LONGITUDINAL ANALYSES OF THE SEXUAL AND REPRODUCTIVE HEALTH

KNOWLEDGE AND PARENT-ADOLESCENT COMMUNICATION OF AT-RISK

ADOLESCENTS

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State University's regulations and meets the accepted standards for the degree of

DOCTOR OF PHILOSOPHY

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ABSTRACT

Despite declining rates, unintended adolescent pregnancy remains a considerable public health challenge in the United States (Hamilton, Martin, & Osterman, 2015). Unintended pregnancy leads to a host of negative outcomes not only for adolescents, but also for their children who are more likely to get trapped in a cycle of poverty that is difficult to break (Rew & Wong, 2006). Factors such as poverty are difficult to address; nonetheless, sexual reproductive health (SRH) knowledge and parent-adolescent communication (PAC) have been identified as important tools for prevention, and potentially modifiable (Swenson et al., 2009; 2010). The goal of the current study was to examine change in SRH knowledge and PAC. Pretest, posttest, and three-month follow-up data were collected from 176 adolescents *(M* = 15.70 years*, SD* = 1.93) who participated in a comprehensive sexual health education program conducted in a Midwestern state with conservative adolescent SRH policies. Study one examined change in SRH knowledge over time, and assessed whether sexual experience, religiosity, cultural awareness, immigration status, and gender moderated change in SRH knowledge. Multi-level modeling analyses showed that SRH knowledge increased; however, the rate decreased over time. Immigrants had significantly lower initial SRH knowledge compared to American-born participants; however, neither group experienced change over time. Adolescents with high cultural awareness had lower initial SRH knowledge; however, their SRH knowledge increased over time whereas it declined for participants with low cultural awareness. Finally, girls had lower initial SRH knowledge; however, they experienced greater growth compared to boys over time. In the second study, we examined the relation between PAC and sexual experience, religiosity, cultural awareness, immigration status, and gender. Our results showed that only immigration status was associated with PAC. At pretest, American-born participants had higher

PAC; however, there was no change over time. Discussion focusses on the implications of these findings for sexually transmitted infections and pregnancy prevention among at-risk adolescents living in states that are socially and politically conservative towards adolescent SRH.

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DEDICATION

To my spouse, Dr. Itai Blessings Mudzongo - thank you for all the love and encouragement. I love you. To my children, Matida and Mufaro Mudzongo – you mean the world to me, may you reach the highest echelons of education, and do far greater than mom and me.

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LIST OF ABBREVIATIONS

AST ....Acculturation Stress Theory

CDC ....Centers for Disease Control and Prevention

CSHEP ....Comprehensive Sexual Health Education program

HBM ....Health Belief Model

HIV ....Human Immunodeficiency Virus

NCPTUP ....The National Campaign to Prevent Teen and Unplanned Pregnancy

PAC..Parent-adolescent communication

ROTO ND...Reach One Teach One North Dakota

SLT ....Social Learning Theory

SRH knowledge ....Sexual reproductive health knowledge

STI..Sexually Transmitted Infection

INTRODUCTION

Despite recent declines, the United States (U.S.) has one of the highest rates of adolescent pregnancy as compared to other developed countries, such as the United Kingdom (U.K.) and Germany (Kearney & Levine, 2012; Martin et al., 2015). In addition, U.S. adolescents are more likely to encounter barriers to accessing adolescent sexual and reproductive health (SRH) services compared to adolescents from other western countries, such as Canada and Sweden (Hocklong, Herceg-Baron, & Whittake, 2003; The Guttmacher Institute, 2015). Furthermore, adolescence is a critical time to learn how to form healthy relationships, yet many adolescents lack access to information regarding sexual health. This lack of access is associated with risky sexual behaviors that lead to unintended pregnancies, births, and sexually transmitted infections (Secor-Turner, Sieving, Eisenberg, & Skay, 2011). In the current study, we focus on sexual reproductive health (SRH) knowledge and parent-adolescent communication (PAC) as prevention tools for unintended pregnancies, births, and sexually transmitted infections (STIs) among adolescents who participated in a comprehensive sexual health education program (CSHEP). We also examine how SRH knowledge and PAC change over time. In addition, we explore if sexual experience, religiosity, immigration status, cultural awareness, and gender moderate change in SRH knowledge and PAC trajectories for diverse adolescents over time.

Pregnancy, Birth, and STIs in the U.S.

The National Youth Risk Behavior Survey revealed that in 2010, 34% of U.S. adolescents between the ages of 14 – 18 years were sexually active; 5.6% had sex for the first time before age 13 years, and 40.9% of the sexually active adolescents had not used a condom during their last sexual intercourse (Kann et al., 2014). The national adolescent pregnancy rate was at a historical low in 2010 at 57.4 pregnancies per 1,000 adolescents, with over 600,000 U.S.

girls aged 15-19 experiencing unintended pregnancies, a widely celebrated 51% decline from its

1990 peak of 116.9 pregnancies per 1,000 adolescents (Kost & Henshaw, 2014). By 2011, the

adolescent pregnancy rate had further declined to a new low of 52 pregnancies per 1,000

adolescents (Child Trends Databank, 2016). The 2010 U.S. adolescent birth rate for girls aged

15–19 was 34.2 per 1,000 adolescents (Hamilton, Martin, & Ventura, 2010); however, more

recent 2014 data indicates a decline to 24.2 births per 1,000 girls aged 15-19 (Martin et al.,

2015). This decline in 2014 pregnancy and birth rates is attributed to an increased percentage of

adolescents choosing abstinence and the use of the most effective birth control, such as long-

acting, reversible contraception (Manlove, Karpilow, Welti, & Thomas, 2015). Research also

indicates that factors such as high SRH knowledge and PAC empower adolescents to choose and

apply healthier and safer sexual behaviors such as testing for STIs including HIV and partner

reduction (Mueller, Gavin, & Kulkarni; 2008). Overall, the U.S. rates indicate the need for

continued preventive interventions to reduce unintended pregnancy and births.

In addition to unintended adolescent pregnancy and births, risky adolescent sexual

behaviors can also lead to STIs. In fact, adolescents account for nearly half of new infections in

the U.S. (Kachur et al., 2013). Sexually active persons may be infected at least once in their lives

and sadly, many may not exhibit any symptoms, meaning greater risk of infection for them and

their partners (CDC, 2014). In 2014, the chlamydia infection rate among girls below the age of

20 years was 2,941.0 per 100,000 among girls and 718.3 cases per 100,000 among boys (CDC,

2017). As for gonorrhea, 430.5 cases per 100,000 were reported for girls below the age of 20

years and 221.1 cases per 100,000 among boys during 2013 to 2014. In addition, nearly 2,000

U.S. adolescents aged between 13-19 years were infected with HIV during 2010-2014 (CDC,

2014). Of newly diagnosed adolescent boys, approximately 55% (1,100) were black, 24% (480)

were Hispanic/Latino, and 16% (320) were White. Only 22% of sexually experienced adolescents were tested for HIV in 2013 suggesting that many more could possibly be infected (Kost & Henshaw, 2014).

Despite the overall decline in adolescent pregnancy and birth rates, progress has been uneven and stark differences exist among the states (Martin et al, 2015). For example, New Mexico had 80 pregnancies per 1,000 girls, compared to 37 pregnancies per 1,000 girls in Maine (Kost & Henshaw, 2014). The 2011 data indicates that minorities bear the brunt of unintended pregnancy; hence, racial and ethnic disparities are a cause of concern (CDC, 2017; Child Trends Databank, 2016). For example, the pregnancy rate among White adolescents in 2011 was 44.9 per 1,000 among girls below the age of 20 and yet it was 75.8 per 1,000 or nearly twice as many among non-White adolescents (Kost & Henshaw, 2016). Among non-Hispanic black adolescents, the pregnancy rate was 93 per 1,000 adolescents below the age 20, and among Hispanic adolescents the rate was 74 per 1,000 (Child Trends Databank, 2016).

In addition to racial disparities, concerning disparities were also found by immigration status. In 2010, the largest minority population lived in California with 60% non-Hispanic Whites (United States Census Bureau, 2011). California is home to the highest proportion of immigrants (27%) and 57% of them are Latino (U.S. Census Bureau, 2012). Many immigrants identify as adolescents of color (Lara, Decker, & Brindis, 2015). Areas in California with the highest adolescent unintended pregnancy rates have high adolescent populations of Hispanic/Latinas and immigrant adolescents (Lara, et al, 2015). In fact, Latina adolescents living in California had nearly four times more unintended pregnancies (39 per 1,000 girls aged 15-19) compared to 10 per 1,000 White girls (California Department of Public Health, 2013). It is possible that there could be some overlap between minority and immigrant adolescents in many

other states as well; (CDC, 2017); hence, understanding immigrant adolescents' risk and protective factors for engaging in risky sexual behaviors is warranted to prevent unintended pregnancy and reduce STIs.

Most studies on unintended pregnancy among immigrant adolescents have focused on Hispanic/Latino adolescents (Guilamo-Ramos, Jaccard, Pena, & Goldberg, 2005; Guilamo-Ramos, Jaccard, Dittus, & Collins, 2008); however, newer studies show that non-Hispanic immigrants are a growing adolescent population that share the characteristics that lead to increased vulnerability to high rates of unintended pregnancies, births, and STIs (e.g., Andjembe, 2016; Du & Li, 2015; Masters, Beadnell, Morrison, Hoppe, & Gillmore, 2008). These factors include rural residency in areas with poor access to SRH services, a lack of awareness about the availability of SRH services, language barriers, cultural differences, fear of accessing government services, and low SRH knowledge and PAC (Andjembe, 2016; UNAIDS, 2001). Minority adolescents account for the largest proportion and suffer the most from the consequences of unintended pregnancies, births, and STIs (CDC, 2017; Kost & Henshaw, 2016; NCTPTP, 2015). Research that helps explain these disparities is warranted to identify modifiable factors associated with protective behaviors.

Adverse Outcomes of Pregnancy and STIs

Compared to their peers who never had an adolescent birth, adolescent parents are more likely to face adverse outcomes such as not graduating from high school (Perper, Peterson, & Manlove, 2010). In addition, adolescent parents are more likely to live below the poverty level and rely on public assistance (Wildsmith, Manlove, Jekielek, Moore, & Mincieli, 2012). Furthermore, compared to children of older parents, the children of adolescent parents are more susceptible to negative outcomes including poorer health, academic performance, and greater

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likelihood of engaging in early sexual activity (Terry-Humen, Manlove, & Moore, 2005; Wildsmith et al., 2012). Adolescent mothers often grow up in poorer neighborhoods, have little or no parental support or monitoring, and few positive role models; thus, their children are more likely to end up living in poverty and become adolescent parents themselves in a downward cycle that is difficult to break (Domenic & Jones, 2007).

Costs of Pregnancy and STIs

Adolescent pregnancies are very costly. The estimated total public cost associated with unintended adolescent pregnancies nationwide in 2010 was $9.4 billion for local, federal, and state expenditures on social service programs and lost tax revenues (The National Campaign to Prevent Teen Pregnancy [NCTPTP], 2014). Unintended adolescent pregnancy and childbearing have substantial economic consequences for society in the form of increased welfare costs, further justifying the urgent need for intervention (Kost & Henshaw, 2014). In addition, STIs are expensive to treat; for example, the lifetime medical costs of STI incidence in young people ages 15-24 in 2000 were estimated to be over $8 billion (Chesson, Blandford, Gift, Tao, & Irwin, 2004). In 2008, the lifetime HIV anti-retroviral therapy per adult individual was estimated to cost more than $379,000 (Owusu-Edusei, et al., 2013; Schackman et al., 2006). More effective prevention strategies are warranted to counter the high costs of treating STIs (The Guttmacher Institute, 2016a).

Comprehensive Sexual Health Education Programs (CSHEPs)

Comprehensive sexual health education refers to instruction relating to sex and sexuality including anatomy, reproduction, development, and behavior, and all U.S. students begin receiving some form of instruction starting from grade five (Atkins, 2012; Landry, Singh, & Darroch, 2000). Adolescence is the period during which risky behaviors leading to social and

public health problems are deep-rooted (CDC, 2017), so having access to credible sexual

reproductive health (SRH) knowledge and information is critical for preventing risky sexual

behaviors (CDC, 2015). In response to high pregnancy, birth, and STI rates, public health

programmers and researchers develop and provide medically accurate, age appropriate and

culturally sensitive CSHEPs (CDC, 2015; Kirby, 1999; 2002; Kirby, Laris, & Rolleri, 2005;

Kirby, Laris, & Rolleri, 2007; Noia & Schinke, 2007). SRH knowledge and parent-adolescent

communication (PAC) are core components of CSHEPs and important tools for empowering

adolescents to practice safer sexual behaviors (Aspy et al., 2007; Swenson et al., 2010). CSHEPs

have successfully influenced adolescent sexual behavior through adolescent attitudes about

having sex, using condoms or contraception, and increasing SRH knowledge (Hamilton, Martin,

Osterman, & Curtin, 2015; Kost & Henshaw, 2015; The National Campaign to Prevent Teen and

Unplanned Pregnancy [NCPTUP], 2015).

Some common characteristics of successful CSHEPs include after-school-hours

programs, voluntary adolescent participation, programs implemented in small groups, 12 or more

program sessions, and having a theoretical foundation (Kirby et al., 2005; Kirby et al., 2007).

Both in school and out-of-school CSHEPs have strengths and weaknesses, but research shows

the overall success of both in reducing unintended pregnancy and STIs, especially among

adolescents who are at greatest risk (CDC, 2015; Mueller, 2008). Evidence-based CSHEPs

delivered by trustworthy adults most effectively empower adolescents to maintain abstinence

longer and practice safer sexual practices (CDC, 2015; Saunders, 2005; Smylie et al., 2008;

Thomas, 2011).

Regrettably, not all adolescents have access to CSHEPs because states are free to decide

if these programs are taught in their schools and some states limit what educators can teach about

sexual health topics (CDC, 2015; Kirby, 2007; National Council for State Legislators, 2016). In particular, states with socially and politically conservative policies about adolescent SRH such as New Mexico, Arkansas, Texas, Mississippi, and Oklahoma have some of the highest pregnancy and birth rates in the U.S. and yet they oppose the provision of comprehensive sexual education in public schools and advocate for the provision of abstinence-only programs (CDC, 2017; The Guttmacher Institute, 2016a). This is despite evidence showing the ineffectiveness of abstinence-only programs compared to comprehensive sex education programs (CDC, 2017; The Guttmacher Institute, 2016a). Not requiring public schools to teach about contraception or not requiring sex education at all in some states (The Guttmacher Institute, 2015) only increases the vulnerability of adolescents to engage in risky sexual behaviors that elevate their risk for unintended pregnancy and STIs (Strayhorn & Strayhorn, 2009).

Clearly, high rates of unintended pregnancy and STIs remain issues of grave concern in the U.S. (CDC, 2015; 2016). In seeking solutions to the adolescent pregnancy and STI problems, researchers focus attention on what works to protect adolescents. SRH knowledge and PAC have been identified as potentially modifiable and are important predictors of sexual behavior (CDC, 2015; Swenson et al., 2009; 2010). Because SRH knowledge and PAC are known to be effective prevention tools and impact sexual decision making, the results of the current study could help to strengthen prevention efforts.

Theories of Adolescent Sexual Behaviors

No one theory is sufficient to explain adolescent sexual behavior, so CSHEP developers and social science researchers use multiple theories to explain their findings (Kirby, 2002; Saunders 2005). Thus, theories help researchers and CSHEP developers and practitioners to use data to optimize CSHEPs and to open avenues of research (Arnett & Tanner, 2009; Lerner,

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Theokas, & Bobek, 2005; Miller & Fox, 1987; Overton, 2015). Theories play a significant role in helping us to understand adolescent sexual reproductive health by showing the relation between variables.

Social Learning Theory (SLT) posits that all behavior is learned through other people (e.g., peers and parents) and social institutions (e.g., faith-based organizations, schools, and the media) and that this learning directly or indirectly influences adolescent sexual decision-making processes (Saunders, 2005). Adolescents learn about relationships, parenting, and sexuality from others around them and classify their observations as either positive or negative (Bandura, 1977; Saunders, 2005). Adolescents expect certain behaviors to be reinforced or discouraged and go on to develop mental schemas that are applied in their own behavior depending on their attitudes and perspectives towards learned or observed behaviors. Hence, internalized and valued behaviors, both positive and negative, may influence an adolescent's sexual decision making (Saunders, 2005). In addition, SLT posits that learning occurs best when CSHEPs use instructors that adolescents respect and admire to reinforce prevention messages (Kirby, 2002, 2007). In turn, these programmatic activities encourage and facilitate the increase in SRH knowledge and encourage communication about SRH topics with peers and parents (Saunders, 2005).

Social Control Theory (SCT) is another applicable theory in explaining adolescent sexual behaviors because of its usefulness for explaining how parents provide their adolescent children with social constraints through rules and monitoring (Miller & Fox, 1987; Parsons, 1951). Hirschi (1969) outlined how parents and the family, peers, school, and participation in religious and community organizations exert social control on adolescent behaviors, including their sexual decision-making. Exposure to positive role models and social networks could also promote delaying childbearing, encourage the pursuit of other goals such as completing schooling

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(Ramirez-Valles, Zimmerman, & Juarez, 2002); thus, reduce the likelihood of engaging in risky sexual behaviors.

In contrast to SLT and SCT, the Health Belief Model (HBM) postulates that an individual needs to be convinced that pregnancy and STIs are negative outcomes that should be avoided for an adolescent to change their sexual behaviors (Rosenstock, Strecher, & Becker, 1988; Saunders, 2005). Adolescents need to have the confidence and agency to adjust their behavior and take protective measures such as using condoms and other forms of birth control (Saunders, 2005). Health related behaviors depend upon sufficient motivation that a particular health issue warrants attention, the presence of a threat to one's health, and finally the belief that the cost of eradicating the health threat can be met (Rosenstock et al., 1988). CSHEPs that use the HBM educate participants on how to initiate conversations with sexual partners about abstinence and safe sex practices, increasing condom and birth control use negotiation skills, and self-sufficiency (Saunders, 2005). In addition, adolescents are trained in initiating conversations with their parents and guardians about handling themselves in sexual relationships with their partners. HBM has been used to study health behaviors including unintended pregnancy and STIs (Brown, Bleakley et al., 2009; Guilamo-Ramos; Jaccard, Dittus, & Collins, 2008; Kirby, 2007).

Acculturation Stress Theory (AST) postulates that new immigrants face stressful situations in the process of adapting to the receiving culture (Vega, Zimmerman, Gil, Warheit, & Apospori, 1994). Stressors, such as discrimination and language difficulties make new immigrant adolescents highly vulnerable to maladaptive behaviors (Guilamo-Ramos et al., 2005; Vega, Zimmerman, Gil, Warheit, & Apospori, 1994). Moreover, factors at the individual level such as gender interact with sociocultural influences to facilitate or hinder the adaptation into the host

country's culture (Berry, 1997). Country of birth and years lived in the U.S. have been used to measure acculturation (Guilamo-Ramos et al., 2005).

Researchers have found inconsistent results on the effects of acculturation, some finding that high acculturation is protective against maladaptive behaviors (Salgado de Snyder, 1987; Yu & Harburg, 1981) and others finding that high acculturation is associated with maladaptive behaviors (Burnham, Hough, Karno, Escobar, & Telles, 1987; Sorenson & Golding, 1988). Two reviews synthesized the research on acculturation and sexual health. First, Bradford et al. (2002) conducted a meta-analysis of 11 studies between 1988 and 1990 and found that acculturation among Latinos in the U.S. was positively associated with condom use; however, acculturation was also positively associated with risk behaviors in terms of risky sex practices and needle sharing. Second, Afable-Munsuz and Brindis (2006) reviewed 17 studies from 1985 to 2005 and found that 80% of the studies that examined sexual initiation reported that more highly acculturated U.S. adolescents were at elevated risk for early onset of sexual activity. However, both reviews included only Latino-focused studies in the U.S. Research that bridges these two sets of findings could illuminate acculturation's impact on SRH knowledge and PAC for diverse adolescent groups over time. This knowledge could in turn be used to improve prevention programs so that they can more effectively empower adolescents to modify their sexual behavior. Having outlined some of the most commonly used theories in association with adolescent SRH, discussion now focusses on the two outcome variables used in the current study.

Sexual Reproductive Health Knowledge

Sexual and reproductive health knowledge is a composite indicator measuring what adolescents know about key SRH topics and issues including the female menstrual cycle, conception, and how to avoid unintended pregnancy and STIs (MEASURE Evaluation, 2017). A

large body of research shows that low SRH knowledge is associated with a higher likelihood of engaging in risky sexual behaviors (De Santis, Provenciao-Vasquez, McCabe, & Rodriguez, 2012; Swenson et al., 2009; 2010). Despite the increasing availability of SRH information formally through public school instruction or out-of-school programs, gaps in adolescent's SRH knowledge remain (CDC, 2017). Regrettably, many adolescents get their SRH information from poorly informed sources, such as friends and the internet leading to many adolescents having at least one SRH misconception elevating their sexual risk (The Kaizer Family Foundation, 2017). Adolescents with low comprehensive SRH knowledge and an inadequate perception of risk more likely to have multiple sexual partners and not use condoms thereby increasing their pregnancy and STI risk (CDC, 2017; Kirby, 2002; Kirby et al., 2004; Loaiza & Liang, 2013). In addition, the lack of easy access to SRH services where adolescents can access contraceptives are also associated with lower levels of SRH knowledge and higher rates of risk (Shnike, Gilchrist, & Small, 1979).

Studies on SRH knowledge show differences between diverse adolescent groups based on several variables. For example, a study of sexual health knowledge, attitudes, and behaviors of British adolescents revealed variations in sexual behaviors based on religiosity (Coleman & Testa, 2008). Higher knowledge has been found among sexually experienced adolescents (Silver & Bauman, 2006). Researchers found differences by gender; for example, boys and girls have different levels of exposure to various sources of information, which affects their SRH knowledge (Hoehn, et al., 2016; Noia & Schnike, 2007). In addition, researchers have found variation in SRH knowledge based on culture, and differences are attributed to underreporting of sexual risk behaviors due to cultural factors or a lack of risk knowledge (Mata, Provencio-Vasquez, Martinez, & De Santis, 2014). Understanding how these variables are associated with

adolescent sexual decision making and how they may moderate change in SRH knowledge over time could help improve prevention programs.

Minority adolescents have been found to be more likely to engage in risky sexual behavior and to be at greater risk of unintended pregnancy and STIs compared to white adolescents partly because of lower SRH knowledge and other factors (CDC, 2017; Child Trends Databank, 2016; Mueller, 2008). Previous studies on SRH knowledge generally focused on single groups of adolescents identified to be at greater risk for unintended pregnancies and STIs. For example, Swenson et al. (2010) focused on African Americans, Rios-Ellis et al. (2010) investigated the effectiveness of an HIV knowledge improvement intervention based on a sample of Hispanic adolescents, and Young and Rice (2011) focused on homeless adolescents. Longitudinal studies that encompass not one but multiple at-risk adolescent subpopulations can help researchers to better understand variation in their SRH knowledge and improve what we know works to protect minority and other at-risk adolescents.

Researchers and practitioners have concluded that accurate SRH knowledge can help determine the health trajectory of today's adolescents (De Looze, Constantine, Jerman, Vermeulen-Smit, & ter Bogt, 2015). SRH knowledge is an integral part of all prevention efforts, and successful programs equip adolescents with SRH knowledge to help them make better decisions about their sexual and reproductive health (CDC, 2015; 2016; Kirby, 2002; Kirby et al., 2004). Effective programs that increase SRH knowledge empower adolescents to delay the onset of sex, practice safer sexual practices, such as the correct and consistent use of condoms and birth control, increase the likelihood of STI testing, and increase sexual assertiveness (Swenson et al., 2009; Swenson et al., 2010). Clearly, providing adolescents with medically

accurate, culturally sensitive, and age appropriate SRH information to enhance knowledge may have tremendous long term benefits (Kirby, Laris, & Rolleri, 2007).

<div align="center">**Parent-Adolescent Communication**</div>

Adolescent sexuality decisions can be a complex process; hence, the contributions of numerous social and familial factors play a major protective role (Miller, 1998). Positive communication between parents and adolescents empowers adolescents to establish individual values and to make healthier sexual decisions (Kapungu et al., 2010). Researchers have conducted multiple studies on parent-adolescent communication (PAC) and its relation to adolescent sexual behaviors (for reviews see Commendador, 2010; Rew & Wong, 2006). Consistent and open PAC leads to healthier relationships and less risky sexual behaviors (Guilamo-Ramos et al., 2008; Martin et al., 2015; Schouten, van den Putte, Pasmans, & Meeuwesen, 2007; Wight, Williamson, & Henderson, 2006).

Parents can deliver age-appropriate and timely prevention messages to their adolescent children; hence, they can be the primary source of information about relationships, sexuality, and behavioral values (Wyckoff et al., 2008). PAC about SRH is a positive parenting practice (CDC, 2015; Devore & Ginsburg, 2005; Hutchinson, 2002 & 2013; Wyckoff et al., 2008). Parents want their adolescent children to be adequately informed about preventing pregnancy and STIs and to begin sexual activity when they are mature enough; however, many parents report having difficulty in communicating with their adolescent children about these issues (Velazquez, 2014; Wilson, Dalberth, Koo, & Gard, 2010).

The nature of PAC topics differed based on the onset of sexual activity; for example, a longitudinal study that examined the timing of parent-child discussions about sexual topics relative to child-reported sexual behavior found that adolescents who had not yet had sex

reported their PAC to mostly be about dating and menstruation (Beckett, et al., 2010). However, after the onset of sexual activity or when parents suspected that their adolescent child to be sexually active, PAC covered more intense subjects, such as condom-use and contraceptives. Researchers have also highlighted differences in PAC based on gender. For example, Atienzo, Walker, Campero, Lamadrid-Figueroa, & Gutierrez (2009) used a cross-sectional study to examine the association between PAC and adolescent sexual behaviors and found that parents discussed different SRH topics with their adolescent children depending on the child's gender. In addition, the manner in which male and female adolescent children received and valued the messages from the parent-child conversations varied depending on whether or not the adolescents had started having sex.

Understanding the longitudinal relation between PAC and sexual experience, religiosity, immigration status, cultural awareness, and gender could help improve what researchers have found to be an effective way for empowering adolescents to make healthier decisions about their sexual and reproductive health behavior. PAC is an important tool that is potent for modifying adolescent sexual behavior and associated with lower unintended pregnancy and STI rates, and is highly modifiable (Aspy et al., 2007; Wyckoff et al., 2008). Overall, the results of this study could lead to the improvement of CSHEPs and empower adolescents to learn how to communicate about SRH with parents and other supportive adults. In all SRH knowledge and

The Current Study

The current study assessed change in SRH knowledge and PAC among adolescents who participated in a CSHEP in a Midwestern state known for its politically and socially conservative views about sexual reproductive health issues and where there is little access to CSHEPs. In 2013, North Dakota (ND) had an adolescent pregnancy rate of 42 per 1,000 among girls aged 15-

19 (CDC, 2017). Adolescents aged 18-19 were responsible for most pregnancies (67 per 1,000).

For a state that is homogeneous, racial disparities were noted for unintended pregnancy rates

among ND adolescents. Non-Hispanic Whites accounted for over 60% of the pregnancies,

followed by American Indian or Alaska Natives (30%), and finally non-Hispanic blacks (3%). In

addition, there is high risk in ND to STIs, such as chlmydia and gonorrhea which continue to

increase annually among adolescents in this state (Schwanz, Wagendorf, & Trythall, 2011).

Rates of unintended pregnancy and STIs in ND are made worse because of the

conservative social context in ND surrounding sexual health which restricts what public school

educators can say about certain sexual health topics (North Dakota Department of Public

Instruction, 2012). Even though ND's adolescent pregnancy rate was better than 43 other states

(Kost & Henshaw, 2014), ND's decline rate is much slower than that of most other states

(Guttmacher Institute, 2015). The lack of comprehensive sexual health education services in ND

leaves adolescents, such as LGBT and adolescents of color at elevated risk for unintended

pregnancy and STIs.

In response to this need, an evidence-based CSHEP, Reach One Teach One North Dakota

(ROTO ND), was implemented to help reduce the incidence of engaging in risky sexual

behaviors, thereby reduce adolescents' vulnerability to unintended pregnancy and STIs, and

promote healthy relationships in preparation for healthy adulthood. The results of this study

could help improve prevention programs. ND's adolescents, their families, and the nation at

large could benefit directly from lower pregnancy and STI rates. In 2010, ND spent

approximately $16 million supporting pregnant adolescents and their children (Kost & Henshaw,

2016; The Guttmacher Institute, 2016b). Those resources can be saved and diverted to other

programs, such as improving education, teacher training, and economic development. In

summary, more research is needed to further understand SRH knowledge and PAC to help reduce risky sexual behavior. In turn, that knowledge could be used to improve CSHEPs and lead to lower unintended pregnancy, birth, and STI rates.

Two separate studies were conducted in the current research study assessing longitudinal change in two variables. The first study examined SRH knowledge and its three objectives were to examine if SRH knowledge changed over time for CSHEP participants, assess if the rate of change increased or decreased, and finally assess if sexual experience, religiosity, cultural awareness, immigration status, and gender moderated change in SRH knowledge over time. In the second study, we examined PAC as the outcome variable. The three objectives for this study were to assess if PAC changed over time for CSHEP participants, if the rate of change increased or decreased, and finally to assess if sexual experience, religiosity, cultural awareness, immigration status, and gender moderated change in PAC over time.

CHANGES IN SEXUAL REPRODUCTIVE HEALTH KNOWLEDGE AMONG AT-RISK ADOLESCENTS PARTICIPATING IN A COMPREHENSIVE SEXUAL HEALTH EDUCATION PROGRAM

Abstract

Unintended pregnancy, birth, and sexually transmitted infections continue to be a major public health concern in the United States (Centers for Disease Control and Prevention, 2016). The goal of the current study was to examine change in SRH knowledge over time, and assess whether sexual experience, religiosity, cultural awareness, immigration status, and gender moderated change in SRH knowledge. Participants were 176 adolescents ($M = 15.70$ years, $SD = 1.93$) who participated in a comprehensive sexual health education program (CSHEP), were living in a Midwestern state that has a conservative social context surrounding sexual reproductive health. Participants completed pretest, posttest, and three-month follow-up surveys. At pretest 44.6% of the sample had already had sex. Multi-level modeling analyses showed that immigrants had lower initial SRH knowledge. Adolescents with low cultural awareness and boys had lower SRH knowledge at the beginning; however, their SRH knowledge increased over time. Our findings help to identify adolescents who are at greatest risk for low SRH knowledge and help CSHEP designers and implementers to better identify adolescents at greater risk for unintended pregnancy and STIs. Future research could further examine the associations between SRH knowledge and sexual behavior.

Introduction

The purpose of this study was to examine change in sexual and reproductive health (SRH) knowledge over time for participants who participated in a comprehensive sexual health education program (CSHEP). In addition, this study was designed to determine if sexual

experience, religiosity, cultural awareness, immigration status, and gender moderated change in SRH knowledge over time. Whether those social and contextual variables are associated with SRH knowledge and moderate its change over time is important for at least two reasons. First, high adolescent pregnancy, birth, and sexually transmitted infection (STI) rates remain a cause of concern in the United States (U.S.). Risky sexual behaviors that lead to high unintended pregnancy and STIs could be a direct result of inadequate SRH knowledge (De Santis, Provenciao-Vasquez, McCabe, & Rodriguez, 2012). Hence, understanding factors associated with its change over time could enlighten CSHEP programmers how to better empower adolescents avoid engaging in risky sexual behaviors (Swenson et al., 2010). Second, CSHEPs are not easily accessible in U.S. states with conservative perspectives about the provision of CSHEPs such as North Dakota leaving adolescents at risk for unintended pregnancy and STIs (The Guttmacher Institute, 2016b). Understanding how the CSHEP impacted adolescents SRH knowledge can be a basis for improving CSHEP programming and delivery leading to the prevention of high unintended pregnancy and the contraction of STIs.

In 2010, over 600,000 U.S. girls below the age of 20 had unintended pregnancies with 60% resulting in a live birth (Kost & Henshaw, 2014). The 2010 U.S. adolescent pregnancy rate declined significantly from the previous high recorded in 1991 and fell by 61% in 2010 to 57.4 pregnancies per 1,000 girls younger than 20 (Centers for Disease Control and Prevention [CDC], 2009; Kost & Henshaw, 2014). Declines in the adolescent pregnancy rate are a welcome development; however, the wide differences by state are a cause of concern. For example, Mississippi had 76 pregnancies per 1,000 girls below age 20 compared to Massachusetts with 37 per 1,000 girls (Kost & Henshaw, 2014). Some of the highest adolescent birth rates were recorded in politically conservative and religious states; for example, New Mexico and Arkansas

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(56 live births per 1,000 girls below age 20), Texas (53 per 1,000), Mississippi (52 per 1,000),

and Oklahoma, (51 per 1,000) (CDC, 2017; Kost & Henshaw, 2014). In states such as Texas,

New Mexico, and Oklahoma, 1 out of 20 teenage girls gives birth every year (Kost & Henshaw,

2014).

A possible reason for higher birth rates in states with conservative SRH policies is their

strong opposition to premarital sex and traditional attitudes and beliefs about sexuality,

especially that sex should only be between a married man and woman (Strayhorn & Strayhorn,

2009). Highly religious Christian groups strongly oppose the provision of comprehensive sexual

health education in public schools and advocate for the provision of abstinence-only programs,

although these have been shown to not be as effective as CSHEPs in reducing adolescent

pregnancy and STIs (CDC, 2017; Strayhorn & Strayhorn, 2009). In fact, some states with high

pregnancy rates do not require schools to teach contraception and some states do not require sex

education at all (The Guttmacher Institute, 2016a). Conservative states that do have sex

education require teachers to stress abstinence and advise children to wait until marriage for

sexual intercourse (Boonstra, 2009). Consequently, adolescents receiving such instruction may

be ill-prepared for their first sexual encounter and may be more likely to engage in risky sex and

be at risk for unintended pregnancy, birth, and STIs (Strayhorn & Strayhorn, 2009).

Large racial discrepancies in pregnancy rates are evident as certain adolescent groups are

at greater risk; for example, the pregnancy rates for black and Hispanic girls below age 20 (99.5

and 83.5 live births per 1,000 respectively) were more than twice the non-Hispanic White rate

(37.8 per 1,000). The fastest growing adolescent population in the U.S. are immigrants (CDC,

2017) and research shows that they face additional barriers when accessing SRH services, such

as language barriers that increase their vulnerability to engage in risky sex (Andjembe, 2016).

Regrettably, little is known about the pregnancy, birth, and STI rates of immigrants, especially non-Hispanics. The CDC tabulates and reports adolescent pregnancy, birth, and STI rates disaggregated by ethnicity, race, and gender (CDC, 2017); however, provides no data by immigration status. Overall, immigrant families and their adolescent children are a growing and yet understudied at-risk adolescent population (Andjembe, 2016; Du & Li, 2015).

Numerous adverse health, social, and economic consequences come with unintended adolescent pregnancy; for example, the U.S. spent an estimated nine billion dollars for local, federal, and state expenditures on social service programs and lost tax revenues (The National Campaign to Prevent Teen Pregnancy unintended pregnancy and sexually transmitted infection (STI) related costs in 2010 alone (The Guttmacher Institute, 2016b; The National Campaign to Prevent Teen and Unplanned Pregnancy [NCPTUP], 2014). Adolescent parents are less likely to complete school and continue to rely on social welfare, placing a heavy burden on the social welfare system (Wildsmith, Manlove, Jekielek, Moore, & Mincieli, 2012). The children of adolescent mothers are also likely to experience negative outcomes for health, education, and are also likely to become adolescent parents themselves (Perper, Peterson, & Manlove, 2010). To reduce unintended adolescent pregnancy and reduce STIs, researchers seek to understand the factors that place adolescents at risk and the factors that protect against that risk. Researchers are also keen to better understand why certain adolescent groups are will more likely engage in risky sex and seek ways to mitigate that risk. This is especially important for minority adolescent groups, who account for the highest incidence of unintended pregnancies, births, and STIs (CDC, 2017).

Some risk factors leading to high pregnancy, birth, and STI rates include greater levels of poverty and economic disadvantage among minorities in the U.S. (CDC, 2017) and a lack of

access to health insurance and healthcare (NCPTUP, 2014). Low socioeconomic conditions, such as living in low-income households and having parents with low education also increase vulnerability (Perper, Peterson, & Manlove, 2010). In addition, adolescents living in foster care and child welfare systems are also at greater risk than other groups (Oman, 2016). These factors are not easily addressed; however, other risk factors, such as low sexual and reproductive health (SRH) knowledge, are modifiable and are known to be associated with a reduced likelihood of engaging in risky sex, and lower pregnancy and STI rates (De Santis, Provencio-Vasquez, McCabe, & Rodriguez, 2012; Hutchinson, 2002; Swenson et al., 2010; Wyckoff et al., 2008).

Since the early 1980's, when the human immunodeficiency virus (HIV) was first identified, researchers and public health practitioners have been concerned about adolescent belief in various harmful myths and misconceptions about pregnancies and STIs, such as believing that a girl cannot get pregnant the first time she has sex (Kirby, 1999; Swenson et al., 2010). For many years since, it has been a priority to correct such misconceptions by providing adolescents with accurate and practical knowledge to reduce risky sexual behaviors (CDC, 2017). Because of the slow rate of decline in pregnancy, birth, and STI rates, more research is needed on protective factors, such as SRH knowledge, that help to protect adolescents living in states with politically and socially conservative adolescent SRH policies protect themselves. This study fills the gap by examining longitudinal changes in SRH knowledge for a sample of at-risk adolescents who participated in a CSHEP and reside in a state that provides little to no access to comprehensive sexual health services in preference to abstinence-only programs.

Research shows that the lowest SRH knowledge rates are among minority adolescents, especially African Americans (Swenson et al., 2009; 2010), Latinos (Guilamo-Ramos, Jaccard, Pena, & Goldberg, 2005; Velazquez, 2014), and American Indians/Alaska Natives (CDC, 2017;

Hodge & Sinha, 2010). These minority adolescents account for the largest proportion and suffer the most from the consequences of unintended pregnancies, births, and STIs (CDC, 2017; Kost & Henshaw, 2016; NCTPTP, 2015). In fact, a large body of research shows that new immigrant adolescents, especially Latinos have an elevated risk for pregnancy and STIs (Nadeem, Romo, & Sigman, 2006; Mata, Provencio-Vasquez, Martinez, & De Santis, 2014). Minority adolescent vulnerability is elevated by low SRH knowledge, insufficient exposure to relevant SRH education in schools, lower likelihood of using family planning clinics or lack of health insurance (Swenson et al., 2009; 2010; The Guttmacher institute, 2016b), and inadequate parent-adolescent communication (Guilano-Ramos et al., 2005; 2009; Kirby, Laris, & Rolleri, 2007; Usher-Seriki, Bynum, & Callands, 2008). Such deficiencies are associated with greater likelihood to engage in risky sexual behavior and higher pregnancy and STI rates (CDC, 2017). Despite an overall decline in adolescent pregnancy and STIs (Kost & Henshaw, 2014), at-risk adolescents account for most unintended pregnancies and STIs (CDC, 2017). This suggests that more research about modifiable factors shown to be positively associated with less risky sexual behaviors is warranted. Assessing longitudinal trends and differences in SRH knowledge trajectories over time could help CSHEPs deliver more effective programs (Card, Lessard, & Benner, 2007; Kirby, Laris, & Rolleri, 2005).

Comprehensive Sexual Health Education Programs (CSHEPs)

Shortfalls in early efforts to address the adolescent pregnancy problem and a lack of access to sexual reproductive health services led to the development and implementation of CSHEPs (CDC, 2017; NCTPTP, 2014). Effective CSHEPs include training for program administrators, and more importantly, the use of theoretically grounded approaches, including theories of social learning and social influence (Kirby, Laris, & Rolleri, 2005; Kirby, Laris, &

Rolleri, 2007; Saunders, 2005). Assessments of CSHEPs show many benefits for adolescent participants in those programs that are well established in theory (Guttmacher Institute, 2015; Jemmott et al., 1998). Benefits include positive impacts on adolescent attitudes, self-efficacy, skills, and SRH knowledge (Card et al., 2007). For example, Mueller, Gavin, and Kulkarni (2008) found a delay of first sexual intercourse among adolescents, and Card, Lessard, and Benner (2007) found a reduction in pregnancy and STIs through increased abstinence, and increased and improved use of contraception among sexually active adolescents after they participated in CSHEPs.

In addition, CSHEP participants have higher SRH knowledge and are less likely to engage in risky sexual behaviors (for a review see Goesling, Colman, Trenholm, Terzian, & Moore, 2014) and more likely to practice safe sex behaviors when they do become sexually active (Saunders, 2005). Not all adolescents have access to CSHEPs such as those living in conservative states that only allow the instruction of abstinence-only programs (Guttmacher Institute, 2015). Adolescents with access to CSHEPs incorporate that SRH knowledge in their own lives and mitigate the risk of an unintended pregnancy or STI (Swenson et al., 2010). Hence, the need to examine variables that are associated with risk and protection over time to further strengthen prevention programs.

Theoretical Background

Research shows that a theoretically grounded approach a key characteristic of effective prevention programs and positively influences adolescent sexual behaviors (Kirby, 1999; Kirby, Laris, & Rolleri, 2005). The tenets of widely applied theories guide the formulation of our research questions in the current study. First, the Social Learning Theory [SLT] (Bandura, 1977) explains the role of significant others, such as parents, siblings, teachers, and peers who teach

adolescents the value and/or consequences of being an adolescent parent and thus influence

decision-making about sexual behavior (Salas-Wright, Vaughn, Maynard, Clark, & Snyder,

2017; Saunders, 2005). SLT recognizes the contributing role of cognitive influences on

behaviors but focuses primarily on social influences on individual behavior (Bandura, 1977). In

addition, adolescents convert their SRH knowledge into behaviors, whether these are risky such

as not using condoms or practicing safer sexual practices, such as being tested for STIs and

abstinence from sex (Miller & Fox, 1987). SLT highlights the importance of self-efficacy and

perceived benefits of a health behavior, which in turn is influenced by level of SRH knowledge

(Nadeem, Romo, & Sigman, 2006).

Second, the Health Belief Model (HBM) posits that an adolescent must be

knowledgeable enough to understand that pregnancy and STIs are undesirable conditions in

order to prevent the occurrence of risky behavior that lead to unintended pregnancy and STIs

(Saunders, 2005). CSHEPs that use HBM educate participants on how to initiate conversations

with parents and/or sexual partners about abstinence and safe sex practices, such as using

contraception (Saunders, 2005). HBM has many similarities to SLT (Rosenstock, Strecher, &

Becker, 1988); hence, the use of both the SLT and HBM in the current study.

Third, we use the Acculturation Stress Theory (AST) that posits that the stress of

assimilating to a host country and a lack of personal resources, such as family closeness, is

related to an increased susceptibility for new immigrant adolescents to adopt maladaptive

behaviors, including drug-use and risky sexual behaviors (Guilamo-Ramos et al., 2005; Vega,

Zimmerman, Gil, Warheit, & Apospori, 1994). This theory has been widely applied in adolescent

sexual reproductive health research, albeit mostly among Hispanic adolescents (Espinoza, Hall,

& Hu, 2012; Guilamo-Ramos, 2005; 2009). Regardless, the popularity of AST in research that

includes different immigrant populations other than Hispanics is increasing (Du & Li, 2015; Schwartz, 2011). In summary, a multi-pronged theoretical approach is useful in guiding research that assesses the influence of variables on SRH knowledge trajectories over time for various adolescent populations.

The theories outlined above have been used to test the association between SRH knowledge and sexual experience, religiosity, cultural awareness, immigration status, and gender. The following section provides an overview of findings from previous studies.

Sexual Experience

Prior sexual experience may influence the ways in which adolescents respond to CSHEPs and can determine adolescents SRH knowledge (Wu et al., 2005). However, SRH research has focused mainly on HIV-prevention knowledge (De Santis et al., 2012; Hoehn et al., 2016; Swenson et al., 2009; 2010). Silver and Bauman (2006) used a cross-sectional design to compare HIV knowledge, attitudes, and demographic characteristics of sexually experienced versus inexperienced inner-city adolescents and found that sexually inexperienced adolescents had lower HIV knowledge in areas including transmission routes and safer sexual practices. The most inexperienced adolescents intended to remain virgins for the next six months and were more positive and confident about remaining abstinent. Silver and Bauman (2006) also found that more sexually experienced adolescents had higher HIV/AIDS knowledge scores compared to their abstinent peers, a finding that confirms previous research (De Santis et al., 2012; Hoehn et al., 2016; Swenson et al., 2010). In addition, Silver and Bauman (2006) found that boys had a lower likelihood to remain abstinent and less likely than girls to refuse unprotected sex.

Developing intervention programs targeted to the strengths and weaknesses of both sexually active and inactive adolescents separately could be a worthwhile investment for

strengthening prevention programs (Goesling et al., 2014). The way in which adolescents respond to prevention messages depends on prior sexual experience; hence, program designers and implementers should seek ways to better equip adolescents with SRH knowledge before they have become sexually active or formed opinions about or made decisions to engage in sexual activity (Silver & Bauman, 2006). When targeting sexually experienced adolescents, prevention programs could focus on equipping them to practice safer sexual practices, such as using condoms and long-acting birth control (CDC, 2017). The focus on sexually inexperienced adolescents could be about delaying the onset of sexual activity and how to use contraception (Silver & Bauman, 2006). Longitudinal research on the impact of sexual experience on SRH knowledge is best poised to capture changes in SRH knowledge over time.

Religiosity

Religiosity can influence adolescent's SRH knowledge and has been found to be a protective factor that contributes to decreased risky sexual behaviors that lead to high pregnancy and STI rates (Cobb & Scott-Jones, 2010). A review of longitudinal studies found that religiosity delays the early onset of sexual activity among adolescent girls; however, researchers found mixed results for adolescent boys as religiosity was not as protective as it was for girls (Rostosky, Wilcox, Wrainght, & Randall, 2004). A longitudinal study by Hardy and Raffaelli (2003) found that higher religiosity at baseline predicted a lower likelihood of early onset of sexual activity between pretest and posttest. In addition, communities with larger populations of Catholics and conservative Protestants had lower rates of adolescent child births (Louri, 2004). McCree et al. (2003) found that highly religious African-American adolescent girls were more likely to have initiated sex at a later age, to have used a condom in the last six months, and to possess more positive attitudes toward condom use. Miller and Gur (2002), using data from the

National Longitudinal Study of Adolescent Health in the U.S., found that frequent attendance at religious events by adolescent girls aged 12 to 21 years was positively associated with consistent use of birth control.

Not all studies, however, have shown a positive effect for religiosity. More religious adolescents with lower SRH knowledge lacked preparation for their first sexual encounter, thus elevating their risk for unintended pregnancy and STIs (Bearman & Bruckner, 2001; Rosebaum, 2009). Dodge et al. (2005) compared U.S. and Netherlands male college students and found that the U.S. young men had higher rates of inadequate contraception and unintended pregnancy than their Dutch peers; religiosity and sex education were thought to explain these differences. Rosenbaum (2009) compared virginity pledgers with a matched sample of nonpledgers and found that pledgers did not differ from nonpledgers in lifetime sexual partners and age of first sex, but pledgers were less likely to have used birth control and condoms in the past year and at last sex. These results suggest that moralistic attitudes toward sexuality possibly increase the likelihood of unintended pregnancies by discouraging the use of contraception without successfully discouraging sexual intercourse (Cahn & Carbone, 2007; Strayhom & Strayhom, 2009).

A study of the variation in knowledge, attitudes, beliefs, and practices of high school students in London, UK found that more highly religious students had lower SRH knowledge compared to less religious students (Coleman & Testa, 2008). In addition, differences were found between students of different religions. For example, in this study Muslims had the lowest SRH knowledge scores and held the most conservative attitudes. Previous research shows that Muslims have the lowest prevalence of engaging in sexual intercourse and have lower SRH knowledge compared to other ethnic groups (Simbar, Tehrani, & Hashemi, 2005). A major

reason for lower SRH knowledge among Muslim adolescents is because premarital sex is contrary to the Muslim code of behavior; hence, Muslim parents perceive SRH education to be contrary to Islamic conservative attitudes about sex (Orgocka, 2004). Clearly, religiosity can play an important role in adolescents' sexual decision making; hence, more research to better understand the association of religiosity and SRH knowledge is warranted and may help to improve CSHEPs.

Immigration Status

The largest proportion of adolescent pregnancies is accounted for by minority adolescents; for example, Hispanic adolescents accounted for 41.7 live births per 1,000 adolescent girls in 2013 (CDC, 2017; Espinoza, Hall, & Hu, 2012; Guilamo-Ramos et al., 2005; 2009). African Americans have the next highest adolescent birth rate and accounted for 39 live births per 1,000 adolescent girls in 2013 (Andjembe, 2016; CDC, 2017; Swenson et al., 2009; 2010). Native Americans also have a high adolescent birth rate and accounted for 31.1 live births per 1,000 adolescent girls in 2013 (CDC, 2017; Koiak-Griffin & Brecht, 1995; Schmidt-Grimminger et al., 2013).

Immigrants are the fastest growing adolescent population in the U.S. and it was estimated that approximately forty-one million foreign-born people lived in the U.S. in 2013 which constitutes 13.1% of the total population (U.S. Census Bureau, 2013). Because the foreign-born population is so large, studying the effect of immigration status on adolescent SRH knowledge makes sense. Immigration status may determine access to health care services; furthermore, immigrants encounter multiple barriers in accessing SRH services compared to American-born adolescents (Ku & Matani, 2001; Pitkin, Bahney, Lurie, & Escarce, 2009). Regrettably data for immigrants are scant. Although most studies on immigrants have focused on Hispanic

adolescents (Guilamo-Ramos et al., 2005; 2008), newer studies show that many factors such as living in low-income households with little or no parental monitoring increase the vulnerability of non-Hispanic immigrants to high rates of unintended pregnancies, births, and STIs (e.g., Andjembe, 2016; Du & Li, 2015; Masters, Beadnell, Morrison, Hoppe, & Gillmore, 2008).

Spence and Brewster (2010) used the National Education Longitudinal Study (NELS 88/94) to test for differences across race/ethnic groups in the association of immigrant generational status with risky sexual behaviors ($n = 8294$). They found that non-Hispanic black girls and Hispanic and White non-Hispanic boys had the highest intercourse risk; however, the patterns were contingent on immigration status; the protective effects of Asian or Hispanic identity were found only among second-generation girls. Among boys, there was greater risk among third-plus generation Hispanics and being an Asian was protective of sexual risk only among first- and second-generation adolescents. Despite a large sample size, this study lacked diversity and had too low a sample size to examine the experiences of first- and second-generation adolescents among Black adolescents. Spence and Brewster (2010) recommended that future research be conducted using community-based sampling from a geographic area with a sizeable African or Afro-Caribbean population to better examine cultural effects.

Cultural Awareness

The current study applies the Acculturation Stress Theory (Guilamo-Ramos et al., 2005; Vega, et al., 1994) to examine the differences in the SRH knowledge by immigration status and cultural awareness since our sample includes immigrants from Nepal, Iran, and African countries such as Burundi, all understudied U.S. immigrant adolescent populations. Immigrant adolescents often hold strong cultural values associated with conservative attitudes about sexual reproductive health (Andjembe, 2016; Guilamo-Ramos et al., 2005). Variation in SRH knowledge could

depend on cultural awareness, and adolescents with low acculturation to U.S. culture come from societies where conversations about sexuality are taboo; hence, they have lower SRH knowledge compared to American-born adolescents (e.g., Coleman & Testa, 2008; Gulamos-Ramos et al., 2005; 2007; Velasquez, 2014). Hingson et al. (1991) found that immigrant middle and high school students in the Boston public schools had less SRH knowledge compared to their U.S.-born counterparts. Research that sheds light on how cultural awareness are related to SRH knowledge may help to enhance prevention efforts to protect immigrant adolescents.

Gender

Levels of SRH knowledge can differ based on gender (Silver & Bauman, 2006). Studies show gender differences in adolescent sexual activity in several dimensions (Andjembe, 2016; Silver & Bauman, 2006). Boys are more likely than girls to be sexually active (De Santis et al., 2012; Hoehn, et al., 2016), claim that they have more sexual partners, use condoms more often, although these findings may reflect response biases (Kirby, 2002). Girls below the age of 20 years are more likely to contract an STI, especially heterosexually acquired HIV infections (CDC, 2015). In a four-city study on HIV testing by Swenson et al. (2009), African American girls reported less HIV-related stigma, more self-efficacy for HIV risk reduction behaviors, and more factual knowledge of HIV/AIDS and STIs than boys (Swenson et al., 2009). A study that tested the efficacy of the Theory of Planned Behavior in predicting condom use among a variety of cultural groups and across genders found slight variations in how well the model predicted for boys and girls (Godin, Fortin, Michaud, Bradet, & Kok, 1997). Knowledge of differences in SRH literacy by gender can help guide CSHEP developers and implementers to tailor programs and messages that achieve greater impact for both boys and girls (Kirby, 1999; Kirby et al.,

2005; 2007). Hence, in the current study, we seek to understand if gender is associated with SRH knowledge and to assess whether gender moderates change in SRH knowledge over time.

In summary, none of the five variables used in the current study (sexual experience, religiosity, cultural awareness, immigration status, and gender) can fully explain changes or variations in SRH knowledge by themselves. Knowledge gained from examining the combination of predictor variables in the current study may help to researchers and program implementers to better understand this important predictor of sexual behavior. Increased knowledge of adolescent SRH literacy helps to improve CSHEPs and enhance prevention efforts especially among at-risk adolescents. Having medically accurate, age-appropriate, and culturally sensitive SRH knowledge is a protective factor; hence, there is a need for research that elucidates what leads to change in SRH knowledge over time (CDC, 2017; Card et al., 2007).

The Current Study

The goal of our study was to examine the association between SRH knowledge over time, and sexual experience, religiosity, cultural awareness, immigration status, and gender. Figure 1 illustrates the model tested in the current study. We sought to answer three questions. First, does SRH knowledge change from baseline (T1) to posttest (T2), and finally to three-month follow up (T3)? Second, what is the rate of individual change in SRH knowledge per each time point? Finally, does having sexual experience, religiosity, cultural awareness, immigration status, and gender moderate change in SRH knowledge over time?
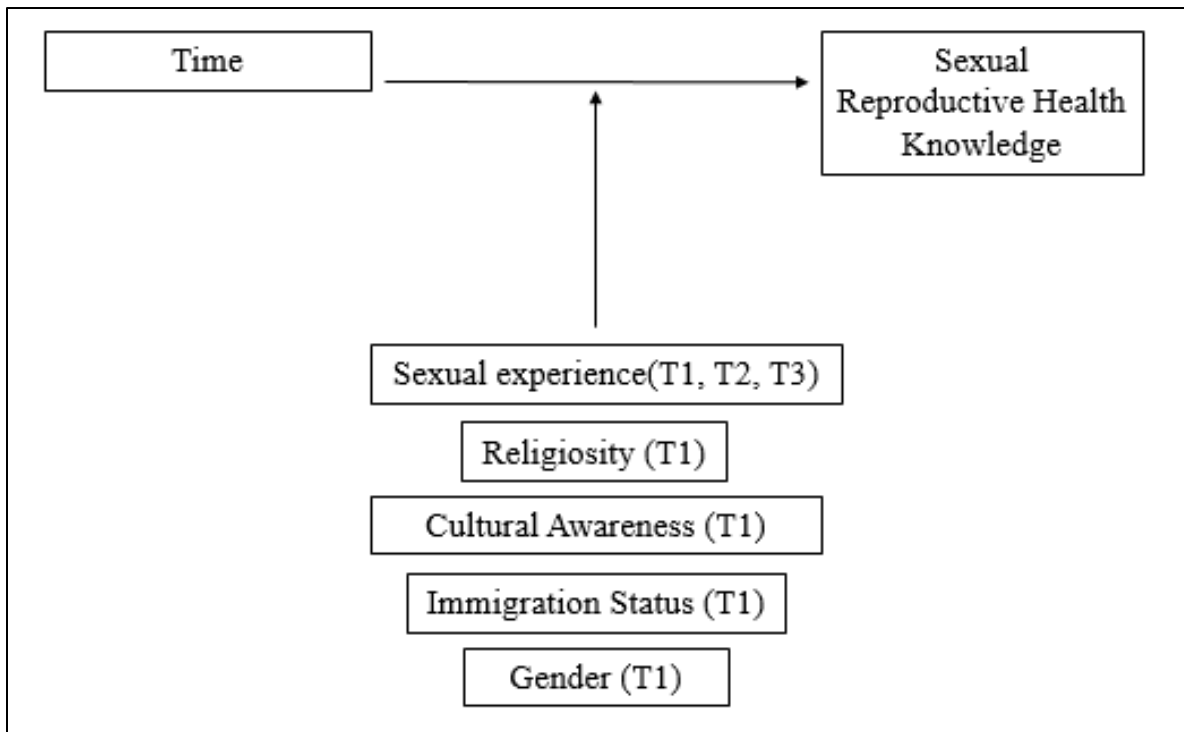
Figure 1. Model explaining moderation effect between time and SRH knowledge.

Method

The Reach One Teach One Program

Participants in the current study participated in Reach One Teach One North Dakota (ROTO ND), a grant-funded evidence-based CSHEP that used the 4th Edition of *Making Proud Choices* [*MPC!*]. *MPC!* is an evidence-based, safer-sex approach for preventing adolescent pregnancy and HIV/STIs. The core curriculum of the program has eight modules that provide program participants with the SRH knowledge, confidence and skills necessary for practicing safer sexual practices, such as using condoms, birth control, and/or choosing abstinence (Jemmott, Jemmott, & Fong, 1998). The program is delivered by highly trained and compassionate educators who base instruction on cognitive-behavioral theories. *MPC!* is an adaptation and extension of the *Be Proud! Be Responsible!* curriculum designed for the prevention of unintended adolescent pregnancies and STIs. In addition to *MPC!*, the core

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curricula for ROTO ND was augmented by three adult preparation modules: Healthy

Relationships, Positive Youth Development, and Healthy Life Skills. Peer education, another key

ingredient in evidence-based prevention programs, was added to the curriculum to enhance its

effectiveness in empowering adolescents to make healthier choices (Jemmott et al., 1998; Kelly

et al., 1991).

Participants and Recruitment

Youth were eligible to participate in ROTO ND if they were unmarried, between the ages

of 13 and 20 years old, and resided in North Dakota (ND). We partnered with community

agencies that work with at-risk adolescents to recruit participants. Purposive sampling was used

to recruit participants vulnerable to pregnancy and STIs. Some of the adolescent participants

were in one or more of the following high-risk categories: youth in foster care, homeless, lesbian,

gay, bisexual, transgender (LGBT), adolescents of color, and immigrants.

Participants were either freshmen at a local university (below the age of 20) or non-

college attending but lived in ND communities. The overall sample had 362 adolescents;

however, the analytic subsample included only non-college attending adolescents who

participated in the ROTO ND program between 2013-2016 ($n = 176$, $M_{age} = 15.70$, *age range* 13

– 20 years; 56% ($n = 96$) girls and 13.2% ($n = 22$) identified as lesbian, gay, bisexual,

transgender, and queer [LGBTQ]). All numbers reported are for the analytic subsample. In 2010,

ND was home to over 53,000 adolescents below the age of 18 years who were mostly white

(81%) with over 70 % of these adolescents living in households that had medium to high income

levels (National Center for Children in Poverty, 2011). ROTO ND participants in the analytic

subsample were more diverse than the local community with the majority (69.1%, $n = 134$) being

adolescents of color, and 42% ($n = 74$) were immigrants and unaccompanied refugee minors

born outside of the U.S. Of this immigrant / unaccompanied minor population, 7.1 had lived in the U.S. for less than 1 year, 7.1% 1-2 years, 12.4% 3-4 years, and 14.1% 5 or more years.

Participants in this study exhibited characteristics associated with increased likelihood of risky sexual behaviors. For example, 40% ($n = 76$) reported having received public assistance in the last six months. At pretest, 32% ($n = 56$) had lived in at least one out-of-home placement; for example, 9.5% ($n = 17$) had lived in a shelter in the past six months, 14.2% ($n = 25$) had lived in foster care, and 8.9% ($n = 16$) had lived in a juvenile detention facility. Participants checked all that apply for whom they lived with the most, with 28.8% ($n = 49$) having lived with their mother only, 6.5% ($n = 11$) having lived with their father only, and 32.9% ($n = 56$) having lived with both their mother and father in the household, 29.4% ($n = 50$) having lived with other people, and 3.4% ($n = 6$) having missing data. General descriptive statistics for the sample can be seen in Table 1.

Data Collection and Entry

Before enrolling into ROTO ND, participants 18 years and older signed an informed consent in English. Participants below the age of 18 had signed informed consent forms from their parents or guardians, and signed an assent form prior to taking the surveys. Study procedures were approved by the university Institutional Review Board for the Protection of Human Subjects of Research. Evaluation data were collected by trained research assistants at three time points using paper and pencil surveys. The pretest survey was administered immediately prior to participating in the first program session, a posttest was administered at the end of their last program session, and a three-month follow-up survey was taken at the beginning of a reunion party. The reunion party was an occasion to bring program participants together to

Table 1

Demographics Statistics

	Mean	Std. Dev.
Age *(range (13-20 years)*	15.71	1.93
	n	%
Race		
White	58	33.5
Hispanic	14	8.1
American Indian	36	20.8
Black African American	35	20.2
Descriptive Statistics for Study Variables		
Sexual experience (Sexually experienced)	58	33.5
Religiosity (High religiosity)	97	64.7
Cultural awareness (High awareness)	104	71.7
Immigration status (Immigrants)	74	42.0
Lived in the U.S. for		
less than 1 year	12	7.1
1-2 years	12	7.1
3-4 years	25	12.4
5+ years	24	14.1
Gender (Girls)	98	56.5

complete the three-month follow-up survey, discuss how the program had empowered them to

undertake peer education activities, and finally to celebrate graduation from the program. Each

survey completion took approximately 15 to 45 minutes. Two trained research assistants entered

the data into the Statistical Package for the Social Sciences (SPSS) Version 24.0 (SPSS, 2016)

database and data entry was checked again for accuracy by a different pair of research assistants

to ensure its trustworthiness. The project staff were fully trained to protect participant

confidentiality and to assist program participants to respond to sexual and other sensitive topics in survey situations.

Participants were provided with transportation to and from program sessions if needed, and meals at program sessions. Small incentives, such as deodorant and socks, at the end of every session were used to encourage attendance and participation. Program participants were trained in doing SRH-related peer education about topics covered in the program. They were required to record the ages of peer education contacts as well as topics discussed. Participants who successfully made 20 or more peer education contacts were provided with a Nook® preloaded with SRH resources to use for further peer education after completing the program.

Measures were taken to retain participants for the posttest and three-month follow-up surveys. Participants provided their physical address, a contact telephone number, the contact details of someone who knows them, and an email address if available. Research assistants and program education staff called participants to remind them of follow-up surveys. For participants who could not attend, the surveys were mailed to them with return envelopes and postage. Finally, participants were provided a $15 gift card incentive for completing the three-month follow-up survey.

Measures

The following is a description of the measures used for these analyses. All measures used for the ROTO ND program surveys have been used previously in similar studies with adolescents aged 13 – 20 years (De Santis et al., 2012; Goesling et al., 2014; Kirby, Laris, & Rolleri, 2005; Secor-Turner, Sieving, Eisenberg, & Skay, 2011; Voisin, Hong, & King, 2012). The measures have been found to have acceptable reliability and validity (Masters et al., 2008;

Plummer et al., 2004). In addition to demographic information, participants reported on sexual behaviors, SRH knowledge, religiosity, cultural awareness, and immigration status.

Sexual reproductive health (SRH) knowledge. The measure of SRH knowledge was created by first adding the correct responses on items about pregnancy, STIs including HIV/AIDS, and sexuality. Seven true/false knowledge items were adapted from the HIV Knowledge Questionnaire (Carey, Morrison-Beedy, & Johnson, 1997) and the Sexual Health History (González-Guarda, Peragallo, Urrutia, Vasquez, & Mitrani, 2008). An example item is "*A sexually active woman is at increased risk of getting pregnant if she forgets to take her birth control pills for three or more days in a row*." Second, the total correct score was then averaged (i.e., divided by seven). Thus, the final scores on the SRH Knowledge variable ranged from 0 – 1 (to indicate 0% to 100% correct if multiplied by 100). This measure has been found to have acceptable reliability and validity (Kirby et al., 2007; Masters et al., 2008). The SRH knowledge variable was measured in all three surveys.

Sexual experience. Participants answered the item "*Have you ever had sex?*" Response options were: 1 = "*No*"; 2 = "*Yes, 1-2 times*"; 3 = "*Yes, 3-4 times*"; and 4 = "*Yes, 5 or more times*." For analysis purposes, these responses were dichotomized by collapsing "*No"* into 0 = "*No sexual experience"* and *"Yes, 1-2 times*; 3 = *Yes, 3-4 times*; and 4 = *Yes, 5 or more times*" into 1 = "*Sexually experienced*." For other studies that used this measure, see Goesling et al. (2014) and Sieving, et al. (2011). Validity and reliability were determined to be acceptable (Plummer et al., 2004; Masters et al., 2008). Data were collected at all three time points.

Religiosity. Participants answered the question "*How important are your religious or spiritual beliefs in their day-to-day life?*" Response categories were on a 4-point Likert-type scale (1 = *Not at all important* to 4 = *Very important)*. This variable was adapted from the

National Substance Abuse, HIV, and Hepatitis Prevention Initiative Survey and has been used in previous research (Rew & Wong, 2006; Rosenbaum, 2009). We dichotomized this variable by collapsing "*Very important*" and "*Somewhat important*" response categories into 1 = "*High religiosity*" and collapsing "*Not important*" and "*A little important*" response categories into 0 = "*Low religiosity.*" Posttest data were not used because this question was later dropped in a new version of the survey because of language barriers with immigrant and unaccompanied refugee participants; hence, not all participants took a version of the survey that had this question at posttest. Only the pretest data were used in the current study.

  Cultural awareness. Participants answered the item "*I have a clear sense of my cultural and ethnic background*" which had a 4 -point Likert-type response scale, ranging from 1 = "*Not at all"* to 4 = "*Very.*" For analysis purposes, this item was dichotomized by collapsing "*Not at all*" and "*A Little*" response categories into 0 = "*Low cultural awareness,*" and "*Somewhat,*" and "*Very*" response categories into 1 = "*Cultural awareness.*" This measure was adapted from validated scales used in previous studies (Afable-Munsuz et al., 2006; Guilamo-Ramos et al., 2005; Sieving, et al., 2011; Trejos-Castillo & Vazsonyi, 2009). Data for this item was only collected at pretest.

  Immigration status. The length of residency in the U.S. was measured using the item "*How long have you lived in the United States?*" Response options were: 1 = "*My whole life*," 2 = "*Less than 1 year*," 3 = "*1-2 years*," 4 = "3-4 years," and 5 = "*5 or more years.*" For analysis purposes, these responses were dichotomized and collapsed into two categories (1 = "*Immigrant [< 1 year - 5+ years]*" and 0 = "*U.S. born [All my life])."* This measure was used and validated in previous studies (De Santis et al., 2012; Guilamo-Ramos et al., 2005; 2008; Trejos-Castillo & Vazsonyi, 2009).

Gender. Participants responded to an item asking "Do *you think of yourself as…?*"

Response options were 1 = "*Female*," 2 = "*Male*," 3 = "*Transgender*," 4 = "*I don't know*," and 5 = "*Write in*." Only male and female were selected as responses; 3.4% ($n = 6$) had missing data. For analysis purposes, these responses were dichotomized into two categories: 0 = "*Boys*" and 1 = "*Girls*."

Data Analyses

Data were analyzed using SPSS. We used Multi-Level Modeling (MLM) to examine the longitudinal changes and within person variations in SRH knowledge. MLM is an appropriate method to answer research questions about time effects, main effects, and moderation (Heck, Thomas, & Tabata, 2010). Non-linearity of the data was considered; however, no transformations were made due to a low sample size (Tabachnick, 2010).

We compared several models to determine relative fit and plausibility by using a multimodel inference approach (Heck, Thomas, & Tabata, 2010). We centered time at the first interval (i.e., time was recoded from Pretest (Time 1), posttest (Time 2), and three-month follow-up (Time 3) to Time 0, Time 1, and Time 2). The quadratic effect was generated by using the square of time which resulted in Time 0, Time 1, and Time 4. The best combination of individual and contextual predictors of SRH knowledge was achieved by engaging in a process of model building utilizing MLM techniques. A series of two-level time-varying models was estimated using the linear mixed-effects models (MIXED) procedure to assess change over time for all three time points (Heck, Thomas, & Tabata, 2010). Predictors were tested in a series of five separate steps.

In Step 1 we tested the unconditional model to ensure that there is a basis for using MLM. In Step 2 we tested a base model with the linear and quadratic time components. In Step

3, we added the main effects of predictor variables. In Step 4, we added the with-in and cross-level interactions to the model. These interactions included; time (Level 1) by sexual experience (Level 1); time (Level 1) by religiosity (Level 2); time (Level 1) by immigration status (Level 2); 4) time (Level 1) by cultural awareness (Level 2); and finally, time (Level 1) by gender (Level 2). The final model in Step 5 only included significant interactions and time components. Akaike's Information Criterion (AIC) values were used to determine the best-fitting model in comparison to the base model (Heck, Thomas, & Tabata, 2010). In a model set, the model with the lowest AIC has the best fit, and differences in AIC reflect relative goodness of fit.

Results

Missing Data

Language difficulties led to a large proportion of missing data from immigrant and unaccompanied refugee minor participants at pretest and posttest. These participants completed a modified version of the survey that had fewer questions; SRH knowledge was one of the eliminated questions. Attrition also contributed to missing data; this is not uncommon when collecting data among at-risk adolescents (Heck, Thomas, & Tabata, 2010).

At pretest 32.4% ($n = 57$) had missing data, at posttest 52.8% ($n = 93$), and 47.2% ($n = 83$) at the three-month follow up (see Figure 2). Forty-five percent ($n = 79$) had missing data at all three time points; hence, they did not have a mean SRH knowledge score. Differences in SRH knowledge could possibly be influenced by immigration status. Thus, missingness could possibly be contingent on SRH knowledge scores. It is possible that participants who did not know the correct responses to the questions did not attempt to answer; hence, data were not missing at random (NMAR). MLM's ability to produce unbiased estimates is one of its strengths (Bickel, 2007; Heck, Thomas, & Tabata, 2010).

With Data | Missing Data

Non-college attending $N = 186$

Below age 13: $n = 10$

T1 Data $N = 119$

Missing (Did not have the question): $n = 57$

Met recruitment criteria and participated in program between 2013-2016 $N = 376$

Analytic sub-sample $N = 176$

T2 Data $N = 83$

- Did not have the *question* $n = 40$
- Lost at T2: $n = 53$
- Total missing: $n = 93$

T3 Data $N = 93$

Lost at T3: $n = 83$

College attending (excluded) $N = 190$

With a mean SRH Knowledge score $N = 117$

Figure 2. Missing data for SRH knowledge at times 1, 2, and 3

Data Exploration

Participants who were missing a SRH knowledge score (i.e., who did not complete posttest and or three-month follow-up assessments) were compared on demographic variables (age, race, religiosity, and gender) with individuals who had scores. Independent samples t-test results showed that program participants did not differ significantly from participants with missing data by age and a chi square test showed no statistically significant difference by race. In addition, a greater proportion of participants with missing data were religious (71.5%) compared to participants who were not religious (28.5%), $\chi^2 = 5.35$, $p = .02$ and were girls (50.9%) compared to boys (49.1%), $\chi^2 = 5.25$, $p = .02$.

Descriptive Statistics

Sexual reproductive health knowledge.

The range for the SRH knowledge score was 0 – 1. At pretest 70% got correct responses ($M = .70$; $SD = .19$); 82% at posttest ($M = .82$; $SD = .15$) and 80% at three-month follow up ($M = .80$; $SD = .16$). SRH knowledge is generally high at all three time points. At baseline, the most correctly responded item was about condoms being able to prevent HIV/AIDS (54% correct). The item with the most incorrectly responded to stated that you have to be 16 years old to be able to buy condoms (46% correct).

Statistically significant differences in the mean SRH knowledge levels were found on three variables; religiosity, immigration status, and gender. Less religious participants had higher SRH knowledge ($M = .87$, $SD = .15$) than participants with high religiosity ($M = .83$, $SD = .16$); $t(61) = 2.19$, $p = .03$. American-born participants had higher SRH knowledge ($M = .87$, $SD = .14$) than immigrants ($M = .80$, $SD = .16$); $t(97) = 4.21$, $p < .001$. Girls had higher SRH knowledge ($M = .86$, $SD = .15$) than boys ($M = .82$, $SD = .16$); $t(94) = 2.15$, $p = .03$.

Sexual Behaviors

Baseline data indicates that 14% ($n = 22$) of the entire sample intended to have sex in the next month and 22.9% ($n = 36$) were not sure. Fifty-nine percent ($n = 62$) reported intentions to use condoms if they have sex in the next month and 9.5% ($n = 10$) were not sure. Forty-five percent ($n = 79$) reported to have sexual experience, and 27.3% ($n = 28$) reported that they were currently sexually active (had had vaginal, oral, or anal sex in the last 30 days). Of the 45% ($n = 79$) who reported having had sex at pretest, 17.7% ($n = 14$) had been pregnant or gotten someone pregnant and 6.2% ($n = 4$) were not sure. Of the 45% who reported having had sex at pretest, 50% ($n = 39$) used a condom when they last had sex, 19.2% ($n = 15$) used a condom

consistently every time they had sex in the last month, 20.8% ($n = 16$) used any kind of

contraception other than a condom when they had sex in the last month, and 34.9% ($n = 22$) used

both condoms and birth control all the times they had sex in the last month.

Trajectory Analyses

The following section explains how the steps for developing the MLM models were

developed. The results presented below show the change in SRH knowledge scores and show

whether sexual experience, religiosity, immigration status, cultural awareness, and gender

moderate change in SRH knowledge scores over time.

Step 1. Unconditional model.

The unconditional model is a one-way ANOVA that contains no predictors and serves as

a baseline model to examine individual variation in SRH knowledge without regard to time

(Shek & Ma, 2011). Its purpose is to measure the mean of SRH knowledge and the amount of

outcome variation that exists in intra- and inter-individual levels. The results can be used to

determine which level (i.e., Level 1, time variant; or Level 2, time invariant) of predictors to add

when fitting the subsequent models. If the variation is high, it suggests that certain amount of

outcome variation could be explained by the predictors at that level (Heck, Thomas, & Tabata,

2010).

Level 1 residual covariance structure.

Multiple covariance structures were used for comparison when building both the

unconditional and base models. The model with unstructured (UN) and diagonal covariance

structures did not converge when adding time as random in the base model. This was possibly

due to the limited degrees of freedom in the dataset and having only three time points. The scaled

identity (ID) covariance structure was selected as the Level 1 covariance structure for all models

to be examined in the current study because it had the lowest AIC and BIC values, indicating a better model fit (Heck, Thomas, & Tabata, 2010).

Results for the unconditional model.

The initial analyses focused on defining the shape of students' growth trajectories and determining whether the initial intercept and random time slope varied across individuals. The intraclass correlation (ICC) was .217, meaning that 21.7% of the variability in levels of SRH knowledge was attributable to differences between the participants. ICC can be used to help researchers be aware of possible moderating effects on outcome variables. A low ICC indicates that MLM might not perform better than the ANOVA or other traditional methods in estimating fixed effects (De Leeuw & Kreft, 1995). The ICC in the current study is greater than .05 and the Level 2 variance is significant; hence, multilevel modeling was warranted for this dataset (Heck, Thomas, & Tabata, 2010; Shek & Ma, 2011).

Step 2. Building the base model.

The Base Model examined individual variation of the growth rates (i.e., any significant variations in individual trajectory changes over time) (Shek & Ma, 2011). This model not only assessed the outcome variation across individuals (i.e., the differences between the observed mean value of each person and the true mean from the population), but also examined individual changes over time [i.e., how each person's rate of change deviated from the true rate of change of the population] (Singer & Willett, 2003). First, the Time variable was added followed by the quadratic rate of change (Time_*sq*). Variance components (VC) was used as the Level 1 covariance structure and Time was added as random with a scaled identity (ID) covariance structure at Level 2. Results showed that the initial status of SRH knowledge at pretest was ($\pi_{0i} = .81$, $p < .001$). The linear effect for SRH knowledge was significant ($\beta_{10} = .09$, $p = .02$). The

quadratic effect was marginally significant and negative ($\beta_{20} = -.03$, $p = .06$). The results are presented in Table 2.

To determine the covariance parameters in the outcomes left at each level, an ID covariance matrix was used at Level 2, meaning that there were variance estimates for the random intercept or that there was variability in the random intercept to be explained between individuals (*Wald Z* = 7.82, $p < .001$). The linear time slope varied significantly across individuals (*Wald Z* = 2.34, $p < .05$). Given that the quadratic model improved model fit over the linear model (Δ AIC = -259.20 + 250.35 = -8.85; Δ BIC = -251.86 + 243.01 = -8.85), the linear and quadratic growth curve parameters were retained in the subsequent models. These results indicated that curvature trajectories fit the data well.

Step 3. Model with main effects of predictors.

To test the predictor effect on the shape of individual growth trajectories, dichotomous variables that acted as moderating variables were examined as time-invariant covariates (except sexual experience which was measured at all three time points) to explore moderation effects over time (i.e., interaction with time). In this step, we sought to assess if the moderators were related to SRH knowledge as main effects. The results show that only immigration status was significantly related to SRH knowledge ($\beta_{03} = -.08$, $p = .001$), see Table 2. The linear effect for time remained significant ($p < .05$) and the quadratic effect for time remained marginally significant ($p < .10$).

Step 4. Models containing interactions.

Each of the five within-level interactions were added to the previous model with the main effects in turn. In this step, we sought to assess if sexual experience, religiosity, immigration status, cultural awareness, and gender were related to SRH knowledge and if they moderate change in SRH knowledge over time. Immigration status remained significant as a main effect *p*

< .05 (β_{03} = -.06, p = .04) indicating that immigrants had a lower starting SRH knowledge of .82 (calculated as .88 – .06). Cultural awareness was also significantly related to SRH knowledge p < .05 (β_{04} = -.07, p = .03) indicating that participants with lower cultural awareness have a lower starting SRH knowledge score of .81 (calculated as .88 – .07).

The interaction between cultural awareness and time was significant (β_{14} = .06, p = .01) indicating that participants with higher cultural awareness make more growth per interval compared to participants with lower cultural awareness. At baseline, participants had an estimated negative quadratic growth rate in SRH knowledge of -.03. The growth rate of SRH knowledge for participants with high cultural awareness was .09 (calculated as .03 + .06). In addition, gender had a significant moderating effect (β_{15} = .04, p = .04), a result suggesting that boys would experience a lower growth rate of -.01 (calculated as .03 - .04) compared to girls' growth rate of .03. The results are presented in Table 2.

Step 5. The final model.

In the final model, only significant interactions were retained to improve model fit (Heck, Thomas, & Tabata, 2010). The results displayed in Table 2 indicate that immigration status remained significantly related to SRH knowledge and accounted for differences in initial SRH knowledge (β_{03} = -.08, p = .001). This suggests that immigrants had a lower starting SRH knowledge score of .82 (calculated as .90 – .08) compared to their American-born peers (see Figure 3). Cultural awareness was also related to differences in initial SRH knowledge (β_{04} = -.06, p = .03), a result suggesting that participants with lower cultural awareness had higher starting SRH knowledge of .96 (calculated as .90 + .06) compared to participants with lower cultural awareness.

The interaction between cultural awareness and time was significant (β_{14} =.06, p = .01). Participants with lower cultural awareness gained higher SRH knowledge per interval compared

to participants with higher cultural awareness. Participants with high cultural awareness would have a growth rate of .08 (calculated as .02 + .06). See Figure 4. The test for the moderating effect of gender also remained significant $p < .05$ ($\beta_{15} = .05$, $p = .02$) indicating that girls would experience a higher growth rate of .07 (calculated as .02 + .05) compared to boys' who experienced a decline rate of .03. The results are presented in Table 2 and Figure 5.
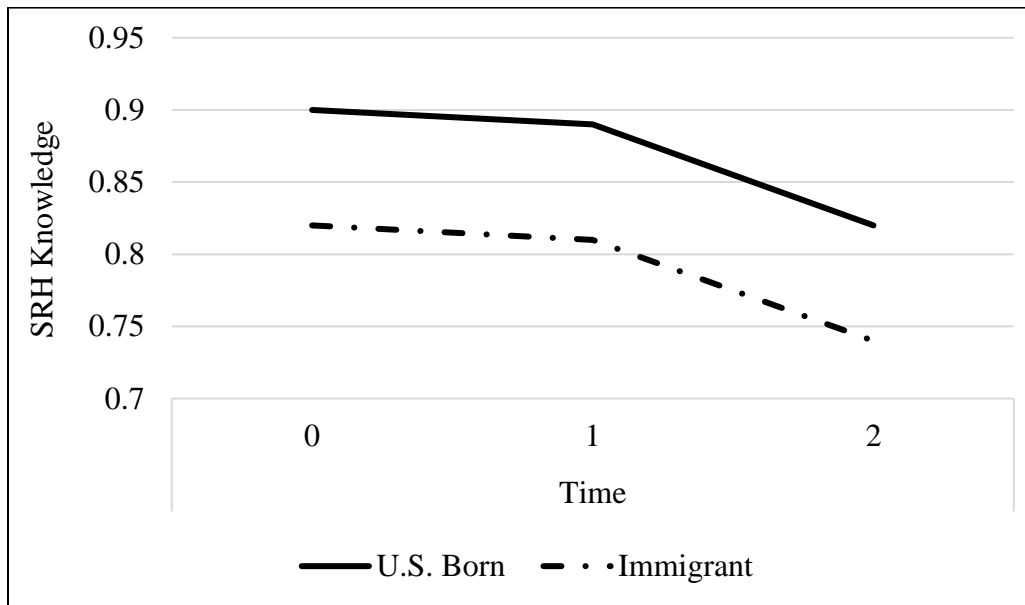
Figure 3. SRH knowledge trajectory by immigration status.

Discussion

The purpose of the current study was to examine change in SRH knowledge among adolescents who participated in a CSHEP. Specifically, we assessed whether SRH knowledge changed over time, if the growth rate of SRH knowledge changed, and finally, if sexual experience, religiosity, immigration status, cultural awareness, and gender moderated change in SRH knowledge. Findings from the current study shed new light about SRH knowledge, a key variable in reducing unintended pregnancy, births, and STIs rates. In addition, our results may

provide useful insights about adolescents living in states with conservative SRH policies and

clarify some inconsistent findings of past research.
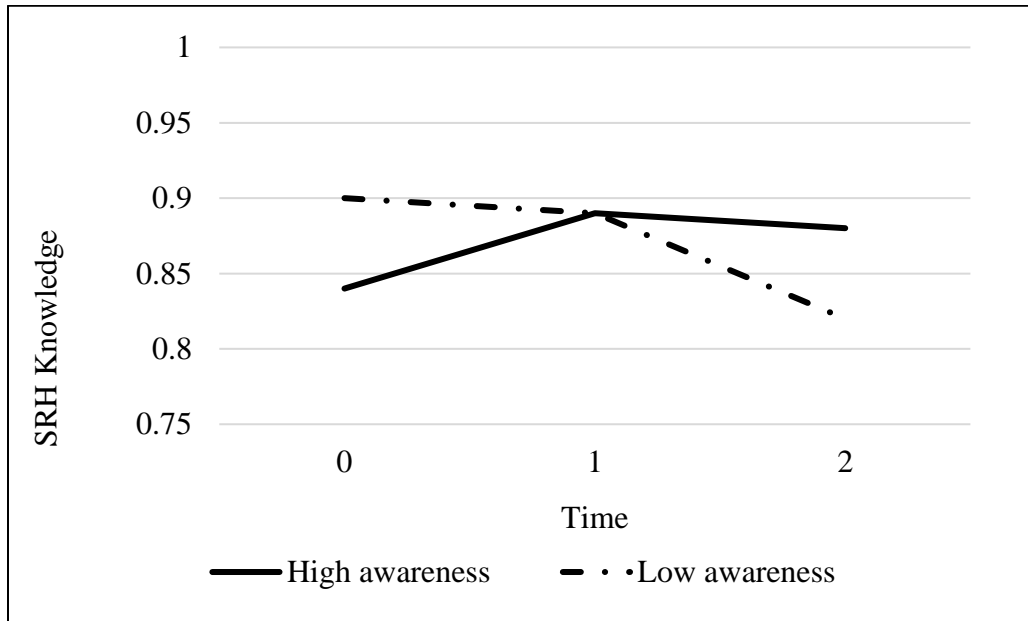
Figure 4. SRH knowledge trajectory for the time by cultural awareness interaction
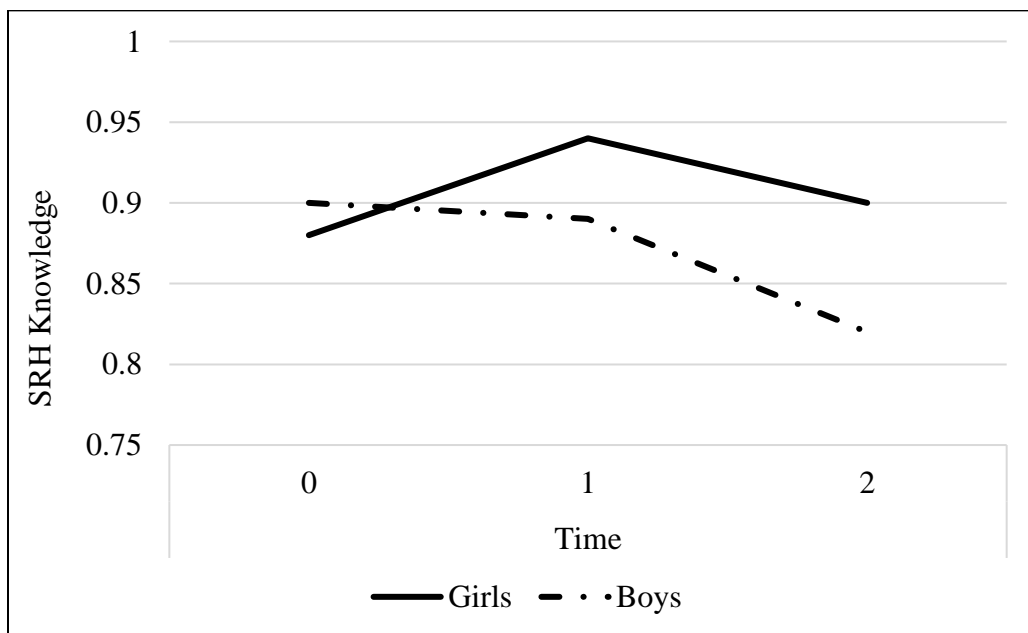
Figure 5. SRH Knowledge trajectory for time by gender interaction

Table 2

Predictors of SRH Knowledge among At-Risk Adolescents

Parameter	Step 1	Step 2	Step 3	Step4	Step5
Intercept	**.84 (.02)***	**.81 (.01)***	**.85 (.03)***	**.88 (.04)***	**.90 (.04)***
Sexual experience			.01 (.02)	.02 (.03)	.02 (.02)
Religiosity			.00 (.02)	.01 (.03)	.00 (.02)
Immigration status			**-.08 (.02)***	**-.06 (.03)***	**-.08 (.02)***
Cultural awareness			-.03 (.02)	**-.07 (.03)***	**-.06 (.03)***
Gender			.01 (.02)	-.02 (.03)	-.02 (.03)
Time		**.09 (.04)***	**.09 (.04)***	.03 (.05)	.02 (.04)
Time_Sq		**-.03 (.02)$^+$**	**-.03 (.02)$^+$**	**-.03 (.02)$^+$**	**-.03 (.02)$^+$**
Time*Sexual experience				-.01 (.02)	
Time*Religiosity				-.01 (.02)	
Time*Immigration status				-.01 (.02)	
Time*Cultural awareness				**.06 (.02)****	**.06 (.02)****
Time*Gender				**-.04 (.02)***	**.05 (.02)***

Notes.

Step 1 = Null; Step 2 = Step 1+ time; Step 3 = Step 2 + Sexual experience, Religiosity, Immigration status, Cultural awareness, and Gender;
Step 4 = Step 3 + interaction terms; Step 5 = Final model with significant interactions only.

Reference categories for dummy variables: No sexual experience; Low religiosity; Immigrants; Low cultural awareness; and Boys.

Standard errors in parentheses.

The model fit improved from model 1 to model 5 (Δ AIC = -259.20 – 226.32= -32.88; Δ BIC =-251.86 – 219.11= -32.75).

$^+p < .10$; * $p < .05$; **$p < .01$; ***$p < .001$

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There were several interesting findings. Descriptive statistics indicated that high nearly half of the sample had already had sex at baseline; nonetheless, it was pleasing to note a low pregnancy rate. It is further surprising that the most incorrectly responded to item was the One about the age at which an adolescent can buy a condom from store. Those results indicate the need for access to comprehensive sexual health education to mitigate risk. T-test analyses showed that although not significant, participants who had sex and those with lower religiosity had significantly higher SRH knowledge compared to participants who had no sexual experience and those with higher religiosity. Although non-significant, the direction of those results were consistent with previous studies; for example, participants who had engaged in sex had higher SRH knowledge (e.g., Silver & Bauman, 2006) and participants with lower religiosity had higher SRH knowledge (e.g., Coleman & Testa, 2008). Second, MLM results showed there were significant differences for cultural awareness, immigration status, and gender. Participants with low cultural awareness, US-born participants, and girls have significantly higher SRH knowledge. These results were confirmed by MLM analyses and the results are discussed in the next section.

Time Effects

To answer the first research question about change, we found that SRH knowledge changed over time. Initially, there was a significant linear increase in SRH knowledge, although this effect went away in the final model. To answer the second question about the rate of growth, we found that there was a significant quadratic time effect meaning that the rate of growth in SRH knowledge marginally slowed down over time. The third question about moderation effects is answered in the following section that outlines the relation of each moderator to SRH knowledge.

Sexual Experience

The association between sexual experience and SRH knowledge was not significant indicating that sexual experience does not moderate change over time. Our results are contrary to previous findings that found differences in SRH knowledge based on sexual experience (De Santis et al., 2012; Hoehn et al., 2016; Silver & Bauman, 2006; Swenson et al., 2010). It is possible that greater access to SRH information (Secor-Turner et al., 2011) has leveled the field for both sexually-active and non-sexually active adolescents. No effect for the sexual experience moderator suggests that CSHEPs must equally support all adolescents to delay the onset of sexual activity and practice safer sexual practices when they choose to start. Because sexual experience is an important determinant of SRH knowledge and sexual decision making, further research to better understand its relation to SRH knowledge is warranted.

Religiosity

Participants' SRH knowledge did not increase based on the importance of adolescents' religious beliefs in their day-to-day lives. In addition, there was no change in the rate of growth over time nor did religiosity moderate change in SRH knowledge. Previous studies found evidence that this variable could be protective (Rostosky, Wilcox, Wringht, & Randall, 2004). It is possible that religiosity is no longer an important determinant of SRH knowledge learning for participants in the current study. In addition, the measure of religiosity used does not capture any nuances among religious adolescents, such as denomination and degree of participation in religious activities. Future studies may need to further test the application of Social Control Theory that posits that adolescents learn about SRH through other people and through institutions by using scale variables that measure more dimensions of religiosity. Examining the effect of specific institutions on adolescents could yield useful results.

Cultural Awareness

Cultural awareness moderated change in SRH knowledge, as was consistent with previous research (Guilamo-Ramos, et al., 2005; Hingson et al., 1991; Spence et al., 2010). Participants with high cultural awareness gained higher SRH knowledge over time compared to participants with low cultural awareness. Participants with a high cultural awareness were more likely to hold traditional attitudes and beliefs about sexuality (Andjembe, 2016; Coleman & Testa, 2008; Guilamo-Ramos et al., 2005); hence they may have been more open to learning about SRH topics and retain the information. It is also possible that participants with high cultural awareness were more willing to do peer education and other activities that may encourage engagement with SRH knowledge learned during the CSHEP and contribute to higher SRH knowledge. Participants with low cultural awareness may have reached saturation point long before they joined the CSHEP; hence the SRH knowledge did not resonate as much over time. CSHEPs can seek ways to increase cultural sensitivity in programming to better resonate with participants with low cultural awareness. More research would be required to better understand why those participants experienced a decline in their SRH over time. CSHEPs can seek ways to increase the SRH knowledge of participants with low cultural awareness.

Immigration Status

Immigration status was associated with SRH knowledge in line with previous research (Hingson et al, 2003; De Santis et al., 2012); however, the interaction with time was not significant, indicating that immigration status did not moderate change in SRH knowledge. Immigrants had lower SRH knowledge at initial status compared to American-born participants. Acculturation Stress Theory helps to explain why immigrants have lower SRH knowledge compared to U.S.-born participants (Berry, 1970; Vega, Zimmerman, Gil, Warheit, & Apospori,

1994). Immigrants face more barriers to accessing SRH knowledge and services and have difficulties when adapting to a host culture that has more liberal views about sexuality and relationships in the U.S. (Andjembe, 2016; Lara, Brindis, & Becker, 2015). It is not clear why this interaction between time and immigration status was not significant. However, a possible cause for this result could be that there was insufficient statistical power at the third time point to detect these differences. Regardless, no change over time suggests that study participants may have benefitted from support services between posttest and three-month follow up. CSHEP programmers could consider tailoring prevention programs to better target immigrants and increase their SRH knowledge over time. Programmers may also consider implementing follow-up programs to help participants better retain and apply the knowledge gained in the program.

Gender

For both boys and girls, SRH knowledge increased at the beginning, but this trend slowed down later. The significant interaction with time indicates that gender moderated change in SRH knowledge. Girls experienced more growth in their SRH knowledge over time compared to boys, in line with previous research (Atienzo et al., 2009; Diclement et al., 2001; Silver & Bauman, 2006). Research shows that adolescent female children of immigrant parents are more closely supervised compared to adolescent male children, and are held to different and more restrictive standards of sexual behavior (Fox & Inazu, 1980; Guilamo-Ramos et al., 2005; Spence et al., 2010). It is possible that messages from the CSHEP are absorbed and learned differently by gender, and girls may have an easier time understanding and applying the SRH knowledge. It is also possible that the education received from the CSHEP is better tailored for girls than boys, an assertion that would warrant further investigation.

Strengths

A notable strength of the current study was access to a diverse sample that included multiple at-risk adolescent groups, such as immigrants, LGBTQ youth, youth in foster-care, and diverse races, thus, increasing generalizability. Our results demonstrate the value and importance of better understanding how immigration status, cultural awareness, and gender are related to SRH knowledge. Further research may continue examining the associations between SRH knowledge and sexual experience, religiosity, cultural awareness, immigration status, and gender and assess the relation between SRH knowledge and behavior.

Limitations

Having a low sample size limited our ability to detect differences in SRH knowledge. Having only three waves of data is sufficient to run MLM analyses; nonetheless, increasing the data collection over a longer period could yield better results. We suspect that a larger sample with more waves may have allowed us to detect associations for sexual experience. We used one-item variables in the current study to measure religiosity/spirituality as a proxy for acculturation; however, future research could achieve higher validity by using scale variables (Rew & Wong, 2006). The lack of a comparison group limits our ability to claim a causal relation between ROTO ND participation and increases in adolescents' SRH knowledge. Finally, SRH knowledge was generally high at all three time points and we may have reached a ceiling effect.

Recommendations for Future Research

Future studies could target diverse adolescent samples living in states with socially and politically conservative policies about adolescent sexual reproductive health and help to increase adolescents' self-efficacy to delay the onset of sexual intercourse and practice safer sexual

practices. Longitudinal studies that seek to elucidate the relation between SRH knowledge and sexual behaviors would complete the circle and help CSHEP programmers to better protect adolescents and reduce rates of unintended pregnancy and STIs. Using scale variables with high validity used in previous studies may improve results. This would be most useful in understanding the association between SRH knowledge and religiosity, acculturation.

Conclusions

Knowledge increased over time for program participants and there was a decrease in the rate of growth over time. Our findings shed light on participants with lower SRH knowledge at initial status and those at greatest risk over time. CSHEPs need to better target participants with low cultural awareness, immigrants, and boys. Considering ways to enhance the cultural components of the CSHEP and developing booster sessions beyond the program could help adolescents gain more SRH knowledge and retain it over time. Understanding changes in SRH knowledge enlightens researchers on an important component of adolescent pregnancy and STI prevention. Future studies assessing the association between SRH knowledge and adolescent sexual behavior are needed to prevent risky sexual behavior and lead to lower rates of unintended pregnancy and STIs in this at-risk adolescent population.

"LET'S TALK ABOUT SEX": CHANGES IN PARENT-ADOLESCENT COMMUNICATION FOR AT-RISK ADOLESCENTS PARTICIPATING IN A COMPREHENSIVE SEXUAL HEALTH EDUCATION PROGRAM

Abstract

Recent data indicates declines in the United States (U.S.) adolescent pregnancy rate; however, the U.S. rate remains one of the highest in the developed world (Hamilton & Ventura, 2012). The goal of the current study was to examine the relation between parent-adolescent communication (PAC) and sexual experience, religiosity, cultural awareness, immigration status, and gender. Participants were 176 adolescents ($M = 15.70$ years, $SD = 1.93$) who participated in a comprehensive sexual health education program and were living in a state with politically and socially conservative adolescent policies about adolescent sexual health. Survey data were collected at pretest, posttest, and three-month follow-up. Descriptive statistics indicate that 44.6% of the sample had already had sex and had a high starting PAC score. Multi-level modeling analyses showed that immigrants had lower PAC compared to American-born participants; however, immigration status did not moderate change in PAC. Discussion focusses on the implications of these findings for STI and pregnancy prevention among at-risk adolescents living in a state with conservative policies about adolescent sexual reproductive health.

Introduction

Despite declining rates, unintended adolescent pregnancy, birth, and sexually transmitted infection (STIs) remain a considerable public health challenge in the United States (Hamilton, Martin, & Osterman, 2015; The Centers for Disease Control and Prevention [CDC], 2017). Many adolescents engage in risky sexual behaviors that can result in unintended health

outcomes; for example, data from the 2015 Youth Risk Behavior Survey among United States (U.S.) high school students revealed that 41% engaged in sexual intercourse in the past year (Kann, 2016). Thirty percent were currently sexually active (i.e., had sex in the past three months prior to taking the survey), and of these 43% reported that neither they nor their partner used a condom during last sexual intercourse, and only 27% reported to have used any other form of birth control, such as birth control pills (Kann, 2016). Fourteen percent of the 43% did not use any form of birth control (Kann, 2016). This puts the 43% at increased risk for an unintended pregnancy or STIs.

Engaging in high risk sexual behaviors could be a result of parent – adolescent communication, a potentially modifiable factor associated with low unintended adolescent pregnancy and STI rates (Aspy, 2007; Kapungu et al., 2010). In reaction to the public health challenges associated with high pregnancy and STIs, we seek through the current study to examine change in parent-adolescent communication (PAC) over time for participants who participated in a comprehensive sexual health education program (CSHEP). PAC can facilitate the acquisition of sexual health knowledge necessary to adopt safe sexual practices.

The 2010 adolescent pregnancy rate for U.S. girls below the age of 20 was 57 per 1,000 adolescents or 625,000 unintended pregnancies (Kost & Henshaw, 2014); however, that rate declined in 2011 to 52 pregnancies per 1,000 girls or 553,000 pregnancies (The National Campaign to Prevent Unplanned Pregnancy [NCTPTP], 2017). However, the U.S. pregnancy rate remains the highest among other developed countries, such as Canada (28 per 1,000), Switzerland (8 per1,000), and Netherlands (14 per 1,000) (CDC, 2017).

In addition to unintended pregnancy and births, adolescents ages 15-24 account for nearly half of the 20 million new cases of STIs each year (CDC, 2014). It is estimated that over 20% of

sexually active adolescent girls aged 15 - 19 years have been infected with a STI at least once, and many others have never been tested (Forhan et al., 2009). Racial disparities reveal that some adolescents are more vulnerable than others. For example, reported cases of chlamydia in 2015 indicate that compared to White adolescent boys (187.2 cases per 100,000 population), Black boys had six times more (1,097.6 cases per 100,000 population), American Indians/Alaska Natives had nearly four times more (709.1 cases per 100,000 population), and Hispanics had twice more (372.7 cases per 100,000 population). These statistics reveal concerning racial disparities for STIs among adolescents (CDC, 2016; 2017).

Although pregnancy and STI rates have decreased substantially in the last decade, the related costs are still relatively high (CDC, 2017; The Guttmacher Institute, 2016a). In 2010 alone, the U.S. annual cost of adolescent pregnancy was estimated to be over $9 billion (NCTPTP, 2015) and $8 billion annually for the lifetime medical costs of STI incidence in adolescents (CDC, 2013; Chesson, Blandford, Gift, Tao, & Irwin, 2004). The high cost of unintended pregnancy and STIs places a significant economic strain on the U.S. healthcare system (CDC, 2013). In addition, it is a cause of concern that U.S. costs are much higher than those of other developed countries such as Canada, that have a low unintended pregnancy rate (13.5/1,000 adolescents in 2010) and spend substantially less on this problem (CDC, 2015; Hamilton, Ventura, Osterman, & Mathews, 2015). Adolescent mothers and their children face greater health risks from pregnancy complications as well as multiple social risks such as failing to complete school (Perper, Peterson, & Manlove, 2010). Researchers and public health practitioners seek to find solutions that may help to reduce high rates of unintended pregnancy and STIs. Studies show that parent-adolescent communication (PAC) is an important variable in prevention efforts because it has potential to influence sexual decision making (DiClemente et

al., 2001; Guilamo-Ramos, Jaccard, Dittus, & Collins, 2008; Kapungu et al., 2010; Martin, Hamilton, Ventura, Osterman, Kirmeyer, & Mathews, 2015); hence, we focus on PAC and seek to examine its relation with other influential variables for pregnancy and STI prevention and assess longitudinal change in PAC.

Comprehensive Sexual Health Education Programs (CSHEPs)

To address the adolescent pregnancy and STI problem, researchers and public health practitioners developed and implemented three types of sexual health education programs. First, Abstinence-only-until-marriage programs teach adolescents that waiting to have sex only in marriage is the only morally correct and accepted option for sexual expression (Alford, 2007). In addition, this curriculum censors information about contraception and condoms for the prevention of unintended pregnancy and STIs and usually avoids controversial topics, such as abortion, masturbation, and sexual orientation (Alford, 2007). Abstinence-only programs have been castigated for not providing evidence-based, medically accurate SRH information, and using fear-based tactics to promote abstinence (Strayhorn & Strayhorn, 2009). Twenty-seven states currently mandate the provision of these programs including Alabama, Mississippi, and Texas (The Guttmacher Institute, 2015).

Second, Abstinence-plus programs teach adolescents that the most effective means of preventing unintended pregnancy and STIs is through abstinence; however, adolescents are also taught about contraceptives, condoms, and partner reduction (Underhill, et al., 2007). Unlike Abstinence-only programs, Abstinence-plus programs accept that many adolescents will engage in sex before marriage and permit discussion about contraception (Alford, 2007). This program is popular in the U.S. and has been associated with a decrease in some STIs (CDC, 2012). Nonetheless, a major flaw with Abstinence-plus is that educators in states where it is taught, such

as Alabama and North Dakota (ND), teach abstinence and rely on healthcare agencies and volunteer groups, including pro-life only groups, to talk to students about abstinence, adolescent parenthood, adoption, and abortion (Alford, 2007). In addition, only 12 states emphasize the teaching of medically accurate information (The Guttmacher Institute, 2015). States such as ND do not emphasize the teaching of medically accurate information leaving many adolescents with SRH knowledge gaps. These gaps reduce adolescents' ability to make informed decisions about their sexual health and place them at risk for unintended pregnancy and STIs (The Guttmacher Institute, 2016a; Underhill, et al., 2007).

Finally, Comprehensive Sexual Health Education programs (CHSEPs) go a step further from Abstinence-only and Abstinence-plus programs by also teaching about safer sexual practices, including delaying the onset of sex, reducing the frequency of sex, and increasing the use of condoms and contraceptives (Alford, 2008; DiClemente, et al., 2008; Kirby, 2007; Oman, Vesely, Aspy, McLeroy, & Luby, 2004). Substantial evidence supports the effectiveness of CHSEPs as participating adolescents are more likely to demonstrate protective sexual behaviors, such as remaining abstinent, reducing sexual activity, using condoms, and are less likely to experience negative sexual health outcomes (CDC, 2015; Jemmott, Jemmott, & Fong, 1998; McEachern, 2010). Core components of medically accurate, age-appropriate, and culturally sensitive CSHEPs include promoting healthy relationships, increasing SRH knowledge, and enhancing PAC (Kirby, 2002; Kirby, Laris, & Rolleri, 2007). These components empower adolescents to choose healthier behavioral alternatives and lead to lower pregnancy and STI rates (Aspy et al., 2007; Hamilton, Martin, Osterman, & Curtin, 2015; Kost & Henshaw, 2014; NCTPTP, 2015).

Adolescent sexual and reproductive health instruction is a controversial subject. Some

conservative states mandate abstinence-only programs and restrict the teaching of some topics

such as contraceptive techniques (Strayhorn & Strayhorn, 2009). Adolescents living in states

with conservative policies about adolescent sexual reproductive health may have little to no

access to sexual reproductive health services exposing them to greater risk for unintended

pregnancy and STIs (The Guttmacher Institute, 2016a). Some of the highest pregnancy, birth,

and STI rates have been recorded in such states including New Mexico (37.8 live births per

1,000 girls below age 20), Arkansas (39.5 live births per 1,000), Mississippi (38 live births per

1,000) (Kost & Henshaw, 2016). Thus, understanding how to effectively prevent adolescent

pregnancy in conservative states remains necessary. The current study examined longitudinal

changes in PAC and tested the potential moderating effects of sexual experience, religiosity,

cultural awareness, immigration status, and gender on PAC trajectories for at-risk adolescents

who participated in a CSHEP in a state with conservative policies about adolescent SRH.

Parent-adolescent Communication (PAC)

PAC is a key prevention tool for unintended adolescent pregnancy and STIs because of

its association with sexual decision making and behavior, and is a major component of CSHEPs

(CDC, 2015; Guttmacher Institute, 2015; Hamilton et al., 2015; Kost & Henshaw, 2014).

Adolescent sexual decision making is a complex process and so several social and family level

variables can help protect adolescents (Miller, Levin, Whitaker, & Xu, 1998). Parents can deliver

age-appropriate and timely prevention messages to their adolescent children; hence, parents can

be a primary source of information about relationships, sexuality, and behavioral values

(Hutchinson, 2002; Wyckoff et al., 2008). Sexually active adolescents below age 19 report that

parents influence their sexual behaviors more than their peers do (Andres, 2006; Aspy, Vesely,

Oman, Rodine, Marshall, & McLeroy, 2007; NCTPTP, 2015). Furthermore, adolescents wish to have open conversations about sexuality and relationships with their parents (CDC, 2015; Deptula, Henry, & Schoent, 2010). Unfortunately, many adolescents and their parents have difficulty having conversations about sexual reproductive health leaving adolescents o receive information from unreliable sources such as the internet or from friends (Kapungu et al., 2010; Whitaker & Miller, 2000). Adolescents with inadequate PAC are at greater risk of more negative outcomes.

Research on PAC's association with adolescent sexual behaviors found several benefits (Guilamo-Ramos et al., 2005; Kirby, 1999; for a review see Rew & Wong, 2006). Adolescents who report having healthy open and frequent PAC have healthier relationships and are less likely to engage in risky sex (DiClemente et al., 2001; Guilamo-Ramos, Jaccard, Dittus, & Collins, 2008; Martin et al., 2015). Atienzo, Walker, Campero, Lamadrid-Figueroa, and Gutierrez (2009) found an association between higher PAC and increased condom and contraception use. Miller & Whitaker (2001) used a cross-sectional design and found that higher mother-adolescent communication (MAC) was associated with condom use at first sex.

Blake, Simkin, Ledsky, Perkins, and Calabrese (2001) examined the longitudinal effects of PAC on adolescents' sexual behavior and found that higher PAC reduced intentions to have sex before finishing high school. Usher-Seriki, Bynum, & Callands (2008) analyzed data from the National Longitudinal Study of Adolescent Health and found that higher MAC delayed onset of sexual activity. DiClemente, Wingood, Crosby, Cobb, Harrington, and Davies (2001) examined PAC about sex-related topics and the negotiation of safer sex among African American adolescent girls using a qualitative study and found that greater PAC was associated with less sexual risk. Aspy et al. (2007) used a cross sectional design to investigate the role of

PAC on adolescent sexual behavior and found a lower likelihood to initiate sexual activity, experience pregnancy, and a higher likelihood to practice safer sex. In summary, substantial research suggests PAC is an important predictor of sexual behavior and can be a useful tool for preventing unintended pregnancy and STIs.

However, a subset of studies has found no protective effect associated with PAC (e.g., see the review by Miller, Benson, & Galbraith, 2001; Hovell et al., 1994; Hutchinson & Cooney, 1998; Liebowitz, Castellano, & Cuellar, 1999). Three studies found PAC to be associated with an increased likelihood to engage in sex (Pearson, Muller, & Frisco, 2006; Somers & Paulson, 2000). Clawson & Reese (2003) examined the moderating role of timing of first conversations between parents and their adolescent children and found that an increase in PAC was associated with sexually risky behaviors. The major limitation with the Clawson and Reese (2003) study was the absence of two measures, the timing when PAC occurred and whether PAC occurred before or after the adolescent child had started having sex (Atienzo et al., 2009).

McNeely et al. (2002) used the National Longitudinal Study of Adolescent Health (Add Health) to examine mothers' influence on the timing of the onset of adolescent sexual activity and found protective effects for girls but not boys. Casper (1990) also found no association between PAC, pregnancy, and sexual initiation. Some common limitations in studies that found no protective effect for PAC include challenges with social desirability (e.g., Zhang et al., 2007) and the use of cross-sectional research designs (e.g. Goesling, Colman, Trenholm, Terzian, & Moore, 2014; Hutchinson, 2002; James et al., 2011). Despite contrary findings that found no or negative outcomes for PAC, sexuality educators continue to encourage parents to discuss sex with their children because, overall, evidence shows that SRH PAC has positive outcomes,

including the delay of sexual intercourse and using safer sexual practices (Deptula, Henry, & Schoeny, 2010).

Due to the weight of evidence suggesting that PAC is a protective factor for adolescent sexual health, scholars developed evidence-based programs that successfully helped adolescents and their parents improve the quantity and quality of PAC (Dilorio, McCarty, Resnicow, Lehr, & Denzmore, 2007). A review by Kirby, Laris, and Rolleri (2005) revealed that 8 of 11 programs increased SRH communication with parents about sex, condoms, or contraception. Other researchers sought to increase the effectiveness of PAC by developing adolescent sexual health education programs that had a parental component. For example, programmers developed *Safer Choices*, a pregnancy and STI prevention program that included parents, students, teachers, and school administrators to strengthen protective factors including PAC (Coyle et al., 2001). Evaluation results show that *Safer Choices* had a positive impact across adolescent groups, regardless of gender, ethnicity, or sexual experience *(*Kirby et al., 2004). Clearly parents play an important role in adolescent sexual decision making; hence, studies that seek to understand what leads to change in PAC could help CSHEPs develop programs to empower adolescents do what we know works to prevent risky sexual behavior. To better understand the role of PAC in prevention efforts, there is a need to understand the theoretical underpinnings that explain the relation between PAC and other variables.

Theoretical Background

No single theoretical perspective is sufficient to explain adolescent sexual behavior (Kirby, Laris, & Rolleri, 2007) and so several theories will be used in the current study. First, Social Learning Theory (SLT) is useful for examining adolescent SRH related research (Bandura, 1977; Bastien, Kajula, & Muhwezi, 2011; Miller & Fox 1987; Saunders, 2005). SLT

explains how adolescents learn SRH communication skills from their parents, a skill that develops over time and is critical to gain self-efficacy to abstain from sex or practice safer sexual practices (Bandura, 1977; Wildman, Choukas-Bradley, Helms, Golin, & Prinstein, 2014). Parents are a source of SRH knowledge for many adolescents (Deptula, Henry, & Schoeny, 2010; Kirby et al., 2004); hence, we can expect frequent and open PAC to positively influence sexual decision making and be protective of unintended pregnancy and STIs (for reviews, see Commendador, 2010; Widman et al., 2014).

Second, the Acculturation Stress Theory [AST] (Vega, Zimmerman, Gil, Warheit, & Apospori, 1994) has been widely applied for examining the processes through which immigrant adolescents adapt their language, beliefs, values, attitudes, and behaviors and try to fit into a different culture. The stress adolescents face during the acculturation process can leave them susceptible to risky behaviors, such as smoking, drinking, and sexual behaviors (Berry, 1997; Guilamo-Ramos et al., 2005; Mcdonald, Manlove, & Ikramullah, 2009; Vega, Zimmerman, Gil, Warheit, & Apospori, 1994). AST has been widely used to study the increased vulnerability to engaging in risky sexual behaviors among Hispanic and Latino adolescents elevating the risk of unintended pregnancy and STIs (Espinoza, Hall, & Hu, 2012; Gonzalez-Lopez, 2004; Guilamo-Ramos et al., 2005; 2009; Hovell et al., 1994; Smith, 2015).

There is a growing population of both Hispanic/Latino as well as non-Hispanic immigrant adolescents in the U.S. (CDC, 2017) and yet little is known about the latter. Many immigrants belong to conservative cultures that report difficulties in having SRH conversations (Andjembe, 2016; Broude & Greene, 1976). AST can be applied to immigrant adolescents from cultures in which SRH conversations between adolescents and their parents are taboo (Andjembe, 2016; Guilamo-Ramos et al., 2005). Interestingly, research showing that AST can be

applied to non-Hispanic/Latino samples is increasing (e.g., Du & Li, 2015). The sample in the current study includes adolescents of color, especially non-Hispanic immigrants and unaccompanied refugee minors; hence, AST could help understand SRH PAC among ethnically and culturally diverse adolescents.

Third, the Reference Group Theory [RGT] (Hyman, 1942; Reiss, 1967) was used to explain how highly religious adolescents ascribe to their religion's normative system as a referent for acceptable social behaviors (Schlehofer-Sutton, Michele, & Guzman, 2002). Specific to this study, RGT might explain how adolescents' personal attitudes and religious beliefs concerning their perspectives on sexuality and sexuality decision making are guided by their religious principles (Haglund & Fering, 2010).

Finally, the Social Control Theory (SCT) explains how parental rules, boundaries, and monitoring can be protective for their adolescent children (Miller & Fox 1987; Parsons, 1951). Parents, guardians, and the family in general, peers, friends, school, involvement in community and faith-based organizations all apply social control on adolescent behaviors, such as decisions about sexual behavior. Adolescents with access to positive role models are less likely to engage in risky sexual behaviors leading to unintended pregnancy and STIs, but more likely instead to have more positive outcomes such as attaining higher education (Ramirez-Valles, Zimmerman, & Juarez, 2002).

The theories outlined in this study guided the formulation of our research questions with respect to the relation between PAC and potential moderating variables. Theories on adolescent sexual behavior revealed the value and importance of PAC in prevention programs and the role of others in shaping their sexual behavior. Adult role models, especially parents can help to shape adolescents' mental schemas used in sexual decision making and behavior. In the current

study, we seek to test the association between PAC and five variables that have been found in previous studied to be important correlates of sexual behavior; sexual experience, religiosity, immigration status, cultural awareness, and gender.

Parent-adolescent Communication and Adolescent Sexual Behavior

Levels of PAC differ for virgins and non-virgins. Virgin adolescents who report having ease and comfort discussing personal problems with parents also report having greater ease having SRH conversations with them (Aspy et al., 2007). PAC that occurs before sexual intercourse tends to focus on topics, such as dating and the female menstrual cycle (Miller Gavin, & Kulkarni, 1998). PAC that occur after sexual intercourse is more likely to focus on topics such as STIs, condom use, and birth control (Beckett et al., 2010; Fox & Inazu, 1980; Raffaelli, Bogenschneider, & Flood, 1998). Initiating PAC after the onset of sexual activity could be too late for some adolescents, who then miss the mentoring and support that could come from parents. Therefore, a need exists to ensure that both sexually active and abstinent adolescents are equipped with timely and accurate SRH information to prevent pregnancy and STIs. Examining if sexual experience moderates longitudinal change in PAC could shed light on how best to tailor prevention messages for adolescents.

Religion, Adolescents' Sexual Behavior and Parent-adolescent Communication

Religiosity is an important correlate of adolescent behaviors (Rew & Wong, 2006; Salas-Wright, Vaughn, Maynard, Clark, & Snyder, 2017). Eighty-four percent of United States adolescents reported having a belief in God and 52% regularly attended religious services (Regnerus & Uecker, 2007; Smith, 2015; Smith & Faris, 2002). In line with the tenets of Social Control Theory (Miller & Fox, 1987), most major world religions maintain teachings that prohibit premarital sexual activity (Argyle & Hills, 2000). Religiosity affects how parents

communicate about SRH with their adolescent children (Manlove, Terry-Humen, Ikramullah, & Moore, 2006); hence, it is a key socialization agent (Wallace & Williams, 1997). The protective mechanism derived from religiosity is its unique effectiveness in promoting self-regulation, self-change, and self-control (McCullough et al., 2009; Rostosky Regnerus, & Wright, 2003). To maintain social ties with their parents and religious communities, adolescents may internalize the norms and values ascribed to them about sexuality (Hirshi, 1969; Landor, Simons, Simons, Brody, & Gibbons, 2011). This helps reduce the probability of engaging in risky behaviors; thus, preventing negative outcomes including unintended pregnancy and STIs.

Some of the favorable outcomes associated with adolescent religiosity include older age at first intercourse (James et al., 2011), have sex less often than less religious adolescents (McCree, et al., 2003), and a greater likelihood of having had fewer sexual partners (Lefkowitz et al., 2004). Ultimately, some studies indicate that religiosity leads to a decrease in unintended pregnancy and STI rates (Vasilenko, Duntzee, Zheng, & Lefkowitz, 2013).

Nonetheless, not all studies have found a protective effect for religiosity (Rostosky, Wilcox, Wright, & Randall, 2004; Sinha, Cnaan, & Gelles, 2007). For example, Bearman and Brunker (2001) studied the efficacy of virginity pledges among Southern Baptists and found that pledgers were less likely to have sex than those who did not pledge; however, pledges worked best for younger adolescents and only within a visible moral community. The contrary results about the relation between religiosity and PAC suggests that further research could illuminate the protective and risk factors of religiosity in its association with PAC. Generally, a common limitation among studies on religiosity and adolescent sexuality is the use of cross-sectional designs (e.g., González-López, 2004; Hutchinson, 2002), a limitation this study seeks to address.

Cultural Awareness, Adolescent Sexual Behavior, and Parent-Adolescent Communication

Public health data suggest that the problems associated with risky sexual behaviors are more prominent among ethnic minority adolescents (CDC, 2016; NCTPTP, 2017; The Guttmacher Institute, 2017). Acculturation is the mechanism that leads to increased risk for these adolescents (Guilamo-Raimos, 2005; 2008; Kirby et al., 2005). Cultural awareness is a common indicator for measuring acculturation. Research shows associations between acculturation and unintended pregnancy and STIs (CDC, 2017; Guilamo-Ramos et al., 2005; 2008; 2009; 2012; Trejos & Vazsoyi, 2009). Research has focused mainly on Hispanic speaking and Latina adolescents; for example, adolescents who maintained respect and conservative values regarding premarital sex and other cultural components were less likely to have had sex but also had greater difficulty negotiating safer sex with their partners (Guilamo-Ramos et al., 2005; Kost & Henshaw, 2015; Trejos-Castillo, & Vazsonyi, 2009). On the other hand, more acculturated Latina adolescents were found to particularly be at risk for alienation from their parents.

Immigration Status, Adolescent Sexual Behavior, and Parent-Adolescent Communication

Another common proxy for acculturation is immigration status. Immigrants have been found to be at high risk because like other ethnic minorities, immigrants also share similar characteristics that elevate adolescents' risk, such as language barriers and rural residence where there is limited or no access to SRH services (Andjembe, 2016; CDC, 2017). Most immigrants come from culturally conservative societies where conversations about sex with parents are taboo; hence, many parallels can be drawn between Hispanic and other cultures (Andjembe, 2016; Broude & Greene, 1976). Data on the sexual behaviors and PAC of immigrants is scant because most agencies such as the CDC do not collect data disaggregated by immigration status.

California is home to the largest Hispanic population in the U.S. and many Hispanics are also immigrants (Lara, Brindis, & Brindis, 2015). The highest unintended pregnancy and STI rates were recorded in counties where those adolescents reside (California Public Health, 2013). The change in migration patterns has led to significantly more immigrants coming to the U.S. (U.S. Census, 2012); hence, there is a keen interest to protect this population. This is especially important because the population of unaccompanied minors from non-Hispanic countries are increasing not only in California, but in other states as well (CDC, 017; U.S. Census Bureau, 2013). Research has shown that immigrants and refugees are at greater risk for low PAC, SRH knowledge, and are more vulnerable to risky sexual behaviors associated with unintended pregnancy and STIs (Andjembe, 2016). Regrettably, this population remains largely understudied. Therefore, our questions about change in PAC over time and its potential association with immigration status and cultural awareness could provide insight into ways to enhance CSHEP effectiveness in reaching and empowering what are known to be at-high risk adolescent groups.

Gender

Questions about the extent and nature of PAC based on gender have been widely addressed in the literature; for example, researchers found that parents communicate with their adolescent sons and daughters differently (Fox & Inazu, 1980; Velazquez, 2014). Compared to adolescent boys, girls report having more frequent and more in-depth conversations with parents about sexuality and relationships (Fox & Inazu, 1980; De Looze, 2015; Regnerus, 2005). Boys have been found to have fewer and less extensive PAC and when they do, it is more often with their father than with mothers (Velazquez, 2014; Wilson, Dalberth & Koo, 2010). Generally, girls receive more PAC and when it does occur, it comes mostly from mothers than from fathers

(Kapungu et al., 2013; Widman, 2014). A large body of research shows that more PAC decreases risk for an unintended pregnancy and STIs (for reviews see Commendador, 2010; Rew & Wong, 2006). In the current study, we seek to assess change in PAC and to assess differences in PAC trajectories by gender?

Some parents apply what seems like a double standard in their expectations about sexuality to sons and daughters; for example, some parents believe that engaging in sexual activity is more harmful for daughters than sons and concentrate SRH communication and mentoring with girls only (Wilson, Dalberth, & Koo, 2010). Such parental perspectives and mentoring could be harmful especially to boys who then miss out on the guidance and support they could get from parents (Guilamo-Ramos, 2009; Vega et al., 1994). In addition, adolescents from cultures with harmful beliefs such as contracting an STI as a sign of high virility, manhood, and 'machismo' in the Latin-American culture or that a woman's main job is to have children heightens adolescent's risk to an unintended pregnancy and STIs (e.g., Guilamo-Ramos et al, 2005; 2008). Gender differences in expectations about sexual behaviors have been found in ethnically diverse families, especially Latinos, immigrant households, and other minorities (Guilamo-Ramos et al., 2005; Swenson et al., 2010; Wilson, Dalberth, Koo, & Gard, 2010).

In summary, PAC is an important predictor of sexual behavior and knowing how PAC differs by sexual experience, religiosity, cultural awareness, immigration status, and gender is critical for understanding how to improve prevention programs. Parents play an important role in influencing their adolescent children's sexual health behaviors, attitudes, and intentions through parenting practices (Kapungu et al., 2010). CSHEP programmers may be able to use our findings to enhance adolescent's ability to approach and start conversations with parents, guardians, and other supportive adults. Parents impact their adolescent children's sexual behavior by sharing

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their beliefs, values, and attitudes about sexuality and relationships among other topics and studies such as this one may help to improve PAC over time (Wyckoff et al., 2008; Devore & Ginsburg, 2005). This is especially important for adolescents who are already at high risk for unintended pregnancy and STIs. With high SRH PAC, adolescents can use what they learn from their parents to develop mental schemas they may apply in their own lives to adopt healthier sexual perspectives and behaviors (Velazquez, 2014; Wilson, Dalberth, Koo, & Gard, 2010).

The Current Study

Because PAC has been identified as a potentially modifiable variable, we seek to focus solely on PAC and examine factors as potential moderating variables. The study was located in North Dakota (ND), a state with conservative policies that restrict the availability of and access to comprehensive sexual health programs and services and provides Abstinence-plus programs (North Dakota Department of Public Instruction, 2008; The Guttmacher Institute, 2015). ND recently passed legislation requiring school-based sexual health education to promote morality-based abstinence until marriage and imposed limits on what educators can teach regarding some sexual health topics, such as abortion and sexual orientation (North Dakota Department of Public Instruction, 2008). The state consistently accepts federal funding for abstinence-based sexual health education and does not provide evidence-based CSHEPs (Guttmacher Institute, 2015). Thus, access to the most effective form of sexual health education is limited in ND, increasing the vulnerability to unintended pregnancy and STIs for certain groups, such American Indians (Hodge & Sinha, 2010) and immigrants (Guilamo-Ramos, Lee, & Husiak, 2011; Mead et al., 2015).

To overcome the lack of evidence-based CSHEP's in ND schools, a medically accurate, age-appropriate, and culturally sensitive CSHEP was implemented through a university-

community partnership with the goal of encouraging preventing unintended pregnancy and reducing STIs among adolescents. ND is a unique location for the current study because of a slower decline in the rate of unintended adolescent pregnancy compared to other states (Kost & Henshaw, 2014) and an increase in some STIs (North Dakota Department of Health, 2016). In 2010, the adolescent pregnancy rate was 42 per 1,000 girls aged 15-19 and the latest data indicates a modest decline in 2011 to 40 per 1,000 girls (Kost & Maddow-Zimet, 2016). This decline is slower than other states during the same period such as New Mexico which experienced a decline from 80 per 1,000 girls in 2010 to 72 per 1,000 in 2011.

In addition to unintended pregnancy and births, the rate of some STIs such as gonorrhea increased by 169% from 57.8 per 100,000 adolescents in 2009 to 226.9 per 100,000 adolescents in 2013 among ND adolescents aged 15-19 years (North Dakota Department of Health, 2017). Furthermore, the high rate of minority adolescents accounting for unintended pregnancy and STIs in ND indicates the need for intervention (Kost & Henshaw, 2014; NCTPUP, 2015). Understanding what works to protect ND adolescents from engaging in risky sexual behaviors may help reduce their vulnerability. Literature focusing on adolescent pregnancy and STI prevention on ND adolescents is scant and no studies have been done focusing on longitudinal change in PAC as a prevention tool for unintended pregnancies, births, and STIs.

The current study treats PAC as the outcome variable and tests the relation between PAC and a unique combination variables not included in previous studies. Specifically, we examined change in PAC and possible moderating effects of ever sexual experience, religiosity, cultural awareness, immigration status, and gender. Figure 6 illustrates the theoretical representation of the moderating variables in relation to PAC. Three questions were addressed in this study. First, does PAC change from baseline, posttest, and three-month follow up after? Second, does the rate

of change differ over time? Finally, does sexual experience, religiosity, cultural awareness, immigration status, or gender moderate change in PAC over time.
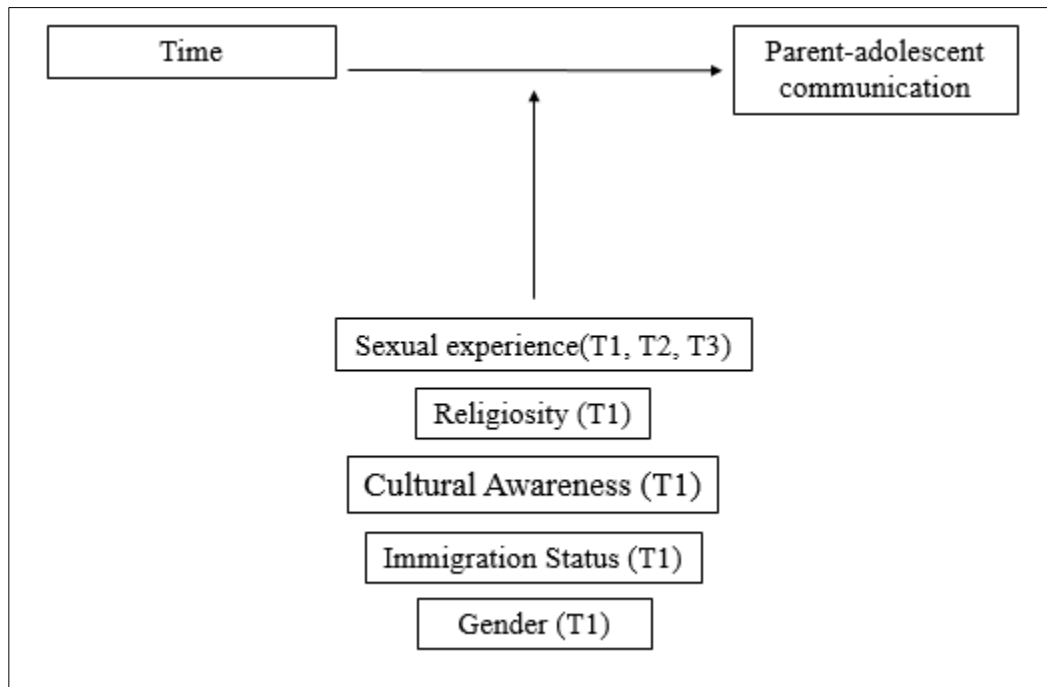
Figure 6. Model explaining moderation effect between time and parent-adolescent communication.

Method

Participants and Recruitment

The current study is part of a larger study on the prevention of unintended adolescent pregnancy and STIs in ND using data from participants in Reach One Teach One (ROTO ND). ROTO ND is an evidence-based CSHEP that used the 4th Edition of Making Proud Choices [*MPC!]* (Jemmott, Jemmott, & Fong, 1998) as its main curricula. *MPC!* was augmented by three adult preparation topics: Healthy Relationships, Positive Youth Development, and Healthy Life Skills. The ROTO ND program included peer education, another crucial component in evidence-based prevention programs (Jemmott et al., 1998; Kelly et al., 1991). In partnership with

community agencies that work with at-risk adolescents, purposive sampling was used to recruit participants vulnerable to pregnancy and STIs. Youth were eligible for participation in the ROTO ND program if they were unmarried, between the ages of 10 – 20, and resided in ND.

The analytic subsample included data collected between 2013-2016 from non-college attending ROTO ND participants ($n = 176$, $M_{age} = 15.70$ years). Most participants 68.8% ($n = 121$) were enrolled in school and 23.9% ($n = 42$) were still in school but were on break. Four percent ($n = 7$) completed school or graduated, 2.3% ($n = 4$) dropped out, and 1.2% ($n = 2$) were suspended or expelled from school. Approximately 53,527 adolescents between the ages of 12 – 18 were living in ND in 2010 with 81% white and over 70% living in households with middle and/or higher income (National Center for Children in Poverty, 2011). These ND community characteristics indicate homogeneity; however, participants in the analytic subsample were more diverse than the local community. For example, 69.1% ($n = 134$) were adolescents of color and 42% ($n = 74$) were immigrants and or unaccompanied refugee minors born outside of the U.S. Of the immigrant/refugee population, 7.1% had lived in the U.S. for less than 1 year, 7.1% 1-2 years, 12.4% 3-4 years, and 14.1% 5 or more years. Fifty-six percent (56%, $n = 96$) were girls and 13.2% ($n = 22$) identified as lesbian, gay, bisexual, transgender, or queer (LGBTQ).

Some participants in this study exhibit characteristics associated with increased vulnerability to risky sexual behaviors. For example, 40% ($n = 76$) received public assistance and 12.6 % ($n = 24$) indicated that they lived in a household that experienced food scarcity in the past six months. When asked with whom they lived with the most, only 32.9% ($n = 56$) lived with both parents in the household and 35.3% ($n = 60$) lived with one parent. Part of the reason for this is because the immigrants were unaccompanied refugee minors who were not living with their biological parents. General descriptive statistics for the sample can be seen in Table 3.

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Table 3

Descriptive Statistics for Study Variables

	Mean	Std. Dev.
Age *(range (13-20 years)*	15.71	1.93
	n	*%*
Race		
White	58	33.5
Hispanic	14	8.1
American Indian	36	20.8
Black African American	35	20.2
Descriptive Statistics for Study Variables		
Sexual experience (sexually experienced)	58	33.5
Religiosity (High religiosity)	97	64.7
Cultural awareness (High awareness)	104	71.7
Immigration status (Immigrants)	74	42.0
Lived in the U.S. for		
less than 1 year	12	7.1
1-2 years	12	7.1
3-4 years	25	12.4
5+ years	24	14.1
Gender (Girls)	98	56.5

Thirty-two percent had lived in at least one out-of-home placement; for example, 8.9% had lived in a juvenile detention facility, 9.5% had lived in a shelter in the past 6 months, and 14.2% had lived in foster care. The number of data points for an individual could include pretest, posttest, and three-month follow up.

Data Collection and Entry

The university Institutional Review Board approved the research protocol. Before enrolling into the CSHEP, participants 18 years and older signed an informed consent in English. Participants below the age of 18 had signed informed consent from their parents or guardians, and signed an assent form prior to taking the surveys. Participants took three paper-and-pencil surveys administered by trained research assistants. The pretest was administered at the beginning of the first program session. The posttest was administered at the end of the last program session. The three-month follow-up survey was taken at the beginning of a reunion party, an occasion that brought the participants back to complete the survey, celebrate graduating from the program, and to discuss how the program had empowered them. Survey completion took approximately half an hour. Data were entered into the Statistical Package for the Social Science (SPSS 24.0) database by two research assistants. Data were later checked for accuracy by a different pair of research assistants. Project staff members were trained to protect participants' confidentiality and to ensure the comfort of participants with responding to sexual and other sensitive topics in survey situations.

Participants were provided with transportation to and from program sessions, and meals at program sessions. Small incentives, such as deodorant and socks, were provided at the end of every session to encourage attendance and participation. Program participants were required to do peer education about SRH topics they learned in the program and self-reported who they spoke to by recording the ages of their contacts and highlighting the topics they discussed. At the end of the program, participants who successfully made 20 peer education contacts were provided with a Nook ® preloaded with SRH resources to facilitate further peer education.

To minimize time 2 and time 3 attrition and collect follow-up surveys, participants were contacted using the contact information they had provided. Research assistants and the ROTO ND staff and volunteers called, emailed, or used social media to contact participants who had missed the final program session when posttest surveys were collected and or the reunion party when three-month-follow-up surveys were collected. The postal service was used for participants who had moved out of state and or could not come to the program site to complete the survey. Finally, participants were given a $15 gift card for completing the three-month follow-up survey.

Measures

Parent-adolescent communication (PAC). The PAC scale variable was created by averaging seven items asking whether participants had ever talked with their parent(s)/guardian(s) about a range of topics related to sexuality (e.g., the female menstrual cycle). This variable was measured at all three time points. Responses were coded (*No* = 0; *Yes, a little* = 1; and *Yes, a lot* = 2). The PAC items have been used in PAC scales used in previous studies and have good validity (González-Guarda, Peragallo, Urrutia, & Vasquez, & Mitrani, 2008; Kapungu et al., 2010; McNeely et al., 2002). The overall scale had a good internal reliability ($\alpha = .88$).

Time variables. Pretest, posttest, and three-month follow-up were used as the measure of time (Time) and its squared value (Time_Sq) as linear and quadratic time variables, respectively. We centered time at the first interval (i.e., Time was recoded from Time 1, 2, and 3 to 0, 1, and 2. The quadratic time variable became 0, 1, and 4).

Sexual experience. This variable was measured with one item, "*Have you ever had sex?*" with response options that ranged from 1 = *No* to 4 = *Yes, 5 or more times*. This measure was adapted from a Planned Parenthood of Minnesota, North Dakota, and South Dakota (PPMNS)

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survey. For other studies that used this measure, see Sieving, et al. (2011) and Goesling, Colman, Trenholm, Terzian, and Moore (2014). For analyses purposes, these responses were recoded into a dichotomous variable (1 = *Sexually experienced*, 0 = *No sexual experience*).

Religiosity. This variable was measured using one item, *"In general, how important are religious or spiritual beliefs in your day-to-day life?"* Response categories ranged from 1 = *Not at all important* to 4 = *Very important*. The religiosity/spirituality measure was adapted from the National Substance Abuse, HIV, and Hepatitis Prevention Initiative Survey and has been used in previous research with adolescents (Rew & Wong, 2006; Rosenbaum, 2009; Whitebeck, Yoder, Hoyt, & Conger, 1999). For analyses purposes, responses were recoded into a dichotomous variable, with "*Not important*" and "*A little important*" responses recoded as 0 = "*Low Religiosity*" and "V*ery and Somewhat important*" responses recoded as 1 = "*High religiosity*". Only pretest data were used for this variable.

Cultural awareness. This variable was measured using the item, "*I have a clear sense of my cultural and ethnic background.*" Response categories ranged from 1 = "*Not at all important*" to 4 = "*Very important.*" Cultural awareness is not a direct measure of acculturation; however, this measure has been widely used in the literature (Guilamo-Ramos et al., 2005; 2008; 2009; Sieving, et al., 2011; Goesling et al., 2014). For analyses purposes, responses were recoded into a dichotomous variable, with "*Not important*" and "*A little important*" responses recoded as 0 = "*Low cultural awareness.*" and "*Very and Somewhat important*" response categories recoded as 1 = "*High cultural awareness.*" Only pretest data were used in these analyses.

Immigration status. This variable was measured using the item, "*How long have you lived in the United States?"* Response categories were: 1 = "*My whole life,*" 2 = "*Less than 1 year,*" 3 = "*1-2 years,*" 4 = "*3-4 years,*" and 5 = "*5 or more years.*" Responses were recoded into

a dichotomous variable representing their immigration status, with 0 = *U.S. born (Lived in the U.S. all my life*) and 1 = *Immigrants (lived in the U.S. for < 1 year - 5+ years).* Immigration status is not a direct measure of acculturation; nonetheless, it has been found to be predictive of important sexual outcomes and has been used extensively in the literature (Andjembe, 2016; Goesling et al., 2014; Guilamo, Ramos et al., 2005; 2009; Sieving, et al., 2011; Trejos-Castillo & Vazsonyi, 2009).

Gender. This variable was measured using the item "*Do you think of yourself as:*" with the following response options: 1 = "*Female*," 2 = "*Male*," 3 = "*Transgender*," 4 = "*I don't know*," and 5 = "*Write in*." For analysis purposes, these responses were recoded into a dichotomous variable with 0 = "*Male"* and 1 = "*Female,*" as those were the only two response options chosen by participations.

Data Analyses

We used Multi-level Modeling (MLM) to examine longitudinal changes and within person variations in PAC, to answer the research questions (Heck, Thomas, & Tabata, 2010). All moderating variables included were represented by dummy codes as this aids in interpretability since only one category becomes the reference group. The variance inflation factor was used to test for multicollenearity and bivariate correlation analyses to indicate that there were no problems with multicollenearity. Non-linearity of the data was considered and found to be positively skewed; however, no transformations were applied due to a low sample size.

We compared several models to determine relative fit and plausibility by using a multimodel inference approach, (Heck, Thomas, & Tabata, 2010). The best combination of individual and contextual predictors of PAC was achieved by engaging in a process of model building utilizing MLM techniques. A series of two-level time varying models was estimated

using the MIXED procedure in SPSS to assess change over time for all three time points (Heck et al., 2010). Five models were considered to examine the shape of the growth curve (linear and quadratic) and the effects of five moderating variables on intercept and growth.

Step 1 of these analyses was to run an unconditional model to ensure that there was a basis for using MLM. In step 2, the base model that had the linear and quadratic time components only was tested. Step 3 examined the main effects of moderators in addition to the time variables. Step 4 contained cross-level interactions in addition to the main effects in the models. These interactions included; time (Level 1) by sexual experience (Level 1); time (Level 1) by religiosity (Level 2); time (Level 1) by immigration status; time (Level 1) by cultural awareness (Level 2); and finally, time (Level 1) by gender (Level 2). Each interaction was added to the model in turn. Finally, Step 5 was a final model with only significant interactions.

Results

Missing Data and Data Exploration

At pretest, 17.6% of the sample had missing data for PAC, 42% at posttest, and 43.2% at three-month follow up. When the mean of PAC variable was created, 34.3% of possible data points were missing and not included in the analyses. Seventeen percent had pretest PAC scores only, 32.7% had both pretest and posttest PACs scores, 14.8% had either posttest or three-month data only, and 35.4% had data at all three time points (see Figure 7). See Table 4 for responses given on this variable as well as the percentage of missing data for each item at baseline. The largest proportion of missing data were from immigrant participants who completed an abbreviated survey due to language problems. Many of the immigrant participants who did not complete the full version of the survey at pretest and posttest could do so at the three-month follow-up.
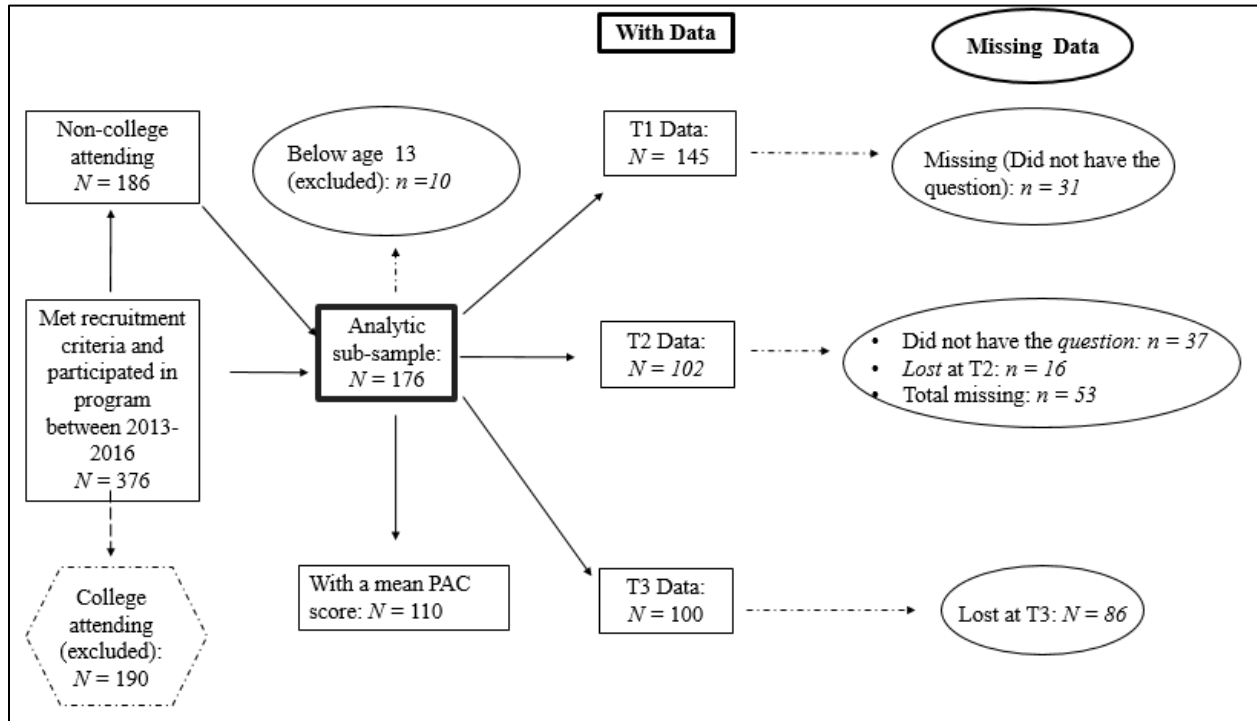
Figure 7. Missing data for PAC at times 1, 2, and 3

Due to the large proportion of participants who did not complete posttest and three-month follow up data, comparisons were made between individuals with data and those missing follow-up data on demographic variables (age, race, and gender). Independent samples t-test results showed that program participants did not differ significantly by age. However, chi square tests showed that participants with missing data were more likely to be religious (75%), $\chi^2 = 9.90$, $p = .01$ and to be girls (59.8%), $\chi^2 = 4.50$, $p = .03$.

High rates of attrition are not atypical in studies with at-risk adolescents because they are often highly mobile (e.g., Cutuli et al., 2013). A large portion of participants with missing data were unaccompanied minors and immigrants not living with their parents such that there was no PAC taking place; hence, the data in the current study were not missing at random (NMAR). No corrections were made for missingness for this dataset because of a low sample size. An

advantage of running analyses using MLM is its ability to accommodate missingness and the

production of unbiased estimates (Bickel, 2007).

Table 4 shows the items used to generate the PAC scale. The most commonly discussed

topics at baseline were the female menstrual cycle, and this does not come as a surprise because

most the sample are girls. Other commonly discussed topics are how to say no to sex and how to

prevent HIV/AIDS using safe sex practices.

Table 4

Baseline Responses to Items on the PAC Scale for a Sample of Adolescents

	No		Yes, a little		Yes, a lot		Missing	
Item	*N*	%	*N*	%	*N*	%	*N*	%
the female menstrual cycle (period)?	32	18.4	40	22.5	31	17.6	73	41.5
how pregnancy occurs?	45	25.8	48	27.3	22	12.7	60	34.3
not having sex (abstinence)?	45	25.8	44	25.2	26	14.6	61	34.5
how to say no to sex?	50	28.8	41	19.1	31	17.6	61	34.7
methods of birth control (pregnancy prevention)?	51	28.8	41	23.1	24	13.6	61	34.5
sexually transmitted infections (STIs)?	56	31.8	35	19.7	24	13.8	61	34.7
how to prevent HIV/AIDS using safe sex practices?	58	32.8	31	17.4	26	15	61	34.8

Note. Individual items were extensions of the following question: "Have you ever talked with your parents/guardians about…"

Sexual behaviors history.

At pretest, 44.6% (*n* = 79) reported having had sex and 27.3% (*n* = 28) were currently

sexually active (had vaginal, oral, or anal sex at least once in the last month). Fourteen percent of

participants (*n* = 22) intended to have sex in the next 30 days and 22.9% (*n* = 36) were unsure.

Fifty-nine percent ($n = 62$) reported having intentions to use condoms if they had sex in the next 30 days and 9.5% ($n = 10$) were not sure. Of the 44.6% who reported being sexually active in the last month at pretest, 50% ($n = 39$) used a condom when they last had sex and 20.8% ($n = 16$) used any kind of contraception other than a condom. Sixteen percent ($n = 28$) reported being sexually active in the last month at pretest, 35.7% ($n = 10$) had been pregnant or gotten someone pregnant, and 14.3% ($n = 4$) were not sure.

Trajectory Analyses

Next, we outline the steps for developing the MLM models. The results presented below show the change in PAC scores and show whether sexual experience, religiosity, immigration status, cultural awareness, and gender moderate change in PAC scores over time.

Step 1. Unconditional model.

The unconditional model is a one-way ANOVA that contains no predictors and serves as a baseline model to examine individual variation in PAC without regard to time (Shek & Ma, 2011). This model measures the mean of PAC and the amount of outcome variation that exists in intra- and inter-individual levels. The results can be used to determine which level (i.e., Level 1, time variant; or Level 2, time invariant) of predictors to add when fitting the subsequent models. High variation would suggest that certain amount of outcome variation could be explained by the predictors at that level (Heck, Thomas, & Tabata, 2010).

The initial analyses focused on defining the shape of students' growth trajectories and determining where the initial intercept and random time slope vary across individuals. The unconditional model (only with intercept as random) produced the results showing a significant estimate of fixed effect of intercept (.81, $p < .001$). The estimates of Level 1 residual (.17, $p < .001$) and Level 2 variance for intercept (.20, $p < .001$) were also significant. The intraclass correlation (ICC) was .541, meaning that 54.1% of the variability in PAC was attributable to

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differences between the participants. The ICC was greater than .05 and the Level 2 variance was significant; hence, MLM was warranted for this dataset (Heck, Thomas, & Tabata, 2010; Shek & Ma, 2011). The results are displayed in Step 1 on Table 5.

Step 2. Building the base model.

To build the base model to be compared with subsequent models, linear and quadratic time components (Time and Time_sq, respectively) were added to the unconditional model in turn. The unstructured covariance structure (UN) did not converge; hence, variance components (VC) was used as the Level 1 covariance structure and the scaled identity (ID) covariance structure at Level 2. Results showed that the initial status of PAC at pretest was ($\pi_{0i} = .76$, $p < .001$). The linear time effect for PAC was marginally significant ($\beta_{10} = .19$, $p = .06$), indicating a marginal change in PAC. The estimate for the quadratic growth rate was not significant ($\beta_{20} = -.08$, $p = .13$) indicating that individuals' growth rates in PAC did not change over time. The results are displayed in Step 2 on Table 2.

To determine the covariance parameters which is how much variability in the outcomes is left at each level, an ID covariance matrix was specified at Level 2, meaning there were variance estimates for the random intercept. The results indicate that there was variability in the random intercept to be explained between individuals (*Wald Z* = .16, $p < .001$). Only the linear term was significant and so the quadratic term was not useful in describing student's growth trajectories and was dropped from subsequent analyses.

Step 3. Model with main effects of predictors.

It was expected that students' initial intercept would vary across individuals and this variation in intercepts would in part be explained by the five moderating variables. It was also expected that variation in the participants' average linear growth rates would be explained by the same predictors. In this model, the predictors were added to the base model. The results

displayed in Step 3 on Table 5 indicate a significant initial PAC intercept (β_{00} = .91, p = .001). This was the students' true initial status adjusted for the five moderating variables (sexual experience, religiosity, cultural awareness, immigration status, and gender). The intercept is the initial PAC rate for participants who have no sexual experience, are not religious, U.S. born, have low cultural awareness, and boys. Only immigration status was significantly related to participant's initial PAC (β_{03} = -36, p < .001). The linear effect for time was no longer significant (.06, p = .11).

Step 4. Models containing interactions.

Each of the five cross-level interactions were added to the previous model with the main effects in turn; however, none were significant. The main effect for immigration status remained significant in this model (p < .001). The results are presented in Step 4 on Table 5.

Step 5. The final model.

The final model had no interactions. The results displayed in Step 5 on Table 5 and Figure 8 indicate that immigration status was related to differences in initial PAC (β_{03} = -.32, p < .01). This means that immigrants had a lower starting PAC score of .57 (i.e., calculated as .89 - .32). Immigrants had a lower PAC score compared to their American-born peers. The linear effect for PAC was not significant (β_{10} = -.05, p = .11), indicating no change in PAC over time.

Discussion

The purpose of the current study was to examine if PAC changed over time, if the rate of growth changed, and finally, if having had sex, religiosity, immigration status, cultural awareness, and gender moderated change in PAC. We found a significant association between PAC and immigration status; however, no moderation effects were found. There was some support for the Acculturation Stress Theory (Vega, et al., 1994) that posits that adolescents adjusting to their new host culture experience stress resulting in maladaptive behaviors including
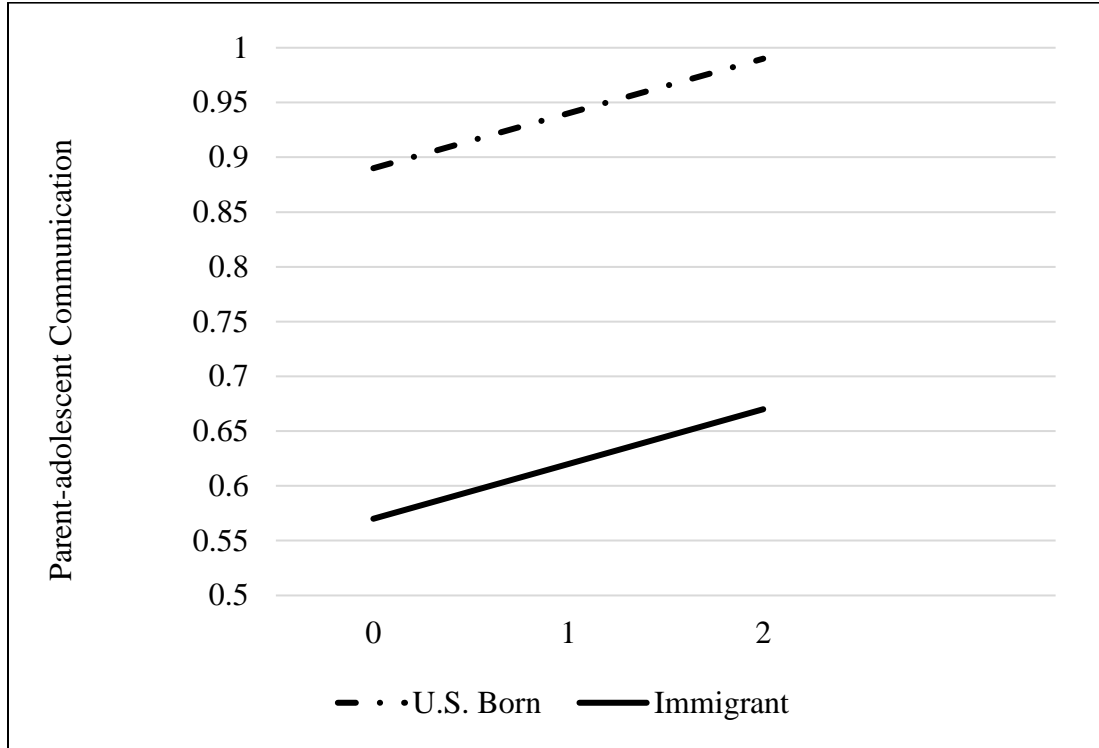
Figure 8. Variation in parent-adolescent communication by immigration status

Time Effects

To answer the first research question about change in PAC, we found no change over time. Initially, there was a marginally significant linear increase in SRH knowledge; however, that effect went away in the final model. To answer the second question, the quadratic time effect was not significant meaning that the rate of growth did not change over time. The answer to the third question about moderation effects between PAC and five moderators, the results are discussed in the following section.

Table 5

Predictors of PAC among At-Risk Adolescents

Parameter	Step 1	Step 2	Step 3	Step4	Step5
Intercept	**.81 (.04)***	**.76 (.05)***	**.91 (.11)***	**.93 (.15)***	**.89 (.13)***
Sexual experience			.01 (.08)	.01 (.11)	-.02 (.08)
Religiosity			.07 (.08)	.09 (.11)	.08 (.10)
Immigration status			**-.36 (.08)***	**-.36 (.12)**	**-.32 (.10)**
Cultural awareness			-.06 (.09)	-.06 (.12)	-.06 (.10)
Gender			.09 (.08)	.06 (.11)	.15 (.09)
Time		**.19 (.10)+**	.06 (.04)	.00 (.09)	.05 (.03)
Time_Sq		-.08 (.05)			
Time*Sexual experience				-.03 (.06)	
Time*Religiosity				-.01 (.07)	
Time*Immigration status				.05 (.07)	
Time*Cultural awareness				-.01 (.06)	
Time*Gender				.09 (.06)	

Notes.
Step 1 = Null model; Step 2 = 1+ Time and Time_Sq.; Step 3 = 2 + Sexual experience, Religiosity, Immigration status, Cultural awareness, and Gender, Step 4 = 3 + interaction terms; Step 5 = Final Model with only interactions.
Reference categories for dummy variables: No sexual experience; Low religiosity; Immigrants; Low cultural awareness; and Boys.
Standard errors in parentheses.
The model fit improved from model 1 to model 5 (Δ AIC = 576.57 - 442.99 = 133.58; Δ BIC =584.26 – 450.25 = 134.01).
$^+p < .10$; $* p < .05$; $**p < .01$; $***p < .001$

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Immigration Status

Our results partially addressed the questions about the association between immigration status and PAC. American-born participants had greater starting PAC compared to immigrants; however, there was no change over time. One explanation why American-born participants have higher PAC could be cultural differences that have significant bearing on PAC outcomes for adolescents, as was found in previous studies (Guilamo-Ramos et al., 2005; 2008; 2009; Vega et al., 1994). Immigrants in the current study come from countries with predominantly conservative cultures where conversations about sex are taboo (e.g., Burundi, Nepal, and Iran). Adolescents from these countries generally tend to have low PAC (e.g. Fox & Inazu, 1980).

The results further demonstrate that immigration status does not moderate change in PAC. Reasons for this are unclear; nonetheless, we suspect that the CSHEP was delivered in a culturally sensitive manner that resonated with all program participants. Culturally sensitive programming is a necessary and valuable component for CSHEPs; however, it is not easy to do. Language barriers can present a major barrier when working with immigrants, especially when youth in a particular programming group come from multiple countries, speak different languages, and vary in English language fluency. In addition, low PAC among immigrants does not come as a surprise because most this subpopulation are unaccompanied refugee minors who come the U.S. without their parents.

Cultural Awareness

No significant differences were found between participants with high or low cultural awareness. Examination of Acculturation Stress Theory (AST) in previous studies showed that Hispanic adolescents and immigrants, who both have been found to have high cultural awareness, encounter multiple barriers in having PAC because of conservative attitudes and

beliefs about sexuality (Guilamo-Ramos et al., 2005; 2008; Vega et al., 1994). It is not clear why the association between cultural awareness was not significant in the current study; however, it is possible that participants in the sample are accepting of liberal American views about sexuality and relationships, and were open to receiving mentorship about engaging in SRH conversations and learning (Alford, 2007; 2008). Nonetheless, further examination of the association between acculturation and PAC is warranted.

Sexual Experience

Sexual experience was not related to PAC. Previous studies found that PAC topics differ for participants depending on whether they had started having sex (Beckett et al., 2010; Fox & Inazu, 1980; Raffaelli, Bogenschneider, & Flood, 1998). PAC may not necessarily depend on the initiation of sex but on other factors such as parent-adolescent closeness (Aspy et al., 2007). Previous studies have found that adolescents who report having a close relationship with parents also have higher PAC (e.g., Nedela, 2011); hence, further investigation on the relation between sexual experience and parent-adolescent closeness and general communication could shed more light.

Religiosity

We did not find a significant association between religiosity and PAC. It is possible that knowledge from the CSHEP was delivered in a culturally-sensitive way such that having high religiosity did not deter adolescents from having conversations with their parents (Rostosky, Wilcox, Wright, & Randall, 2004; Sinha, Cnaan, & Gelles, 2007). It is also possible that religiosity was not important an important factor during PAC or that the peers they spoke with were not highly religious. Another possible cause why the association with PAC was not significant could be because the measure of religiosity used here did not capture important

nuances among religious adolescents (e.g., denomination, degree of participation in religious activities, etc.).

Gender

Although initial analyses showed that girls had higher PAC than boys, in line with previous studies (Velazquez, 2014; Wilson, Dalberth & Koo, 2010), MLM analyses did not distinguish boys from girls in their PAC scores. A possible cause for this result could be the fact that the CSHEP providers successfully tailored lessons such that messages resonated with boys, just as much as girls. More research, nonetheless, would be needed to confirm that assertion.

Strengths

The ROTO ND CSHEP is the first of its kind in ND; hence, the results of the current study shed new light on at-risk adolescents living in a state with conservative policies about adolescent SRH and provides only Abstinence-plus education in schools (North Dakota Department of Public Instruction, 2008). We found that many adolescents are already sexually active at pretest, further affirming the need to empower them to delay the onset of sexual intercourse and to practice safer sexual practices when they have sex. The diverse sample in the current study shed new light about a growingly diverse adolescent population in a homogeneous state. This has implications for future adolescent sexual health education programming. Assessing change in PAC using MLM helped to retain as many participants as possible and adheres to calls for the use of more sophisticated methods that may help to assess variation (Spence et al., 2010).

Limitations

Despite its strengths, there were several limitations to the study design. First, high attrition at posttest and the three-month follow up contributed to a diminished sample size and

that may have diminished our capacity to detect differences in PAC for different subgroups. Second, some of the measures are rudimentary and do not provide a thorough investigation of the topics at hand. Finally, not having a comparison group limits our ability to make causal inferences. It is not clear if changes in PAC were a result of program participation or were by chance.

Suggestions for Future Research

Future studies with a larger sample and more waves of data may further explain the associations between PAC and sexual experience, religiosity, cultural awareness, immigration status, and gender. Other studies follow participants for up to two years and longer follow-up may help to unravel differences for ND at-risk adolescents (Kirby et al., 2004; Kirby, 2007; Rew & Wong, 2006). In addition, the use of more composite measures may yield better results. Future studies should also aim to include a comparison group, to help determine the extent to which ROTO ND impacts adolescents' PAC. Non-significant relations in the current study suggest that other variables may help to elucidate what could lead to change in PAC. Programmers could ensure that translators are available and or that surveys are translated into the languages spoken by the participants to ensure they understand the material and are able to complete surveys. CSHEPs could also consider involving parents in programming as this could further improve adolescent health outcomes (Card et al., 2007; CDC, 2017; Saunders, 2005). Changing immigration patterns lead to adolescents adapting to the U.S. culture and this could have ramifications for adolescents' sexual and reproductive health; hence, studies that show how these factors impact PAC may improve CSHEPs.

Conclusion

The current study sought to assess if PAC changed over time, if the rate of growth changed, and finally if change in PAC was moderated by sexual experience, religiosity, cultural awareness, and gender. We found that PAC did not change over time; nonetheless, immigrants had lower initial PAC compared to U.S.-born participants. Our results suggest that immigrants are at lower PAC and could be at greater risk of engaging in risky sexual behaviors that lead to unintended pregnancy and STIs. CSHEPs need seek ways to better target and empower these adolescents to have SRH conversations with their parents and other supportive adults. More needs to be done to increase PAC over time and ensure that adolescents can confidently discuss SRH-related topics with adults and receive mentoring that could lead to safer sexual practices.

GENERAL CONCLUSIONS

Since 2010, the rate of unintended pregnancy declined by 51% from its 1990 peak of 116.9 pregnancies per 1,000 adolescents to 57.4 per 1,000 (Kost & Henshaw, 2014); however, rates in the United States (U.S.) remain the highest among other developed countries, such as Canada (The Guttmacher Institute, 2017). U.S. adolescents face more barriers to accessing sexual reproductive health services and the rates of decline among states are uneven and slow (Kost & Henshaw, 2016; The Guttmacher Institute, 2015). The substantial strain caused by the high costs of unintended adolescent pregnancy and STIs remains a concern in the U.S. The government spent $9.4 billion in 2010 alone towards this problem (The Guttmacher Institute, 2016b). These resources could be saved and diverted to development related programs and activities. The rate of decline in ND remains one of the slowest in the U.S (CDC, 2017; The Guttmacher Institute, 2016a). We focused on SRH knowledge and PAC in the current study because research shows them to be highly modifiable potential prevention tools for unintended pregnancies and STIs (CDC, 2017; Swenson et al., 2009; 2010). Two studies were conducted to examine change in sexual reproductive health (SRH) knowledge and parent-adolescent communication (PAC) among adolescents who participated in a comprehensive sexual health education program (CSHEP).

This study is unique because it is based on the Reach One Teach One North Dakota (ROTO ND) CSHEP, the first of its kind in ND, a state with conservative policies on adolescent sexual reproductive health. ND supports school-based abstinence-plus programs and restricts what public school educators can teach about certain sexual reproductive health (SRH) topics, such as options for pregnancy (The Guttmacher Institute, 2017). We hoped that our results could

shed new light on empowering adolescents to make healthier decisions regarding their sexual

behavior and lead to lower pregnancy and STI rates.

In the first study, we focused on SRH knowledge and examined if sexual experience,

religiosity, immigration status, cultural awareness, and gender moderated change in SRH

knowledge for diverse adolescents who participated in ROTO ND. Surprisingly, adolescents may

still have at least one misconception about sexuality, such as that pregnancy is something that

could never happen to them (CDC, 2012; 2017; De Santis et al., 2012). Inadequate SRH

knowledge and inadequate risk perception increases adolescents' vulnerability to engage in risky

sexually behavior (De Santis et al., 2012; Rew & Wong, 2006). Our results showed significant

associations for three variables; cultural awareness and gender were associated with SRH

knowledge and changed over time. Immigration status was also related to SRH knowledge;

however, it did not change over time. Our findings suggest that adolescents may come into

CSHEPs with schemas shaped by their culture and immigration status and this may deter their

learning of SRH knowledge (Bandura, 1977; Saunders, 2005). Immigrants, boys, and adolescents

with low cultural awareness had lower SRH knowledge and this suggests that they could be at

greater risk for unintended pregnancy and STIs compared to participants with high cultural

awareness, American-born, and girls. More research is needed to better understand the role

played by acculturation in adolescents' experiences in CSHEPs in order to increase adolescents

SRH knowledge.

The second study assessed the longitudinal relation between PAC and sexual experience,

religiosity, immigration status, cultural awareness, and gender for adolescents who participated

in the ROTO ND CSHEP. Previous research found that adolescents who have consistent and

open conversations with parents about sexuality and have close relationships with them are less

likely to experience an unintended pregnancy or contract STIs (Aspy et al., 2007; Guilamo-Ramos et al., 2005; Velazquez, 2014). Social Learning Theory posits that all behavior is learned (Bandura, 1977); hence SRH knowledge can be transmitted through PAC which in turn influences adolescent sexual behaviors. Protective behaviors such as abstaining from sex or practicing safer sex can be learned. It is therefore concerning that many parents and their adolescent children report having difficulties in having these conversations that would facilitate learning protective behaviors (Fox & Inazu, 1981). The following factors have been found to be associated with PAC: sexual experience (Raffaelli, Bogenschneider, & Flood, 1998), religiosity (Haglund & Fering, 2010), cultural awareness (Vega, Zimmerman, Gil, Warheit, & Apospori, 1994), and gender (Velazquez, 2014).

Our results indicate that only immigration status was significantly associated with PAC. A large proportion of participants in the current study come from predominantly conservative cultures where PAC about sexuality and relationships is uncommon (Andjembe, 2016); hence, they had lower starting PAC compared to American-born participants who typically start receiving some form of sexual health education in middle school (Atkins, 2010). Immigrant participants were possibly receiving CSHEP messages for the first time. It is encouraging, however, that although not significant, the PAC trend was positive. Considering that immigrant adolescents have been found to face additional barriers to learning such as language barriers (e.g., Guilamo-Ramos et al., 2008), it is possible that ROTO ND program staff successfully engaged immigrants as well as American-born participants. The lack of change in PAC scores for both groups between the program end and the three-month follow up suggests that participants could benefit from booster sessions and other kinds of support for PAC to increase and subsequently result in less risky sexual behavior.

PAC was not related to sexual experience, religiosity, cultural awareness, and gender. The reason for these results is unclear; however, a possible cause is that other variables not tested in the current study may have significant associations with PAC or that we simply lacked statistical power to detect differences in the current study. Hence, further investigation to better understand the relation between these variables is warranted. Our findings may inform researchers and CSHEP programmers about the nature of SRH knowledge and PAC among at-risk adolescents living in states with conservative adolescent SRH policies. That knowledge may be helpful for improving program delivery, lead to less risky sexual behavior, and ultimately, lower unintended pregnancy and STIs.

Strengths

The longitudinal design of the current research helped overcome the limitations of cross-sectional studies and was useful for assessing change over time. Considering the large proportion of missing data, the use of MLM methods helped minimize the diminished sample. Previous studies have focused on only one at-risk adolescent population at a time (e.g., Swenson et al., 2009; 2010; Velazquez, 2014); however, the sample in the current study is a good representation of multiple at-risk adolescent groups, such as adolescents in foster-care, the juvenile detention system, from different racial and ethnic backgrounds, LGBTQ youth; immigrants, and others. The ROTO ND CSHEP is the first of its kind; hence, it may provide a basis for new avenues of research.

Limitations

First, it is possible that the small sample size may have contributed to non-significant results because of the reduction in power to detect differences. Second, the use of one-item measures may have limited validity of our measures. Third, acculturation is a complex process

that has been conceptualized and measured in a variety of ways and we may have been limited in the current study to assess its impact on SRH knowledge and PAC scores (Guilamo-Ramos et al., 2005). Fourth, the high attrition rate indicates that our findings need to be interpreted with caution. Finally, the lack of a comparison group removed our ability to make causal inferences; hence, we cannot attribute change in SRH knowledge to ROTO ND participation.

Implications for Future Research

Future studies with a larger sample and more waves of data may further explain the associations between SRH knowledge and PAC, and sexual experience, religiosity, cultural awareness, immigration status, and gender. CSHEP providers working with at-risk adolescents need to be consider that less acculturated youth (i.e., those with low cultural awareness and immigrants) and boys may be particularly likely to have deficits in SRH knowledge. Targeting adolescents with lower SRH knowledge may help better tailor messages that resonate with adolescents and can be applied in their lives and lead to less risky sexual behavior. The CSHEP's culturally-sensitive approach may need to be strengthened. This can be done by providing interpreters and translating surveys into participants' languages. Further research is needed to determine ways to enhance methods of delivering medically accurate, age-appropriate, and culturally-sensitive SRH knowledge and promote PAC and increase SRH knowledge among ND adolescents. Such knowledge may help to decrease risky sexual behaviors and lead to a reduction in the rates of unintended pregnancy and STIs.

Conclusions

Despite declines in the rate of unintended pregnancy and STIs, progress is uneven with some states doing better than others (CDC, 2016; 2017; The Guttmacher Institute, 2015). ND is a state that continues to experience slow decline in unintended pregnancy and increases in some

STIs (CDC, 2017). The current study sheds light on two potentially modifiable variables, SRH knowledge and PAC, that have been found to be key prevention tools for unintended pregnancy and STIs because of their association with sexual behavior (Kapungu et al., 2010; Swenson et al., 2009; 2010). Our findings show that generally, SRH knowledge increased from pretest to posttest; however, the rate of change decreased over time. PAC did not change over time. Some adolescent groups are at greater risk of low SRH knowledge; namely, immigrants, participants with low cultural awareness, and boys. In addition, immigrants are also at risk of lower PAC. Considering these findings, some adjustments to intervention and prevention programs may help to improve effectiveness in increasing adolescents' SRH knowledge and PAC. Our results add to the literature on evidence-based programs for at-risk adolescents and provide critical information for improving CSHEPs. Finally, understanding longitudinal associations between SRH knowledge and PAC over time may help public health practitioners and CSHEP providers to better identify and work with adolescents at greatest risk for unintended pregnancy and STIs.

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