ), marital status ( $r = .167$ ,  $p < .001$ ), or number of children ( $r = .133$ ,  $p < .001$ ). This indicates that to an extent, sex differences in mating strategy led to sex differences in religious attendance as predicted by the reproductive religiosity model. These analyses also demonstrate that, outside of the predictions of the reproductive religiosity model, sex is still significantly correlated with attendance even when controlling for reproductive variables.

As predicted, testing religious belief in place of attendance produced slightly different results. As with attendance, controlling for number of sexual partners, marital status, and number of children reduced correlations between belief in god and age ( $r = -.012$ ,  $p = .144$ ), and year of birth ( $r = -.018$ ,  $p = .039$ ). Conversely, the correlation between belief in God and sex was not substantially reduced, ( $r = 0.128$ ,  $p < .001$ ). This suggests that the relationship between sex and belief in God was not qualified by controlling for sexual and reproductive variables, indicating a possible locus of sex differences that was not accounted for by the reproductive religiosity model. On the other hand, as expected and as with religious attendance, controlling for age, year of birth, and sex did not substantially reduce the correlation between belief in God and number of sex partners ( $r = -.129$ ,  $p < .001$ ), marital status ( $r = .088$ ,  $p < .001$ ), or number of children ( $r = .153$ ,  $p < .001$ ). Overall, correlations between reproductive variables and attendance were weaker than correlations between reproductive variables and belief in God as predicted. Results of these partial correlations are displayed in Table 4.

### Multiple Regression

**Religious Attendance.** Religious attendance was predicted from number of children, marital status, sex, and number of sex partners (Table 5). Age, year of birth, and belief in God were included as control variables in order to examine independent effects of sexual and reproductive variables and religious attendance. The regression model was significant with an  $R^2$  of .244,  $F(7,13610) = 628.96$ ,  $p < .001$ . Belief in God ( $\beta = .393$ ,  $p < .001$ ), number of children ( $\beta = .056$ ,  $p < .001$ ), marital status ( $\beta = .086$ ,  $p < .001$ ), and number of sexual partners ( $\beta = -.144$ ,  $p < .001$ ), were all significant predictors of church attendance. Conversely, sex ( $\beta = -.005$ ,  $p = .524$ ), age ( $\beta = .000$ ,  $p < .980$ ), and year of birth ( $\beta = -.040$ ,  $p < .022$ ), were not significant predictors. In line with predictions, these results suggest that sexual and reproductive variables explain away the association between attendance and demographic variables even when accounting for belief in God as a covariate. Outside of predictions, although reproductive variables were all significant and unique predictors of attendance, number of children predicted substantially less variance in relation to number of sexual partners and marital status. Results of this regression analysis are displayed in Table 5.

**Religious Belief.** Belief in God was predicted based on number of children, marital status, sex, and number of sex partners (Table 6). The regression model was significant with an  $R^2$  of .226,  $F(7,13610)=568.48$ ,  $p < .001$ . Age, year of birth, and church attendance were included as control variables. It was found that attendance ( $\beta = .403$ ,  $p < .001$ ), age ( $\beta = -.108$ ,  $p <$

.001), sex ( $\beta = .113, p < .001$ ), year of birth ( $\beta = -.096, p < .001$ ), number of children ( $\beta = .102, p < .001$ ), and number of sexual partners ( $\beta = -.038, p < .001$ ) are all significant predictors of belief in God. Conversely, marital status ( $\beta = -.007, p = .427$ ) was not a significant predictor of belief in God. In line with predictions, sexual and reproductive variables were significant predictors of religious belief independently of demographic variables and religious attendance, which was the dominant predictor of religious belief as expected. Also in line with predictions, number of sexual partners and number of children were stronger predictors in the attendance regression model than the belief regression model. Although it was not explicitly predicted, it is worth noting that while number of sexual partners was a significant predictor of belief, it predicted substantially less variance than other significant predictors listed above. Contrary to predictions, number of children was a stronger predictor of belief in God than attendance. Results of this regression analysis are displayed in Table 6.

### **Mediation Analyses**

Some (N=18) participants were not included in these analyses due to missing data in men and women, which slightly reduced sample sizes to 7617 and 6001, respectively. Summarized results and confidence intervals of both models are displayed in table 7.

In the mediation testing the reproductive religiosity model, the relationship between sex and church attendance was fully mediated by number of sexual partners. The model was significant with an  $R^2$  of .227,  $MSE= 5.83, p < .001$ . As illustrated in Figure 1a, sex significantly predicted number of sexual partners ( $b=$

-.309,  $p < .001$ ) and number of sexual partners predicted church attendance frequency ( $b = -.750$ ,  $p < .001$ ). The total effect of sex on church attendance was .207 ( $SE = .043$ ), and the direct effect of sex on church attendance after adding number of sexual partners as a mediator was insignificant ( $p = .524$ ) when controlling for age, year of birth, marital status, and number of children ( $b = -.028$ ,  $SE = .044$ ). The indirect effect of belief in God on church attendance through number of sexual partners ( $b = .2317$ ,  $SE = .015$ ) was significant per the results of bootstrapped confidence intervals, which did not include 0. In line with predictions that the reproductive religiosity model would be significant, results of this mediation analysis demonstrate that an individual's number of sexual partners significantly and fully mediate the relationship between sex and religious attendance.

In the mediation testing the traditional model, the relationship between sex and number of sexual partners is significantly partially mediated by number of sexual partners. Figure 1b illustrates the effects within this model. The overall model was significant with an  $R^2$  of .189,  $MSE = .225$ ,  $p < .001$ . Results indicated that sex significantly predicted attendance frequency ( $b = -.204$ ,  $p < .001$ ), and that attendance frequency significantly predicted number of sexual partners ( $b = -.029$ ). The total effect of sex on number of sexual partners ( $b = -.309$ ,  $SE = .008$ ,  $p < .001$ ), and the direct effect of sex on number of sexual partners after adding number of attendance frequency ( $b = -.303$ ,  $SE = .008$ ,  $p < .001$ ), were both significant when controlling for age, year of birth, marital status, and number of children. The indirect effect of belief in God on church attendance through

number of sexual partners ( $b = -.006$ ,  $SE = .001$ ) was also significant per the results of bootstrapped confidence intervals, which did not include 0.

Mediation regression coefficients for both models are displayed in Table 7. Mediation models are visually represented in Figure 1a and 1b. In line with predictions, the overall fit for this mediation is not as good as the reproductive religiosity mediation model. Although it was not specifically predicted for, the fact that the indirect effect of this model is trivial in size by conventional standards (Cohen, 1977) is also consistent with the prediction that the reproductive religiosity model would be a better fit.

## Chapter 3: Discussion and Conclusion

### Discussion

Religious behavior and belief have long been documented as strong influencers of sexual and reproductive behavior (Buss, 2002). However, the reproductive religiosity model (Weeden et al., 2008) has revitalized scientific interest in the study of religion and sexual behavior with findings that sexual and reproductive behavior are strongly related to religious attendance. Even more compelling is that, controlling for sexual and reproductive variables eliminated the relationship of age, birth cohort, and sex to religious attendance. While this gives plausible reason to doubt that religious beliefs determine sexual behavior (Fitzjohn et al., 2000; Hardy & Raffaelli, 2003; Rostosky et al., 2004; Zaleski & Schiaffino, 2000), analyses of these studies had yet to incorporate other measures of religiosity (e.g., belief in God). Additionally, subsequent reviews (e.g., Pedersen et al., 2010; Schulz, 2010; Smiler, 2011) shed doubt on claims of sex differences in mating strategy (Buss & Schmitt, 1993). The purpose of this study was to begin addressing these issues, adding to the literature in three notable ways.

First, this study aimed to examine sexual and reproductive variables predicting both religious attendance and belief in God using partial correlation analyses. In line with predictions, controlling for sexual and reproductive variables substantially reduced correlations between attendance and demographic variables. Also in line with previous research (e.g., Weeden et al., 2008; Weeden et al., 2016), controlling for demographic variables in the same

manner had comparatively minimal effects. Additionally, similar associations were seen when testing belief in God in place of religious attendance in that controlling for demographic variables had little effect on correlations with reproductive variables and. However, controlling for reproductive variables qualified all correlations between belief in God and demographic variables with the exception of sex. The finding that sex (i.e., being female) was a significant correlate of religious belief and not attendance may imply that reported sex differences in religious attendance may have more to do with religious belief than with sexual and reproductive variables. Although it was not predicted, this is consistent with research that has theorized that women may be more socialized to be introspective and seek existential security through private and internal devotion (Cornwall, 2009; Eagly, 1987; Eagly & Wood, 1999; Stark, 2002). However, this correlation does not imply causality between gender and religious belief and this relationship may not extend to all measures of religiosity. For example, Schnabel (2015) reported that women were only higher in reported instances of daily prayer while Loewenthal, MacLeod, & Cinnirella (2002) reported that sex differences in attendance were culturally variable.

In order to examine the individual predictive power of sexual/reproductive and demographic variables on belief in God and attendance, two multiple regression analyses were performed. Results of the regression analysis predicting religious attendance mirrored partial correlation results to a large extent; sexual and reproductive variables were each significant predictors with number of sexual partners being the strongest of the three while demographic

variables were not significant predictors. On the other hand, results of the regression analysis assessing belief in God produced different results than those of the partial correlation. With the exception of marital status, sexual/reproductive variables as well as demographic variables were independent and significant predictors of belief in God. Contrary to predictions, number of children was a stronger predictor of belief in God than attendance. Once again, this result implies that sex explains a significant portion of unique variance even when controlling for other reproductive and demographic variables. This further suggests that the reproductive religiosity model may not fully explain well-known sex differences in religiosity. Although attendance and belief were the strongest predictors of each other, these variables are related constructs and therefore it is not particularly surprising that they are strong predictors of each other. By including them in the regression models, the intention was to better examine the ways in which sexual and demographic variables accounted for variability in religious belief and religious attendance *independently* of each other. To a degree, multiple regression results corroborate the central claim of the reproductive religiosity model that differences in sexual and reproductive morals are primarily responsible for individual differences in church attendance. While the reproductive religiosity model did not address the relationship between belief in God and sexual/reproductive variables, these results are supplementary in that they imply belief in God plays a role within the reproductive religiosity model. In line with the claim that individuals may increase or decrease religious *participation* depending on whether it advances or hinders their sexual behavior,

results suggest differences in religious attendance likely stem from differences in reproductive variables. On the other hand, differences in belief in God seem to stem from differences in demographic measures.

Since a large body of research supports the notion that there are sex differences in mating strategy (see Buss & Schmitt, 1993) and sex differences in religious beliefs and socialization (see Stark, 2002), it was not immediately clear which measure was the primary locus for sex differences in religious attendance. However the finding that sexual behavior is related to religious attendance independently of moral views (see Weeden et al., 2016) suggests that sexual behavior would at least partially mediate belief in God and church attendance. Thus, it was hypothesized that the reproductive religiosity model would fit a mediation model better than the traditional model of sex leading to religious attendance and then sexual behavior. This was the obtained result; number of sexual partners was a significant partial mediator of the relationship between sex and church attendance when including age, marital status, number of children, year of birth, and belief in God as covariates. As established in this study's regression models, each of the primary variables in the mediation model was related. It is particularly noteworthy that these regression models demonstrated that sex was a significant predictor of belief in God independently of other reproductive and demographic variables yet the same was not true for religious attendance. Due to these results, it is not particularly surprising that full mediation occurred in the reproductive religiosity mediation model. However, this result is still an important finding because without specifically accounting for religious

belief, it would be plausible that sexual behavior could really be predicting belief rather than attendance. This would contradict the theory that religious attendance is the primary vehicle by which individuals come to meet their reproductive goals as opposed to religious belief, which is a considerably less social and public display (Weeden et al., 2008). As a final note, while the mediation model testing the traditional account may have produced a statistically significant indirect effect, the effect size is considerably small by conventional standards (Cohen 1977). Thus, interpretation of these results should focus on comparing effect size between the models rather than significance level.

These findings lend support to the reproductive religiosity model, which states that sexual behavior is not likely to be the sole or even primary driving factor behind church attendance in the modern U.S. Rather, a high level of short-term mating behavior (i.e., a high number of sexual partners) is likely to be in direct conflict with restrictive lifestyles that are often enforced in religious contexts. SST asserts that human beings are strategists and capable of adjusting the environments and contexts in which they place themselves to the degree that it is beneficial to individually relevant goals (Buss & Schmitt, 1993; Buss, 1998). Regarding religious contexts and reproductive goals, this certainly appears to be the case for men and women alike. Lastly, comparing mediation models for the reproductive religiosity and traditional accounts allows direct comparison and a more definitive interpretation of a superior model. Further, controlling for belief gives unique insight because religious beliefs and attendance had not yet been tested as separate constructs within the context of the reproductive religiosity

model. Though not confirmatory, these analyses are supportive of the reproductive religiosity models claim of a causal flow from sex, age, and birth year to sexual behavior and then to religious attendance.

### **Limitations and Future Directions**

Several important limitations must be noted when interpreting the results of this study. First, this study's measures of religious beliefs, religious behavior, and sexual behavior were all single item measures. Although these items asked participants to rate their beliefs and behaviors in a straightforward manner, they cannot be interpreted as measures of the full spectrum of religious behavior or belief nor sexual behavior and are therefore limited in their scope. On a similar note, while a growing body of research invoking the reproductive religiosity model corroborates that cooperative moral views are qualified by controlling for sexual moral views and attitudes (Weeden & Kurzban, 2013), this study was unable to test for these measures. This was primarily because potentially relevant items (e.g., "What are your views on teens having sex?") were not asked on the same year as variables included in this study and therefore these measures could not be compared directly. Lastly, regression models and partial mediations explained a moderate degree of variability in both belief in God and church attendance but do not test causal relationships. Although the proposed mediation models are backed by theory, the possibility remains that belief and attendance or even attendance and sexual behavior may exert reciprocal influences. For example, as noted by Kaplan & Gangestad (2005), theories of evolutionary psychology allow for the possibility of a reciprocal influence between evolved psychology and

environment. In this case, structural equation modeling may be better suited to analyze these paths.

Primarily, future studies would do well to strengthen methodology by employing measures of sexual and religious constructs that have been empirically validated. Namely, the Revised Sociosexual Orientation Inventory (SOI-R; Penke & Asendorpf, 2008) which measures sexual behavior as well as attitudes toward casual sex and the Revised Religious Life Inventory (Hills, et al., 2005) which measures belief as well as participation aspects of religion. Lastly, while belief in God and sexual behavior accounted for a significant degree of variability in church attendance frequency, the primary focus of this study was to test the reproductive religiosity model which makes relatively narrow claims in regards to the cultures, contexts, and time periods to which it can apply. Therefore, future studies should aim toward a convergence of religious theories (e.g., attachment theory; Kirkpatrick, 2005; cultural transmission; Atran & Henrich, 2004; religious prosociality; Norenzayan & Sharif, 2008), which likely have credibility by their own right in explaining religious origins, behavior, cognition, and other aspects of religion. Lastly, to repeat Weeden, Cohen, and Kenrick (2008), sexual conservatism and religious attendance are not *necessarily* connected nor is the connection necessarily limited to the U.S. or religions practiced within it. While it is plausible that the relationship described in the model exists elsewhere, Weeden et al. nor I express any firm opinion on whether the model applies to religious and cultural demographics outside of those described within this study. Despite these limitations, this study adds to the

current research on the relationship between sexual behavior and religion from an evolutionary psychology perspective.

### **Conclusion**

Overall, the most important finding of this study is that number of sexual partners fully mediated the relationship between sex and religious attendance even when controlling for religious belief. This supports a major claim of the reproductive religiosity model that short-term mating behavior explains a significant degree of individual differences in attendance that traditional accounts could not. This study also provides some evidence supporting the claim that sex differences in mating strategy and sexual behavior are not responsible for sex differences in all measures of religiosity, namely belief in God. Overall, these results provide an impetus for additional research to investigate the interplay between religion and sexual variables, particularly the causality between religion and sexual behavior.

**Appendix**

Characteristic	n	%
Gender		
Male	6004	44
Female	7632	56
Age		
18-29	2836	20.8
30-39	3109	22.8
40-49	2755	20.2
50-59	2045	15
60+	2891	21.2
Race		
White	11072	81.2
Black	1664	12.2
Other	900	6.6
Religion		
Protestant	7950	58.3
Catholic	3341	24.5
Jewish	273	2
Non-Religious	1541	11.3
Other	531	3.9
Marital Status		
Married	7773	57
Not married	5863	43

*Table 1.* Participant characteristics for final sample (N=13636).

Table 2

Descriptive  
Statistics

Measure	Mean	SD	Median	Mode	Variance	Minimum	Maximum
Belief in God	5.08	1.415	6	6	2.0	1	6
Attend	4.61	2.73	4	1	7.47	1	8
Sexual partners	10.53	32.27	4	1	1038.04	1	992
Log partners	.618	.524	.602	.00	.275	0	3
Children	1.78	1.64	2	0	2.69	0	8

*Table 2.* Descriptive statistics for reproductive and religious variables of interest in the final sample.

Table 3

Measure	Belief	Attend	Sex Partner	Children	Age	Birth Year	Sex <sup>a</sup>	Marital Status <sup>b</sup>
Belief in God	1							
Attend	.444	1						
Sexual Partners	-.190	-.253	1					
Children	.184	.188	-.135	1				
Age	.077	.132	-.104	.403	1			
Year of Birth	-.103	-.149	.128	-.377	-.980	1		
Sex <sup>a</sup>	.183	.121	-.319	.090	.040	-.027	1	
Marital Status <sup>b</sup>	.117	.203	-.281	.298	-.333	-.337	.028	1

*Table 3.* Correlations between variables of interest. All correlations significant at the  $p < .001$  level.

<sup>a</sup>Correlation with being female. <sup>b</sup>Correlation with being married.

Table 4

Measure	Attendance		Belief in God	
	Partial correlation controlling for sexual variables	Partial correlation controlling for demographic variables	Partial correlation controlling for sexual variables	Partial correlation controlling for demographic variables
Number of sexual partners (log transformed)	-	-.218**	-	-.129**
Number of children	-	.133**	-	.153**
Marital Status <sup>b</sup>	-	.167**	-	.088**
Year of Birth	-.046	-	-.018	-
Sex <sup>a</sup>	.047	-	.128**	-
Age	.033**	-	-.012	-

*Table 4.* Partial correlations between church attendance, and belief in God controlling for sexual and demographic variables (N=13636).

<sup>a</sup>Correlation with being female. <sup>b</sup>Correlation with being married.

\*\* $p < .001$

Table 5

Frequency of church attendance

Measure	B	SE(B)	$\beta$	t	p
Belief in God	.763	.015	.393	50.61	<.001**
Number of sexual partners (log transformed)	-.750	.043	-.144	-17.36	<.001**
Number of children	.095	.014	.056	6.69	<.001**
Marital Status <sup>b</sup>	.479	.046	.086	10.33	<.001**
Year of Birth	-.006	.003	-.040	-2.29	.022
Sex <sup>a</sup>	-.028	.044	-.005	-.637	.524
Age	<0.0	.003	.000	.025	.980

*Adj. R*<sup>2</sup>: .244 (*p* < .001), *F*: 628.98, *SE*: 2.39

*Table 5.* Regression model predicting frequency of church attendance from sexual and demographic variables (N= 13617).

<sup>a</sup>Correlation with being female. <sup>b</sup>Correlation with being married.

\*\**p* < .001

Table 6

Belief in God

Measure	B	SE(B)	$\beta$	t	p
Attendance Frequency	.208	.004	.403	50.61	<.001**
Number of sexual partners (log transformed)	-.104	.023	-.038	-4.54	<.001**
Number of children	.089	.007	.102	11.98	<.001**
Marital Status	-.019	.024	-.007	-.778	.437
Year of Birth	-.008	.001	-.096	-5.49	<.001**
Sex	.322	.023	.113	14.12	<.001**
Age	-.009	.001	-.108	-6.13	<.001**

*Adj. R<sup>2</sup>: .226 (p < .001), F: 568.48, SE: 1.25*

*Table 6.* Regression model predicting belief in God from sexual and demographic variables (N= 13617).

<sup>a</sup>Correlation with being female. <sup>b</sup>Correlation with being married.

\*\*p < .001

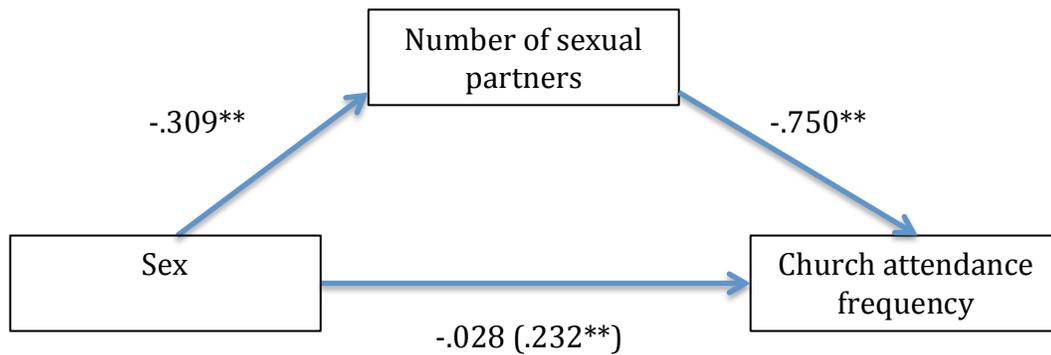
Table 7

## Results of mediation analyses

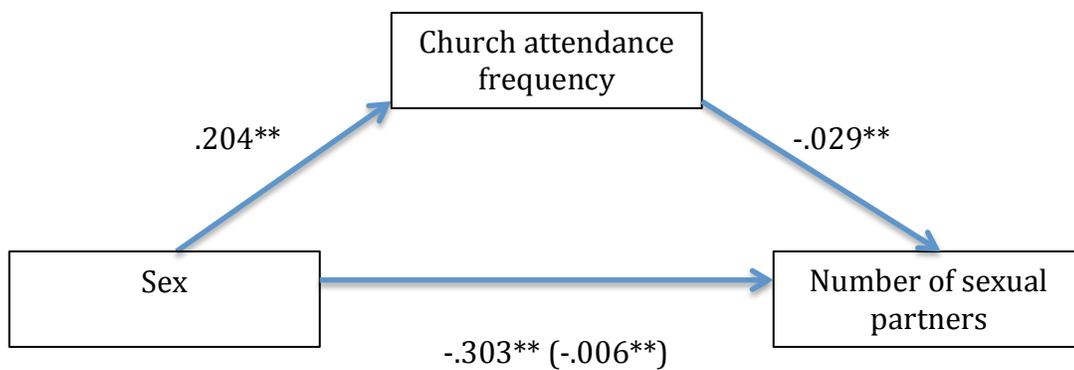
	Effect/path	Effect	SE	t	p	95% CI
Reproductive						
	Total	.2036	.043	4.79	<.001**	.1204- .2869
	Direct	-.0281	.044	-.637	.5242	-.1145- .0583
N=13618	Indirect	.2317	.015	-	-	.2036- .2611
Traditional						
	Total	-.3089	.008	-37.06	<.001**	-.3253- -.2926
	Direct	-.3031	.008	-36.72	<.001**	-.3192- -.2869
N=13618	Indirect	.0059	.001	-	-	-.0086- -.0035

*Bootstrap samples: 10000*

*Table 7.* Mediation model results for reproductive religiosity model and traditional model predicting the total effect of number of sexual partners on religious attendance and religious attendance on number of sexual partners, respectively (N=13168). Bootstrapped CI's do not contain 0 and are significant. Covariates include age, year of birth, marital status, number of children, and belief in God.



*Figure 1a.* Standardized regression coefficients for the relationship between sex and church attendance frequency as mediated by number of sexual partners. The coefficient for the indirect effect is in parentheses (N=13618).



*Figure 1b.* Standardized regression coefficients for the relationship between sex and number of sexual partners as mediated by church attendance frequency in. The coefficient for the indirect effect is in parentheses (N=13618).

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