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Associations between Social Determinants of Health and Adolescent Pregnancy: An Analysis of Data from the National Longitudinal Study of Adolescent to Adult Health

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Associations between Social Determinants of Health and Adolescent Pregnancy:

An Analysis of Data from the National Longitudinal Study of Adolescent to Adult Health

by

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A dissertation submitted in partial fulfillment
of the requirements for the degree of
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ABSTRACT

This dissertation study utilized the National Longitudinal Study of Adolescent to Adult Health to analyze empirical relationships between social determinants of health and adolescent pregnancy. Although rates of adolescent pregnancy are at an all-time low in the United States, disparities persist. Examining relationships between the social determinants of health and adolescent pregnancy provides support for funding and interventions that expand on the current focus of individual and interpersonal level factors. Based on the Healthy People 2020 Social Determinants of Health Framework, proxy measures for social determinants of health were identified within the Add Health study and analyzed in relationship with adolescent pregnancy. Results indicated that six of 17 measures of social determinants of health had an empirical relationship with adolescent pregnancy. These measures included the following: feeling close to others at school, receipt of high school diploma, enrollment in higher education, participation in volunteering or community service, litter or trash in the neighborhood environment, and living in a two parent home. The results of this study can inform future research, allocation of funds and interventions based on social determinants of health that show an association with adolescent pregnancy

CHAPTER 1:

INTRODUCTION AND STATEMENT OF THE PROBLEM

Adolescent pregnancy is a public health issue in the United States that negatively affects the physical, social, academic and economic wellbeing of adolescents, children born to adolescents, and society as a whole (Chandra et al., 2005; Manlove et al., 2010; Perper et al., 2010). Although rates of adolescent pregnancy in the U.S. are at historic lows since 1990, marked variations exist across populations resulting in increased negative health and social outcomes for youth of certain race/ethnicities, geographic locations, and socioeconomic statuses (Kost & Henshaw, 2012). These disparities represent a health inequity that demands public health attention. Historically, adolescent pregnancy prevention has been approached from individual and interpersonal behavior change. Accordingly, the majority of federally funded programs are designed to intervene at these levels (Crenshaw et al., 2010; Deptula et al., 2010; Finer & Philbin, 2013; House et al., 2010; Reese et al., 2013; Kirby, 2007; OAH, 2013). Such programs intend to prevent adolescent pregnancy by modifying behavior change, often through behavioral antecedents such as attitudes, beliefs, and other mediating factors (OAH, 2013). However, often these programs do not take into account larger social factors that may play a critical role in impacting pregnancy.

There is currently a call to action for a social determinants of health approach to reduce health disparities (CDC, 2013). Although there are varying definitions of social determinants of health, as well as what is included or excluded from being a social determinant, the term can

generally be thought of as the differences in social conditions that lead to health inequities (WHO, 2013). The social determinants of health have been used to address a wide range of health outcomes, including areas as diverse as child health, oral health, cardiovascular health, and malaria prevention (WHO, 2013). Social determinants of health have also previously been applied to studying adolescent pregnancy in a variety of ways, although increased research is necessary (Maness & Buhi, 2015). An approach based on the social determinants of health may identify and alter factors contributing to adolescent pregnancy that are not feasible with individual or interpersonal behavior change approaches.

Statement of Need

Existing research that analyzes social determinants of health and adolescent pregnancy is sparse (Maness & Buhi, 2015). Although the Centers for Disease Control and Prevention have promoted utilizing social determinants of health as an approach to adolescent pregnancy prevention, widespread use has not yet occurred (CDC, 2013). It is also important to have supporting research upon which to base community intervention efforts to ensure that determinants targeted actually have correlations with adolescent pregnancy.

Consequences of Adolescent Pregnancy. Due to the consequences of pregnancy among adolescents and persisting disparities between age, geographic and racial/ethnic groups, an increase in research is needed to develop new approaches to pregnancy prevention (Ventura et al., 2006; Kost & Henshaw et al., 2012). Individuals who become pregnant during adolescence are at higher risk for adverse health outcomes (Martin et al., 2010; Matthews et al., 2010; Youngkin & Davis, 2006). These negative physical health outcomes during pregnancy include increased risk for hypertension and anemia (Martin et al., 2010). Hypertension in pregnant women increases the likelihood of preeclampsia, gestational diabetes, and placental abruption, all

of which may negatively affect the health of the woman and fetus (CDC, 2014). Hypertension as well as anemia, a result of iron deficiency, during pregnancy can also increase the risk for pre-term birth and low birth weight (CDC, 2014). Overall, adolescent pregnancies that result in birth carry a higher risk for preterm delivery, cesarean section, low birth weight, and infant death (Martin et al., 2010; Matthews et al., 2010; Youngkin & Davis, 2006).

In addition to physical health risks, adolescent pregnancy can also result in emotional strain, which can be tied to social, academic and economic factors (Chandra et al., 2005). Nearly two-thirds of births to females under the age of 18 are unintended, which increases the risk that the mother is not emotionally or financially prepared for pregnancy or to parent. This lack of emotional or financial preparation can increase the risk for infant injury and death as well as amplify the difficulty of meeting educational goals and gaining employment (Youngkin & Davis, 2006; Perper et al., 2010). Research has shown that adolescent mothers are comparatively at a disadvantage for achievement in school and are less likely to receive a high school diploma (Perper et al., 2010). Only 50% of adolescent mothers earn a high school diploma by the age of 22 in contrast to 90% of adolescents who do not give birth (Perper et al., 2010).

Although the consequences of adolescent pregnancy are most often reported for females, adolescents that father a child also face myriad risks. Data from the National Longitudinal Study of Adolescent to Adult Health found that adolescent fatherhood is associated with fewer years of schooling, lower receipt of high school diploma, as well as increased rates of cohabitation and marriage at a young age (Fletcher & Wolfe, 2012). One contrasting finding to females is that males who fathered a child as an adolescent were found to have an increase in employment status rather than a decrease (Fletcher & Wolfe, 2012).

In addition to health concerns at birth, the children of adolescent mothers are also at social, academic, and economic risk throughout the life span. Offspring of adolescent parents are more likely to experience abuse, to be placed in foster care, and to become pregnant during adolescence themselves (Manlove et al., 2010; Perper et al., 2010). These children are also at greater risk for difficulty with academic achievement, school dropout, and unemployment than those not born to an adolescent mother (Hoffman, 2008; Manlove et al., 2000). Male children of adolescent parents are 2.2 times more likely to be incarcerated during their lifetimes than male children born to older mothers (Hoffman, 2006).

Adolescent pregnancy and births have consequences not only at the individual level, but to society as a whole. Research has indicated that adolescents who give birth are more likely to use public assistance than those who do not and more likely to have children that enter the foster care system (Hoffman, 2006). In 2008, adolescent pregnancy and childbirth cost U.S. taxpayers nearly $11 billion dollars. These costs resulted from healthcare utilization, foster care, lost tax revenue due to lower economic potential and increased incarceration rates of children born to adolescent parents (National Campaign, 2011).

Trends and Disparities in Adolescent Pregnancy. CDC tracks pregnancy rates for adolescents ages 15-19 through the National Center for Health Statistics (NCHS). U.S. pregnancy rates are estimated based on the total live births, fetal losses, and abortions per year (Ventura et al., 2010). Data to calculate the abortion rate is provided to NCHS through the Guttmacher Institute's national census of abortion providers (Kost & Henshaw, 2014). These data are used to track as closely as possible all pregnancies that occurred rather than just those that resulted in birth. Due to these estimations, data for trends in overall pregnancy rates are not as frequently available as birth rates. The rate of adolescent pregnancies in 1990 was 116.8 pregnancies per 1,000 females.

An estimation of the pregnancy rate from 2010 indicated a rate of 57.4 pregnancies per 1,000 adolescent females, representing a significant drop since 1990 (Curtain et al., 2013; Kost & Henshaw, 2014).

Trends in adolescent pregnancy have varied across populations since 1990. Between 1990 and 2002, pregnancy rates for Hispanic adolescents dropped 19% in comparison with around 40% for black and white adolescents (Ventura et al., 2006). Data from 2008 showed that black and Hispanic women had more than twice the adolescent pregnancy rates then white women (Kost & Henshaw, 2012). Data estimating pregnancy rates did not include American Indian or Alaska Native populations (Ventura et al., 2006). In addition to race and ethnicity, age is an additional factor in adolescent pregnancy. Although two thirds of all adolescent pregnancies are among those ages 18 and 19, younger youth are also at risk for pregnancy. The age of menarche is at an average of 12 to 13 years old, making it physically possible for younger females to become pregnant (Kost & Henshaw, 2012; Potts, 1990). Between 1990 and 2002, the pregnancy rate for adolescents ages 15-17 dropped more dramatically (42%) than for older adolescents ages 18-19 (25%) (Ventura et al., 2006).

Trends and disparities in Adolescent Births. Trends in adolescent births differ from trends in adolescent pregnancies, because not all pregnancies result in birth. Birth rates are often easier to track than pregnancy rates because of the availability of birth records. The birth rate among 15 to 19 year olds declined 52% between 1991 and 2012 (Hamilton et al., 2012). In 2012, the lowest number of adolescent births was reported (305,420) since World War II (Hamilton et al., 2013).

Trends in the adolescent birth rate have varied across populations since 1990. The Hispanic birth rate has decreased a greater percentage than the overall population, down to 46.3 per 1,000 females in 2012 from 104.6 per 1,000 in 1991 (Hamilton et al., 2013). However,

Hispanic adolescents still have the highest birth rate of all racial and ethnic groups in the U.S. (Hamilton et al., 2012). For example, the 2012 adolescent birth rate was 43.9 per 1,000 black females, 34. 5 per 1,000 American Indian or Alaska Native and 20.5 per 1,000 white females (Hamilton et al, 2013).

Adolescent births are more common among older than younger adolescents, yet both have declined since 1990. In 2012, the birth rate for 15-17 year olds was 14.1 per 1,000 females in comparison with 51.4 per 1,100 for adolescents ages 18-19 (Martin et al., 2013). Also in 2012, 3,674 births were recorded for adolescents ages 10-14 (Hamilton et al., 2013). This is in comparison to 305,420 births for adolescents ages 15-19 (Hamilton et al., 2013). The birth rates for these two age groups were 0.4 per 1,000 and 29.4 per 1,000 respectively in 2012 in comparison with 1.4 per 1,000 and 61.8 per 1,000 in 1991 (Hamilton et al. 2013).

Trends in adolescent births also show disparities by geographic area (CDC, 2013). Southern and southwestern rates have higher adolescent birth rates in comparison with the rest of the country. In addition, rural counties in the U.S. have nearly one third higher the birth rate of urban counties when controlling for race/ethnicity (CDC, 2013).

The rate in adolescent fatherhood decreased 36% from 1991 to 2010. This represented a change from 25 to 16 per 1,000 males ages 15-19 and was a 50% decline among blacks and a 26% decline among whites (Martin et al., 2012). Reports of rates in adolescent fatherhood are different from those of adolescent females in part because men over age 20 have children with females under age 20, as well as births that are not acknowledged by the father (Fletcher & Wolfe, 2012).

Significance of Study

Although adolescent pregnancy and birth rates in the U.S. have dropped dramatically since 1990, they are still higher than in other developed countries (McKay, 2010). To put it into perspective, in 2006 the pregnancy rate was still more than twice as high as rates in Canada (28 pregnancies per 1,000 females) and Sweden (31 pregnancies per 1,000 females (McKay, 2010). Adolescent pregnancy includes a host of consequences for both the individual and society as a whole, making it a vital issue for public health. Understanding trends in adolescent pregnancy is important due to the lasting effects on the health, academic, economic and social wellbeing of adolescents affected by pregnancy and their children, as well as the U.S. as a whole in terms of social and economic concerns. A dissertation study that examines links between social determinants of health and adolescent pregnancy using an organizing framework is an opportunity to contribute to the field of public health in several key areas including research, practice, and policy.

Few studies on adolescent pregnancy have utilized a framework or analyzed a broad range of social determinants of health in one study. The research implications of this are that this study was able to analyze multiple determinants within a single population to examine the strength of relationships with determinants and shed light on determinants with the strongest links to adolescent pregnancy. Based on the outcomes of this study, future studies can analyze specific pathways between social determinants found to be associated with adolescent pregnancy.

Practice implications of the current research are that it highlights areas where current practice is supported by research and where it is not. This could promote adolescent pregnancy prevention programs that focus on social determinants of health, which have been identified to

be related to adolescent pregnancy. Identifying pathways from social determinants of health to pregnancy could amplify existing programs rather than replace them.

This study also has the potential to advance public policy surrounding adolescent pregnancy prevention. Results of the study could support a push for increasing federal funding for programs or initiatives that address the social determinants of health (CDC, 2013). This study can give guidance as to which social determinants have links to adolescent pregnancy and support or expand components of programs that are most effective for youth.

Purpose of the Study

The purpose of the dissertation study is to empirically examine the relationships between social determinants of health and adolescent pregnancy based on a framework of social determinants of health. The selected framework is the Healthy People 2020 Social Determinants of Health Framework (USDHHS, 2013).

Research Questions

The research questions are as follows: 1) Is there a bivariate association between adolescent pregnancy and each element of the Social Determinants of Health? 2) If an association exists, then a) what is the strength and direction of the association and b) does the association remain after controlling for additional factors? As explored in question two, more research is required to determine links between adolescent pregnancy and social determinants, as well as research that analyzes multiple social determinants in the same study sample. In order to prioritize funding and policy for social determinants of health, it is important to have a clear idea of which social determinants have an impact on adolescent pregnancy and the strength of the relationship. Key areas are broken down by the five sections of the Healthy People 2020 Social Determinants of Health Framework (Figure 1).

Hypotheses

This study uses a framework that contains many social determinants of health, some of which have shown previous evidence of a relationship with adolescent pregnancy and some of which have not previously been studied. The proxy measures of social determinants of health, including poverty, family structure, incarceration, and physical environment, are hypothesized to show a significant relationship with adolescent pregnancy (Maness & Buhi, 2015). Due to the paucity of research in other areas of social determinants of health, it is the purpose of the study to determine where relationships exist that may not have been previously studied or expected.

Overview of the Study

This study utilized secondary data from the National Longitudinal Study of Adolescent to Adult Health (Add Health) to analyze the relationships between social determinants of health and adolescent pregnancy (Add Health, 2013). The social determinants of health analyzed were based on the Healthy People 2020 Social Determinants of Health Framework (USDHHS, 2013). Bivariate tests and logistic regression were employed to examine the relationship between each social determinant of health and adolescent pregnancy both individually and in relationship to one another. Data were analyzed using SAS Version 9.2 (SAS, 2008).

Definition of Terms

Access to Employment: The opportunity for a person to enter into employment, either for themselves or for others (Eurofound, 2011).

Access to Health Services- including clinical and preventative care: Includes components of health insurance coverage, usual and ongoing source of care, ability to receive care quickly after a need is recognized, and an adequate number of primary care providers from which to receive care (USDHHS, 2013)

Access to Healthy Foods: Access to healthy foods includes convenient physical access to grocery stores and other retailers that sell a variety of healthy foods; prices that make healthy choices affordable and attractive; a range of available healthy products; and adequate resources for consumers to make healthy choices (Letsmove.gov, n.d.)

What is the relationship between adolescent pregnancy and economic stability? Key Areas: • Poverty • Employment Status • Access to Employment • Housing Stability
What is the relationship between adolescent pregnancy and education? Key Areas: • High School Graduation Rates • School Policies that Support Health Promotion • School environments that are safe and conducive to learning • Enrollment in higher education
What is the relationship between adolescent pregnancy and the social and community context? Key Areas: • Family Structure • Social Cohesion • Perceptions of Discrimination and Equity • Civic Participation • Incarceration/Institutionalization
What is the relationship between adolescent pregnancy and health and healthcare? Key Areas: • Access to Health Services • Access to Primary Care • Health Technology
What is the relationship between adolescent pregnancy and neighborhood and built environment? Key Areas: • Quality of Housing • Crime and Violence • Environmental Conditions • Access to Healthy Food

Figure 1. Research questions based on Healthy People 2020 social determinants of health framework.

Access to Primary Care: Having a primary care provider as a usual source of care (USDHHS, 2013)

Civic Participation/Civic Engagement: The ways in which citizens participate in the life of a community in order to improve conditions for others or to help shape the community's future (Adler & Goggin, 2005).

Crime: Includes violent crimes, property crimes, and victimization from crimes of violence (USDHHS, 2013).

Employment Status: Whether individuals in the civilian non-institutional population did work for pay or profit within the last week or were temporarily absent from a job or business in the last week (U.S. Census, 2004).

Enrollment in Higher Education: Enrollment in a 2 or 4 year college. (USDHHS, 2013)

Environmental Conditions: Safe air, land, and water are fundamental to a healthy community environment. Environmental hazards like secondhand smoke, carbon monoxide, allergens, lead, and toxic chemicals, can cause disease and other health problems. (USDHHS, 2013)

Family Structure: The combination of relatives that comprise a family. Considers the presence or absence of: legally married spouses or common law partner; children; and in the case of economic families, other relatives. (statcan.gc.ca, 2012).

Health Technology: The context and the ways professionals and the public search for, understand, and use health information, significantly impacting their health decisions and actions. (USDHHS, 2013)

High School Graduation Rates: Definition: Graduation with a regular diploma 4 years after starting 9th grade (USDHHS, 2013)

Housing Stability: Having difficulty paying rent, spending more than 50% of household income on housing, having frequent moves, living in overcrowded conditions, or living with friends and relatives. (Kushel et al., 2006).

Incarceration/Institutionalization: Being held in a in a prison, jail, or other confinement facility (BJS, n. d.).

Perceptions of Discrimination: A behavioral manifestation of a negative attitude, judgment or unfair treatment towards members of a group (Banks et al., 2006)

Poverty: The poverty level is based on money income and does not include noncash benefits, such as food stamps. Poverty thresholds reflect family size and composition and are adjusted each year using the annual average Consumer Price Index level. (USDHHS, 2013).

Pregnancy: Pregnancies that result in birth, abortion, miscarriage or stillbirth (Kost & Henshaw, 2014).

Quality of Housing: Housing quality includes factors such as ventilation, lighting, disease vectors in the home, and overcrowding, which can affect health (WHO, n.d.).

School Environments that are Safe and Conducive to Learning: A positive school climate is the product of a school's attention to fostering safety; of a supportive academic, disciplinary, and physical environment; and of respectful, trusting, and caring relationships throughout the school community no matter the setting (AIR, 2014).

School Policies that Support Health Promotion: A health promoting school is one that constantly strengthens its capacity as a healthy setting for living, learning and working (WHO, 2014).

Social Cohesion: The extent of connectedness and solidarity among groups in society (Kawachi & Berkman, 2000)

Social Determinants of Health: The conditions in which people are born, grow, live, work and age. These circumstances are shaped by the distribution of money, power and resources at global, national and local levels (WHO, 2013).

Violence**:** Indicators include homicide, fire-arm related deaths and injuries, physical assault, physical fighting among adolescents, bullying among adolescents, weapon carrying by adolescents on school property, child maltreatment, intimate partner violence (including physical, sexual, psychological and stalking) , rape, abusive sexual contact, non-contact sexual abuse, intentional self- harm, and children's exposure to violence (USDHHS, 2

CHAPTER 2:

REVIEW OF THE LITERATURE

Introduction

Adolescent pregnancy is a public health issue in the United States that has traditionally been addressed by the federal government using individual and/or interpersonal interventions (OAH, 2013). Although a multitude of evidence-based pregnancy prevention programs exist and have shown effectiveness, health disparities in adolescent pregnancy remain (CDC, 2013; OAH, 2013). The social determinants of health have been introduced as an alternative or additional method to address adolescent pregnancy. Within the past decade, the popularity of social determinants of health to increase health equity has risen, along with a multitude of definitions of the term (WHO, 2008). Research linking social determinants of health and adolescent pregnancy has shown promising developments, but large gaps in the literature remain (Maness & Buhi, 2015).

Pregnancy Prevention Initiatives

The federal government has historically addressed adolescent pregnancy through the funding and support of programs that are predominantly individual and interpersonal based. The federal response to address adolescent pregnancy has historically included support for abstinence-only sex education programs, including the Adolescent Family Life Act, Title V-funded abstinence-only-until-marriage education, Community-Based Abstinence Education, and Competitive Abstinence Education Program Grants (The National Campaign, 2013; FYSB,

2013; Howell & Keefe, 2007). More recent legislation has supported the inclusion of evidence-based comprehensive sex education with ongoing abstinence-based initiatives to address adolescent pregnancy. These programs are the Personal Responsibility Education Program, the Office of Adolescent Health's (OAH) Adolescent Pregnancy Prevention Program, Pregnancy Assistance Fund, and partnership with the Center for Disease Control and Prevention (CDC) on the President's Adolescent Pregnancy Initiative (CDC, 2013; The National Campaign, 2013; OAH, 2014).

Among evidence-based adolescent pregnancy prevention programs, 31 have been designated by OAH as rigorous after external evaluation and are supported by the federal government (OAH, 2012). A review by Kirby (2007) identified a similar subset of evidence-based programs, including a large overlap with the OAH programs. These programs have been implemented in a variety of settings and evidence for their success is based on program evaluations (Figure 1) (Kirby, 2007; OAH, 2012).

Adolescent Pregnancy Program. The Office of Adolescent Pregnancy Programs (OAP) was started in 1978 as the first federal programmatic response to adolescent pregnancy (OPA, n.d.). Title VI of the Public Health Service Act allowed the creation of the Adolescent Pregnancy Program to provide services to adolescents who were pregnant or already had a child as an adolescent (OPA, n.d.). The Adolescent Family Life Act replaced this program in 1981 (OPA, n.d.)

American Family Life Act. The Adolescent Family Life Act (AFLA) was passed in 1981 under the Reagan administration to give grants to public agencies and nonprofits related to adolescent pregnancy (Howell & Keefe, 2007; Mecklenburg & Thompson, 1983; OPA, n.d.). This act, Title XX of the Public Health Service Act, was passed without hearings or floor votes

from Congress and directed funds towards primary and secondary prevention as well as research and healthcare projects related to adolescent pregnancy (Mecklenburg & Thompson, 1983; SIECUS, 2011). In 1982 AFLA became the first federal support of abstinence-only sex education (Howell & Keefe, 2007; Mecklenburg & Thompson, 1983). Prior to this time public school sex education included basic information about puberty and hygiene. This was considered by conservative groups to be ineffective, resulting in a push for abstinence-based education (Goodson & Buhi, 2012). In 1988, AFLA was accused of violating the separation of church and state by giving funding to faith-based organizations, which resulted in legal action (SIECUS, 2011). After this lawsuit, faith-based organizations still received funds through AFLA, but were not allowed to use government money for the purposes of teaching or promoting religion (SIECUS, 2011).

The original law that passed AFLA mandated that two-thirds of funding go towards health care and one-third towards pregnancy prevention (Howell & Keefe, 2007). This rule was amended in 1997 to allow more funding for abstinence-only education. Programs receiving funding for abstinence-only sex education were required to follow a mandated eight-point definition of abstinence education that remains prominent in abstinence-based education today (Figure 1).

Funding for AFLA fell throughout the decades following 1980 up until the early 2000s. Between 2005 and 2009, its abstinence-only programs received $13 million per year (Howell & Keefe, 2007). During the height of its funding in 2005, AFLA received a poor government performance review which stated that the program did not properly assess results due to poor strategic planning (Howell & Keefe, 2007). However, despite this negative review AFLA continued to receive funding and award grants. In 2010, funding was completely cut for the part

of AFLA related to abstinence-only education due to the *Consolidated Appropriations Act of 2010* that ended discretionary funding for abstinence-only-until-marriage-programs (SIECUS, 2011). In 2012, AFLA was moved from oversight from the Office of Population Affairs to the Office of Adolescent Health (OAH) (OAPP, n.d.).

Title V-funded abstinence-only-until-marriage education. Title V-funded abstinence-only-until-marriage education began when welfare reform was passed in 1996, with the purpose of providing states with funding for abstinence education (Howell & Keefe, 2007; SIECUS, 2011). This program resulted in the creation of the 8-point definition of abstinence education that would be used in requirements for several federal pregnancy prevention programs, including AFLA and Community-Based Abstinence Education (Figure 1) (SIECUS, 2011). Funding for Title V-funded abstinence-only-until-marriage education is allocated to states based on the proportion of low-income children in each state (Howell & Keefe, 2007). States must match three dollars for every four federal dollars given, increasing funding from $50 to $87 million per year.

In 2004, the oversight of Title V-funded abstinence-only-until-marriage education was switched from the Maternal and Child Health Bureau (MCH) to the Administration for Children, Youth and Families (ACF) (Howell & Keefe, 2007). This switch resulted in a tightening of standards for grant eligibility, including that each of the 8-point definition of abstinence education must be given equal attention in teaching, as well emphasizing that the promotion of contraceptives could not be used in curricula (Howell & Keefe, 2007). This meant that programs were not allowed to teach about contraceptives unless if providing information about their failure rates and were required to state that sex outside of marriage is physically and psychologically

harmful (Howell & Keefe, 2007). In addition, funds could only be used among youth ages 12-29, preventing any funds going towards pre-adolescents (Howell & Keefe, 2007).

As a result of the strict guidelines implemented in 2004, states began to turn down grant money from this initiative (Howell & Keefe, 2007). Several of the guidelines were again changed in the following years, and as of 2013, grantees can decide what emphasis to place on each of the 8-points of the definition of abstinence education (FYSB, 2013). Funds can also be used for counseling, adult supervision or mentoring that supports abstinence (FYSB, 2013).

In 2013, $36.9 million dollars was distributed to states for direct use of funds, or for distribution to community organizations, schools and health departments (FYSB, 2013; Howell & Keefe, 2007). As of 2013, the program is promoted as focusing on pregnancy prevention among youth ages 10-19 with an emphasis on homeless, foster care, and minority populations (FYSB, 2013). According to the Family and Youth Services Bureau (FYSB), a division of ACF, these goals are worked towards with an emphasis on supporting beliefs about abstinence, education about sexually transmitted infections, (STIs) and building skills to resist peer pressure (FYSB, 2013). Although there are not strictly regulated guidelines on all of these factors, states are provided with outcome measures and encouraged to use theoretical frameworks, conduct programs over an extended period of time, use trained educators and use professionals for curriculum development (FYSB, 2013). As of 2014, Title V-funded abstinence-only-until-marriage education is funded for $50 million annually (FYSB, 2013).

Community-Based Abstinence Education. U.S. Congress created Community-Based Abstinence Education (CBAE) in 2000 as a competitive grant within the Maternal and Child Health Block of funding (Howell & Keefe, 2007). Community organizations were able to apply directly for these grants (SIECUS, 2011). CBAE grants were among the most restrictive of all

funding for abstinence-based education and had strict rules for grantees to be eligible for the funds. These rules include that programs target youth only between the ages of ages 12-18 and follow all components of the 8-point definition of abstinence (Table 1).

CBAE was initially funded with $20 million in 2001, but under the support of the Bush administration funding increased to $113 million by 2007 (Howell & Keefe, 2007). In 2005, the governmental organization responsible for CBAE was changed from the Maternal and Child Health Bureau to the Administration for Children, Youth and Families (ACF) (Howell & Keefe, 2007). After this change, ACF further restricted the requirements for CBAE funding. Changes included that programs promoting the use of contraceptives were not eligible for funding and an emphasis that abstinence included abstaining from all types of sexual activity, not just sexual intercourse (SIECUS, 2011). A report released by the Government Accountability Office after the transition indicated that ACF was not verifying that grantees were using scientifically accurate information nor requiring that grantees ensure their own material was scientifically accurate (GOA, 2008). This report put pressure on ACF to modify grantee requirements and the 2007 announcement stated that grantees were required to use scientifically accurate material when using CBAE funds (SIECUS, 2011).

In 2008 a congressional hearing on abstinence-only-until-marriage programs revealed a lack of evidence of the effectiveness of these types of programs and began a push to end funding for initiatives like CBAE (SIECUS, 2011). Funding was first cut for CBAE in 2009, when $14.2 million was removed from the budget (SIECUS, 2011). In 2010, all funding for CBAE was ended with the passing of the *Consolidated Appropriations Act of 2010* that eliminated discretionary funds for all abstinence-only-until-marriage programs (SIECUS, 2011).

Competitive Abstinence Education Program Grants. The Competitive Abstinence Education Program Grants began in 2012 and were funded with $5 million (National Campaign, 2013). This program, headed by the Family and Youth Services Bureau (FSYB) funds 9 grants per year. The purpose of this program is to provide abstinence education to youth at highest risk of pregnancy (FSYB, 2013). Competitive Abstinence Education Program Grants do not have requirements for evidence-based programming, but do require that that grantees use the 8-point federal definition of abstinence education (National Campaign, 2013). These grants continue to be funded as of 2013 (FSYB, 2013).

Personal Responsibility Education Program. The Personal Responsibility Education Program funds both abstinence and comprehensive sex education programs that are medically accurate, age appropriate, and evidence-based (National Campaign, 2013). This program began in 2010 as part of the Affordable Care Act and is overseen jointly by FYSB and ACYS (FYSB, 2013). A sum of 75 million dollars is allotted per year to support the prevention of both adolescent pregnancy and STI transmission in youth at highest risk and in areas with the highest rates (National Campaign, 2013).

If a state does not apply for funding from PREP for two years in a row, the additional funds go into a pot that is available for other states (National Campaign, 2013). Competitive PREP grants are awarded to organizations in states that did not apply for funding and an additional $10 million is awarded to organizations that apply to develop innovative strategies to prevent adolescent pregnancy (National Campaign, 2013). Lastly, PREP Tribal Grants are funded at $3.5 million a year and awarded to American Indian tribes for pregnancy prevention programs (National Campaign, 2013).

Office of Adolescent Health Adolescent Pregnancy Prevention Program. The OAH Adolescent Pregnancy Prevention Program was started in 2010 as five-year competitive grants for organizations to replicate existing and implement innovative evidence-based pregnancy prevention programs (CDC, 2013; OAH, 2014). The program started with $110 million a year in funds, which was cut to $105 million in 2011 where it remains as of 2014 (OAH, 2014). Grants are divided into two categories: Tier one grants are given to replicate existing evidence-based programs and Tier two grants are to develop and test more programs (CDC, 2013). Each year, $75 million is given to Tier one grants, $25 million to Tier two grants, and $5 million used for grantee program support (CDC, 2013). These grants are awarded to public and private organizations on a competitive basis (OAH, 2014).

As part of Tier two grants and the President's Adolescent Pregnancy Initiative, CDC and OAH partner to offer community wide grants (CDC, 2013). This initiative, which allows evidence-based or innovative programs, is focused on Hispanic and African American youth due to health disparities in adolescent pregnancy among these populations (CDC, 2013). The five key components of this partnership are: community mobilization and sustainability, evidence-based programs, increase access to contraceptive and reproductive services, educating stakeholders, and working with diverse communities (CDC, 2013). This portion of the program also aims to identify and address specific social determinants of health. This includes examples such as identifying specific social determinants associated with adolescent pregnancy in Alabama, community-based assessments in Connecticut, and examining access to reproductive services in South Carolina (CDC, 2013).

Office of Adolescent Health Pregnancy Assistance Fund. The OAH Pregnancy Assistance Fund provides state grants for adolescents who are already pregnant or parenting

(National Campaign, 2013). This program began in 2013 as part of the Affordable Care Act (OAH, 2014). Each year, $25 million in competitive grants is awarded for support to help with school, health and childcare; to improve services for those in situations of domestic violence; and to raise public awareness of adolescent pregnancy (OAH, 2014).

Table 1**.** The 8-point federal definition of abstinence education.

For purposes of this section, the term "abstinence education" means an educational or motivational program which—
A. has as its exclusive purpose, teaching the social, psychological, and health gains to be realized by abstaining from sexual activity;
B. teaches abstinence from sexual activity outside marriage as the expected standard for all school age children;
C. teaches that abstinence from sexual activity is the only certain way to avoid out-of-wedlock pregnancy, sexually transmitted diseases, and other associated health problems;
D. teaches that a mutually faithful monogamous relationship in context of marriage is the expected standard of human sexual activity;
E. teaches that sexual activity outside of the context of marriage is likely to have harmful psychological and physical effects;
F. teaches that bearing children out-of-wedlock is likely to have harmful consequences for the child, the child's parents, and society;
G. teaches young people how to reject sexual advances and how alcohol and drug use increases vulnerability to sexual advances; and
H. teaches the importance of attaining self-sufficiency before engaging in sexual activity.

Note: Descriptive note. Reprinted from "Compilation of the social security laws". Social Security Administration, 2010.

Evidence-based Pregnancy Prevention Programs

OAH identifies 31 programs as evidence-based, which means they met criteria for effectiveness in a review of over 1,000 studies (Table 2) (OAH, 2013). The 31 OAH supported evidence-based programs are described in detail below, including settings in which they were implemented and evidence upon which OAH evaluated them for success. In the OAH review, programs must have shown evidence through evaluation that they prevent adolescent

pregnancies or births, reduce STIs or reduce other risk behaviors (OAH, 2013). Due to this broad criteria, some programs that are supported as evidence-based are STI or HIV prevention programs that were not developed specifically for pregnancy prevention. In addition, OAH reviewed only outcome variables that met review evidence standards, therefore some studies included sexual behavior outcome variables that were not included in the review (OAH, 2013).

In addition to the OAH program review, a review by Kirby (2007) identified adolescent pregnancy prevention programs that showed strong evidence of positive impact on sexual behavior, pregnancy, or STD rates (Table 2) (Kirby, 2007). Rather than publishing the unique characteristics of each selected program, Kirby listed a general set of elements to program success and a separate table of supported programs. Eleven of these programs overlap with programs identified as evidence-based by OAH (Kirby, 2007; OAH, 2013). These previously described programs include Aban Aya, BART, Children's Aid Society Carrera Program, ¡Cuídate!, Draw the Line, Respect the Line, Making Proud Choices!, Reducing the Risk, Safer Choices, SiHLE, Adolescent Health Project, and Adolescent Outreach Program (Kirby, 2007). Four additional programs were supported by Kirby and are called Keepin' it R.E.A.L., Advance provision of emergency contraception, Reproductive Health Counseling for Young Men, and Reach for Health Community Youth Service Learning.

Among evidence-based programs cited by OAH and Kirby (2007), the majority of programs are aimed at the individual level. Programs range from a one-time session to several years of intervention and include a variety of settings, such as school, community, and clinic-based. Several programs are tailored especially for minority youth: Sisters Saving Sisters, SiHLE, Respeto/Proteger, HORIZONS, ¡Cuídate!, BART, Aban Aya Youth Project (OAH, 2012). In addition, several programs are for specialized settings or groups including juvenile

detention centers (HIV Risk Reduction among Detained Adolescents; Rikers Health Advocacy Program), substance dependent youth (ARK), youth with parents living with HIV (Project TALC), and adolescent mothers (Be Proud! Be Responsible! Be Protective!).

Evaluation outcomes for evidence- based programs ranged from contraceptive use to measures of sexual intercourse and pregnancy. Length of follow up was most commonly six or twelve months, with one study that followed up four years after the intervention was completed. (Rotheram-Borus et al., 2003). Thirteen studies found at least one significant result at one year follow-up (St. Lawrence et al., 2002; Konia-Griffin, 2003; St. Lawrence et al., 2005; Villarreal et al., 2013; Coyle et al., 2004; Boyer et al., 2005; Weed et al., 2011; Decremented et al, 2009; Torturer et al., 2010; Bryan et al., 2009; Decremented et al., 2004; Jabot et al., 2005). Two evaluations found no significant effects for females, these programs included the Aban Aya Youth Project and Draw the Line, Respect the Line (Flay et al., 2004; Coyle et al., 2004). The majority of the current evidence-based programs for adolescent pregnancy prevention are individual based to teach knowledge and skills surrounding pregnancy prevention, whether from an abstinence or comprehensive standpoint.

Table 2. Evidence-based pregnancy prevention programs supported by OAH and Kirby.

Program	**Kirby**	**OAH**
Aban Aya	X	X
Advance provision of emergency contraception	X	
All4You!		X
Assisting in Rehabilitating Kids		X
Becoming a Responsible Adolescent	X	X
Be Proud, Be Responsible!		X
Be Proud, Be Responsible, Be Protective!		X
Children's Aid Society Carrera Program	X	X
¡Cuídate!	X	X
Draw the Line, Respect the Line	X	X

Table 2 (Continued)

Heritage Keepers Abstinence Education		X
FOCUS		X
Horizons		X
It's Your Game: Keep it Real		X
Keepin' it R.E.A.L.	X	
Making a Difference!		X
Making Proud Choices	X	X
Project AIM		X
Project TALC		X
Promoting Health Among Adolescents! Abstinence Only		X
Promoting Health Among Adolescents! Comprehensive		X
Raising Healthy Children		X
Reach for Health Program	X	
Reducing the Risk	X	X
Reproductive Health Counseling for Young Men	X	
Respeto/Proteger		X
Riker's Health Advocacy Program		X
Safer Choices	X	X
Safer Sex		X
SHARP		X
SiHLE	X	X
Sisters Saving Sisters		X
Adolescent Health Project: HIV Prevention for Adolescents in Low-Income Housing	X	X
Adolescent Outreach Program	X	X
What Could You Do?		X

Note: Descriptive note. Reprinted from "Preventing risky sexual behavior". Buhi, E. R., Maness, S., & Mahony, H, 2013. Unpublished book chapter

History of Social Determinants of Health

Social determinants of health was first used as a term in the 1970s (Wilde, 2007). Upon its first use, the purpose was to steer away from the idea of individual causes of disease (CDC, 2009). This reflected a shift from the biological perspective of the 1950s to one of community action in the 1960s and early 1970s (WHO, 2005). In 1978, at the International Conference on Primary Healthcare, the Alma-Ata Declaration on Primary Health Care emphasized the importance of addressing social conditions to influence health (Solar & Irwin, 2010). Social

determinants of health became less popular in the 1980s as a reflection of economic conditions focused on privatization and free markets (WHO, 2005). In the early 2000s, social determinants of health began to receive more recognition in public health, particularly in Europe, and several independent researchers published definitions of the term (Kindig, 2007; Krieger, 2001; Raphael, 2004). Upon the World Health Organization's (WHO), 2005 creation of the Commission on Social Determinants of Health, government agencies and other organizations worldwide began to take notice and develop initiatives related to the social determinants of health (WHO, 2014).

Definitions of Social Determinants of Health

Although there is no single definition of social determinants of health, the concept is widely used and has gained popularity in recent years. (Ansari, 2003; Dahlgren & Whitehead, 1991; Kindig, 2007; Krieger, 2001; Raphael, 2004; Taylor, 2012; USDHHS, 2008; WHO, 2013). Organizations and individual researchers have developed varied definitions and frameworks of social determinants of health. However, all rest upon the premise that social factors are in some way related to health outcomes.

Institutions. *World Health Organization (WHO).* The World Health Organization (WHO) is a major proponent of examining and implementing a social determinants of health approach on a global scale (WHO, 2013). WHO's main goal is to use the social determinants of health to reduce global health inequities. Research and recommendations have influenced other organizations to develop strategies to address social determinants of health. WHO defines social determinants of health as "The conditions in which people are born, grow, live, work and age. These circumstances are shaped by the distribution of money, power and resources at global, national and local levels" (WHO, 2013). The idea behind this definition is that the differences in

social conditions lead to health inequities, which are differences in health status both within and between individual countries.

In 1998, the WHO Regional Office for Europe, in partnership with the University College London, produced *The Solid Facts*, which focused on the social determinants of health in Europe (Wilkinson & Marmot, 1998). The purpose of this report was to promote awareness, debate and action. A second edition of this work with updated evidence was published in 2003 (Wilkinson & Marmot, 2003). The messages in the report were divided into 10 sections: the social gradient, stress, early life, social exclusion, unemployment, social support, addiction, food and transport. To exemplify interest in the topic, within one year the updated version of the report had more than 218,000 downloads (Marmot, 2005).

In March 2005 the former WHO Director-General, Dr. J.W. Lee, created the Commission on Social Determinants of Health in order to promote health equity not only in Europe, but globally (WHO 2008; WHO, 2013). This initiative began with a three-year period of gathering research and information on social determinants. The committee was led by chair, Sir Michael Marmot (Marmot, 2005; WHO, 2013). During the three years of information gathering, knowledge networks of policy makers, researchers and organizations were formed in nine key areas of social determinants of health. These nine areas were employment conditions, social exclusion, priority public health conditions, women and gender equity, early childhood development, globalization, health systems, measurement and evidence, and urbanization (WHO, 2013). Members of the knowledge networks completed extensive research to build a knowledge base including pathways and models of social determinants of health in their key area, which were compiled for the 2008 WHO final report (WHO, 2008).

After the three-year information-gathering period, the Commission on Social Determinants of Health published a report to disseminate recommendations (WHO, 2008). The report acknowledged that social and economic policies have an impact on health, yet historically the healthcare sector has been seen as the only responsible agency for dealing with health concerns (WHO, 2008). The report highlighted commissioners' feelings of "passion for social justice, respect for evidence, and frustration that there was far too little action on the social determinants of health" (WHO, 2008, p. 3). In addition, the Commission acknowledged that while the phrase social determinants of health is new, the ideas of social change behind it are no different from past movements such as the labor movement or civil rights movement (WHO, 2008).

A conceptual framework was created for the Commission, which included a focus of taking action on circumstances and structural drivers of everyday life. This conceptual framework is different from many other models because it considers the health system itself to be a social determinant of health (Solar & Irwin, 2010). This model also differentiates between structural determinants, which we think of as the social determinants of health, and intermediary determinants such as material, biological, and behavioral factors, which influence structural impact on health.

Another major statement brought forth by the Commission was that the gold standards of scientific research, including randomized controlled trials, do not often work well in studies of large scale social conditions and there is a need to develop new approaches for studying social determinants of health. When knowledge networks compiled evidence, they were permitted to use research including observational studies and community trials (WHO, 2008).

The Commission's final report indicated three key areas upon which to focus: improve daily living conditions, address inequitable distribution of power, money and resources, and measure and understand the problem as well as assess impact of action (WHO, 2008). The final report also included a four part research agenda (WHO, 2008). First, to understand the reasons why there is a relationship between social determinants and health outcomes as well as to understand the interactions between stratifications such as gender or ethnicity and health outcomes. The second research agenda item was regarding interventions to address social determinants of health. This facet encouraged the need to evaluate interventions as well as the costs and benefits of implementation. Next, policy analysis was discussed and the need to both analyze policy processes as well as understand contextual factors. The final research goal was to develop new methods for monitoring and measuring social determinants of health as well as the impact of related interventions. The Commission on Social Determinants of Health also shared what roles different groups should play, recognizing that global change cannot be sustained without action from global, national, and local levels (WHO, 2008).

At the 2011 World Conference on Social Determinants of Health in Rio de Janeiro, Brazil, the Rio Political Declaration was adopted by member states as a global commitment addressing social determinants of health (WHO, 2013). This commitment was again endorsed at the 2012 65th World Health Assembly in Geneva, Switzerland. Evidence of WHO's commitment to addressing the social determinants of health can be found in the actions of independent government and other agencies citing the commission and engaging in greater research and action regarding the social determinants of health (CDC, 2012; Mikkonen & Raphael, 2010). WHO remains a global leader in using the social determinants of health to promote health equity.

Centers for Disease Control and Prevention (CDC). CDC's website description of social determinants of health uses the WHO definition of the concept (CDC, 2012). CDC provides a description of activities within the agency that are devoted to social determinants of health, including minority initiatives and work groups for health equity as well as work within the Racial and Ethnic Disparities Action Institute within the Office of Minority Health and Health Equity (CDC, 2013). Health Equity was added to the title of the Office of Minority Health as part of the Affordable Care Act in 2011 (CDC, 2013).

Much of the publicized work that CDC has conducted related to social determinants of health has been through infectious disease, primarily the National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention (NCHHSTP) (CDC, 2009). In 2008, NCHHSTP invited external consultants to help determine priorities for social determinants of health (CDC, 2009). A final report indicated areas of need in the following areas: policy, data systems, agency partnerships, capacity building, prevention research and evaluation (CDC, 2009). Following this initiative, the division published a white paper on using social determinants to reduce HIV, viral hepatitis, STDs, and tuberculosis in the U.S. (CDC, 2013). In 2013, a five-year report was published including changes made to the strategic plan and public health work by the incorporation of a social determinants of health approach (Dean & Fenton, 2013). In 2013, the final of three Public Health Reports supplements on Social Determinants of Health was published, including research on applying social determinants of health to practice (CDC, 2013).

Specifically related to adolescent pregnancy, CDC is partnering with the Office of Adolescent Health (OAH) and Assistant Secretary for Health (ASH) to offer community based grants that address social determinants of health (CDC, 2013). From 2010-2015, nine organizations have been funded. This initiative, although small, is working to identify specific

social determinants of health linked with pregnancy in different states as well as implementing programs related to incarceration, poverty, employment, foster care, and healthcare access (CDC, 2013).

Healthy People 2020. In the planning stages of Healthy People 2020, following Healthy People 2010, the Secretary's Advisory Committee released a report encouraging social determinants of health to be prioritized (USDHHS, 2008). Although the WHO definition of social determinants of health is listed on the Healthy People 2020 website, Healthy People 2020 includes a slightly different description of the social determinants of health, stating that "Social determinants of health are conditions in the environments in which people are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes and risks." (USDHHS, 2013).

A further description includes both social and physical determinants in their description of social determinants of health (USDHHS, 2013). This is in part due to the fact that one of the four overarching goals of Healthy People 2020 is "Create social and physical environments that promote good health for all" (USDHHS, 2013). This means, in addition to issues such as access to healthcare and social support, the physical environment, such as community design and physical barriers is included. As part of the goal to address social determinants of health, Healthy People 2020 created a place-based organizing framework (Figure 2). This framework distinguishes five key areas of social determinants and goes into detail regarding critical components in each key area (Table 3) (USDHHS, 2013). The five key components prioritized by Healthy People 2020 are neighborhood and built environment, health and healthcare, social and community context, education, and economic stability.

Figure 2. Healthy People 2020 social determinants of health framework
Note: Descriptive note. Reprinted from "Social determinants of health." 2013, U.S. Department of Health and Human Services.

York University Conference in Toronto. At the 2002 York University Conference in Toronto, a Canadian model of social determinants of health was developed (Raphael, 2009). This model includes the following 14 social determinants of health: aboriginal status; disability; early life; education; employment and working conditions; food insecurity; health services; gender; housing; income and income distribution; race; social exclusion; social safety net; and unemployment and job security.

Women's Health West. Influenced by the WHO Commission on Social Determinants of Health 2010 report, the Australian, Women's Health West organization put together a working group on the social determinants of sexual and reproductive health (Taylor, 2012). This group published a report related to the social determinants of sexual and reproductive health in

Australia and developed a framework which in part included the social determinants of health. As part of a larger framework, the social determinants of health section included subsections of poverty and socio-economic status, violence and discrimination, gender norms, public policy and the law, cultural norms, and access to affordable culturally appropriate health services (Taylor, 2012).

Table 3. *Components of Healthy People 2020 social determinants of health framework*

Each of these five determinant areas reflects a number of critical components/key issues that make up the underlying factors in the arena of SDOH.

- Economic Stability
  - Poverty
  - Employment Status
  - Access to Employment
  - Housing Stability (e.g., homelessness, foreclosure)
- Education
  - High School Graduation Rates
  - School Policies that Support Health Promotion
  - School Environments that are Safe and Conducive to Learning
  - Enrollment in Higher Education
- Social and Community Context
  - Family Structure
  - Social Cohesion
  - Perceptions of Discrimination and Equity
  - Civic Participation
  - Incarceration/Institutionalization
- Health and Health Care
  - Access to Health services—including clinical and preventive care
  - Access to Primary Care—including community-based health promotion and wellness programs
  - Health Technology
- Neighborhood and Built Environment
  - Quality of Housing
  - Crime and Violence
  - Environmental Conditions
  - Access to Healthy Foods

Note: Descriptive note. Reprinted from "Social determinants of health." 2013, U.S. Department of Health and Human Services.

Individual researchers. *Dahlgren & Whitehead, 1991.* The determinants of health model created by Dahlgren & Whitehead (1991) describes social determinants of health as part of a larger model using concentric circles including individual lifestyle factors, social and community networks, as well as general socioeconomic, cultural and environmental conditions. Determinants in the model include agriculture and food production, education, work environment, living and working conditions, unemployment, water and sanitation, healthcare services, and housing. The paper in which the model was introduced was a second discussion paper from the WHO Regional Office for Europe on health equity. Although this paper discusses individual determinants of health in additional to social determinants, this research was pivotal in early work coming from WHO emphasizing health equity.

Krieger, 2001. Krieger (2001) discussed a definition of social determinants of health that includes specific pathways of how societal conditions affect health. Krieger stated that social determinants of health "refer to both specific features of and pathways by which societal conditions affect health and that potentially can be altered by informed action" (Krieger, 2001, p. 697). Krieger discussed that social processes are essential factors in health outcomes without being deterministic, suggesting that social factors play a role without playing the single role in health inequities. Krieger acknowledged that the following are included in social determinants of health: economic, political and legal systems; material and technological resources; adherence to norms and practices consistent with international human rights norms and standards; and external political and economic relationships to other countries (Krieger, 2001). Krieger also mentioned a similar term to social determinants of health, "social environment" and preferred not to use terms equating social factors with "environment" or "ecology" because it takes away the emphasis of the role that humans play to create the social conditions (Krieger, 2001).

Ansari et al., 2003. Ansari (2003) published a social determinants of health public health model that shows the relationships between systems. Ansari acknowledged the fear that the field of epidemiology was growing too narrow and focused on individual risk factors. Ansari's theoretical framework was designed to guide epidemiology that includes social determinants of health, but also acknowledges the interconnectedness with biology and behavior. In this concept of determinants there are four categories, social determinants, health care system attributes, disease inducing behaviors, and health outcomes (Shi et al., 2011). Each of the social determinants are further broken down into socio-economic determinants, psychosocial risk factors, and community and societal characteristics (Table 4) (Ansari, 2003).

Raphael, 2004. The definition created by Raphael (2004), that "economic and social conditions influence the health of individuals, communities, and jurisdictions as a whole" (p. 2), was selected by the National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention (NCHHSTP) when they began a focus on social determinants of health in 2008 (CDC, 2009). Raphael also explained the social determinants of health as physical, social and personal resources that a person can have or fail to have to achieve goals, satisfy needs and to cope with the surrounding environment (Raphael, 2009). Examples of these resources are listed as conditions of childhood, income, education, food, housing, employment, working conditions, health, and social services. This work was conducted specifically regarding the health of Canadians.

Kindig, 2007. Kindig (2007) acknowledged that population health is a new term with no agreement about its concept and went on to write a paper defining many of the terms involved in population health, to give a better understanding of the subject.

Table 4. *Components of the public health model of the social determinants of health*

- Socio-economic determinants
  - Age
  - Gender
  - Race
  - Ethnicity
  - Education
  - Occupation
  - (Un)employment
  - Income
  - Religion
  - Housing
- Psychosocial risk factors
  - Poor social networks
  - Low self-esteem
  - Self-efficacy
  - Depression
  - Anxiety
  - Insecurity
  - Loss of sense of control
  - High physical/psychological demand
  - Chronic stress
  - Isolation
  - Anger/hostility
  - Coping
  - Perception/expectations
- Community and societal characteristics
  - Social networks and support structure
  - Social and community participation
  - Civic and political involvement and empowerment
  - Trust in people and social institutions
  - Tolerance of diversity
  - Altruism. Philanthropy and volunteer work
  - Poverty
  - Residence (urban, rural, remote)
  - Income inequality

Note: Descriptive note. Reprinted from "A public health model of the social determinants of health." By Ansari, Z., Carson, N., Ackland, M., Vaughan, L., & Serragallo, A., 2003, *Sozial- und Praventivmedzin, 48*(4), 242-251.

In this paper, a social determinant is defined as "A proposed or established causal factor in the social environment that affects health outcomes (e.g. income, education, occupation, class, social support)" (Kindig, 2007, p.153). Kindig suggests that the word "determinants" may have become popular because of the book *Why are some people healthy and others not?: The determinants of health of populations* (Evans et al., 1994).

Comparison of Definitions and Operationalization

When comparing definitions and frameworks of the social determinants of health, both similarities and differences can be found. One of the key differences between definitions is what exactly is included as a social determinant. Although all definitions discuss social factors in relation to heath, the specific social factors or institutions included in each definition vary.

It is unclear whether all definitions provide an all-encompassing list of the social determinants of health, or simply give examples. For example, Krieger (2001) lists economic, political and legal systems; material and technological resources; adherence to norms and practices consistent with international human rights norms and standards; and external political and economic relationships to other countries. The Healthy People 2020 Framework includes neighborhood and built environment, health and healthcare, social and community context, education, and economic stability (USDHHS, 2013). Ansari (2003) even includes psychosocial risk factors in the list of social determinants of health, although these factors appear to be individual characteristics that impact social determinants. These concepts can be overlapping or miss areas from one definition to the next, making it difficult to determine upon which specific areas to act. This is one of the reasons why WHO created the Commission on Social Determinants of Health in order to build a knowledge base from which to create action in areas

of need, since social determinants are varied and broad. Similarly, the critical components within the key areas of the Healthy People 2020 Framework are not all encompassing, but highlighted as critical issues to address within the decade (USDHHS, 2013).

Similarities between the various definitions of social determinants of health include an overarching goal of achieving health equity (CDC, 2013; USDHHS, 2013; WHO 2008). Social determinants of health are proposed as a new approach to health disparities that take into account more than individual behavior. Although definitions varied to great extents, the most commonly included factors were education, employment, health services, and neighborhood (Raphael 2004; Raphael, 2009; WHO 2008; USDHHS, 2013; Dahlgren & Whitehead, 1991).

Another link between definitions was an effort to link social determinants to other levels of health determinants (WHO, 2008; Taylor, 2012; Dahlgren & Whitehead, 1991; Krieger 2001; Ansari et al., 2003). Of the four frameworks with visual models included, three include individual or other levels in addition to social determinants of health (Dahlgren & Whitehead, 1991; WHO 2008; Taylor, 2012). The Healthy People 2020 Framework is the only model discussed that focuses solely on social determinants of health and critical components within each key area upon which to focus (USDHHS, 2013).

Overall, attempts to define and operationalize the social determinants of health have included commonalities in several key areas and links to other levels. Further research in this area requires a firmer definition of what specific factors should be uniformly considered as social determinants of health as well as the exploration of pathways between different levels of determinants. For the purposes of this study, the WHO definition of social determinants of health was used due to its broad nature and wide use among other organizations (WHO, 2013). Under

this definition, the Healthy People 2020 Social Determinants of Health Framework was employed to further define and clarify social determinants of health (USDHHS, 2013).

Links between Social Determinants of Health and Adolescent Pregnancy

In a recent systematic review looking at empirical links between at least one social determinant of health and pregnancy among young people, 18 of 22 studies found at least one statistically significant link (Maness & Buhi, 2015). This study utilized the Healthy People 2020 Social Determinants of Health Framework to organize links between social determinants and adolescent pregnancy (USDHHS, 2013). Few studies utilized a theoretical framework to explore the mechanisms behind these associations and the ones that did predominantly used variations on the social ecological model (Maness & Buhi, 2015). This paucity of evidence in the literature indicates a need to further explore the causal pathways that link social determinants of health and adolescent pregnancy.

The previously mentioned systematic review found social determinants to have a link with adolescent pregnancy in several broad areas including income, family structure, incarceration, physical environment, and housing (Maness & Buhi, 2015). Most existing research fell into the categories of poverty and family structure among youth ages 12-19. Of the 18 studies in the systematic review that indicated an empirical link between at least one social determinant of health and adolescent pregnancy, 12 used no theory or framework to explain *how* social determinants of health effect adolescent pregnancy (Berry et al., 2000; Crosby et al., 2004; Dormire & Yarandi, 2001; Dworsky & Courtney, 2010; Greene et al., 1998; Hillis et al., 2004; Lang et al., 2012; Lau et al., 2013; Moore & Chase-Lansdale, 2001; Oettinger, 1999; Sabo et al., 1999; Young et al., 2004). This supports evidence that the mechanisms linking social

determinants and adolescent pregnancy are understudied. However, several studies did incorporate theory or provide discussion on speculative mechanisms or pathways

Use of Theory in the Literature

Among studies identified linking social determinants of health and adolescent pregnancy, no theories were specific to social determinants of health and included theories often focused on individual or multiple levels (Maness & Buhi, 2015). Some studies had additional research questions that included behavioral and psychosocial factors which may have contributed to the choice of theory. Theory was predominantly related to ecological frameworks that included multiple levels from individual to system level (Corcoran, 2000; Raneri & Wieman, 2008; Thompson et al., 2008).

One study of familial correlates of sexual behavior mentioned Grotevant & Cooper's (1986) model of adolescent psychosocial development in the introduction, but did not incorporate this theory throughout the methods (Barnett & Papini, 1991). The model suggests that the parent-child relationship changes during adolescence and how qualities of individuality and family connectedness can affect adolescent development (Grotevant & Cooper, 1986). This study found a correlation between family income under $19,000 as well as not living with father and adolescent pregnancy and offered only speculative comments on pathways mediating these links. The author cited past work proposing that the breakdown of a family system might lead adolescents to seek other "love objects" to take the place of a lack of family attention and nurturing, which could be in the form of a sexual partner or child (Fox, 1980). In addition, the subject of low self-esteem caused by family disruption was proposed as a potential pathway to adolescent pregnancy (Barnett & Papini, 1991).

Another study looking at the social determinant of family structure found an association between not living in a two-parent household and adolescent pregnancy (Thompson et al., 2008). This study used an ecological systems framework to examine both individual, family and community contexts of risk (Zweig et al., 2002). However, this framework was mentioned only in the introduction and may have more utility for understanding risks specifically within different levels rather than the pathways through which social determinants result in changes in adolescent pregnancy (Thompson et al., 2008). Raneri & Wiemann (2008) utilized social-ecological theory to examine predictors of repeat adolescent pregnancy and found a relationship with limited economic resources. This study utilized theory in a way that does not describe pathways as much as levels involved in adolescent pregnancy.

An additional study that used theory in order to understand how social determinants of health affect adolescent pregnancy includes Corcoran (2000). This study, which found links with between adolescent pregnancy and proxy measures of poverty, utilized Bronfenbrenner's ecological conceptual framework (Bronfenbrenner, 1979). Corcoran (2000) examined the micro, meso-, exo-, and macro-systems to seek a combination of factors that predict adolescent pregnancy through the use of Bronfenbrenner's conceptual framework of an ecological systems model. This study measured parental income from the macrosystem and did find an empirical link with adolescent pregnancy. However, the theory was not utilized to discuss the "why" of the empirical link, only speculation as to whether helping adolescents gain educational and occupational resources would prevent them from seeing parenting as a way to gain identity, resources, or self-esteem (Corcoran et al., 2000).

Minnis et al. (2009) created a unique framework in order to examine the potential pathways between gang membership and pregnancy (Table 1). This study looked at not only

whether there was an empirical relationship between gang membership and adolescent pregnancy, but also the mechanisms through which it influenced adolescent pregnancy. These potential mechanisms included partnership characteristics, contraceptive behaviors and pregnancy intentions.

Among studies that did not utilize theory or a framework to examine links between social determinants of health and adolescent pregnancy, several works suggested future areas for study (Berry et al., 2000; Greene et al., 1998; Hillis et al., 2004; Lang et al., 2012; Moore & Chase-Lansdale, 2001). Moore & Chase-Lansdale (2001) highlighted past research that may be related to the association found between family structure (measured as mother being married) and adolescent pregnancy including that individuals learn how to act in relationships from observing those around them, that adolescents may model their patterns after parental behavior, and that adolescents in two parent households may have fewer opportunities to engage in sexual activity. This study also cited past research suggesting that greater conflict during divorce can affect psychological development that results in behaviors leading to pregnancy (Moore & Chase-Lansdale, 2001).

Dworsky & Courtney (2010) found an association between living in a foster care group home and adolescent pregnancy. This study speculated in the discussion that a pathway to this association could be that placement instability makes it difficult for adolescent girls to develop relationships with adults which may decrease the risk of pregnancy. However, like with the Chase-Lansdale (2001) study, this idea was not tested and requires future research.

Hillis et al. (2004) found an association between growing up with an absentee father and adolescent pregnancy, yet acknowledged that the mechanisms behind this association are not known. This study suggested that family and ecological stress could undermine the quality of the

living environment and result in increased rates of pregnancy as well as how engaging in unprotected sexual activity could be a way to achieve interpersonal connections that may not exist. Another issue acknowledged was that although many levels of factors have been found to be associated with adolescent pregnancy, none of them have independently accounted for a large part of adolescent pregnancy risks and research analyzing multiple risks at once may be beneficial.

Existing research supports that several social determinants of health are significantly associated with adolescent pregnancy; therefore creating change in social determinants of health could theoretically effect changes in adolescent pregnancy. However, not all social determinants have been studied to determine whether links exist with adolescent pregnancy. In addition, the aspect of "how" social determinants of health affect adolescent pregnancy and exploring causal pathways is underdeveloped and often relies on speculation in discussion sections rather than empirical evidence. This provides an area for important future research that will bolster the utility of addressing social determinants of health as well as understanding how these changes truly affect adolescent pregnancy.

Theoretical Framework

Social determinants of health influence adolescent pregnancy through pathways that include other structural, behavioral, psychological, and biological factors (Ansari et al., 2003; Solar & Irwin, 2010). In order to create change, it must first be determined if empirical links exist between any or all defined social determinants of health and adolescent pregnancy. Once these links are established, theoretical frameworks can be utilized to understand the specific mechanisms that link these social determinants to adolescent pregnancy and build interventions addressing these factors. Although existing research indicates links between several social

determinants of health and adolescent pregnancy as well as associated theoretical mechanisms, additional research in this area is necessary (Maness & Buhi, 2015).

Frameworks are one way to explore the mechanisms that link social determinants of health to health outcomes. Although multiple frameworks have been developed to explain theoretical mechanisms that link social determinants of health to health outcomes, little work in adolescent pregnancy has utilized these frameworks (Ansari et al., 2003; Dahlgren & Whitehead, 1991; WHO, 2008; Taylor, 2012). Broad models such as those created by the World Health Organization (WHO) or Healthy People 2020 to date have not been published with specific application to adolescent pregnancy, although they may have utility to be adapted for this topic area (WHO, 2008; USDHHS, 2008).

The Healthy People 2020 Framework was selected for this study because out of all frameworks discussed, it breaks down social determinants of health into defined categories, includes priority areas for the decade, and maintains a focus solely on the social determinants level, rather than multiple levels. It is important to first establish links with the social determinants and level before moving forward to understand interacting pathways with other levels.

The Healthy People 2020 Social Determinants of Health Framework is divided into five areas: economic stability, education, social and community context, health and healthcare, and neighborhood and built environment. Each of these areas is comprised of three to five critical components to be addressed within the decade (Figure 1). These components were used as proxy measures to answer the research question of whether adolescent pregnancy is associated with a number of social determinants of health.

CHAPTER 3:

METHODS

This study employed secondary data analysis to answer the following research questions:

1) Is there a bivariate association between adolescent pregnancy and each element of the Social Determinants of Health?
2) If an association exists, then a) what is the strength and direction of the association and b) does the association remain after controlling for additional factors.

The secondary data source used was the National Longitudinal Study of Adolescent to Adult Health (Add Health) (Add Health, 2013). The secondary analysis of this dataset was designated as exempt by the University of South Florida Institutional Review Board prior to the start of the analyses (Appendix A).

Secondary Data Source

The Add Health study is a longitudinal study developed by the University of North Carolina Population Center for the purpose of collecting information from adolescents on factors including social, economic, psychological and physical measures of health. Contextual data were also gathered on families, social networks, relationships, schools, neighborhoods and communities beginning in 1994 and spanning across four waves until 2009 (Harris et al., 2009). Plans are in place for a continuation of the study to collect in a fifth wave beginning in 2015 (Add Health, 2014). The largest longitudinal study of adolescence that has ever been conducted, this study was funded by grants from the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD), the MacAurthur Foundation, Robert Wood Johnson

Foundation, as well as 21 additional federal agencies. Around 5,000 publications, including publications in scholarly journals, presentations, unpublished manuscripts and dissertations have been produced based on Add Health data (Add Health, 2013).

Study Sample

The original clustered sampling design for Add Health included a sampling frame of 80 high schools that were representative of U.S. youth. Wave I (N=90,118), conducted in 1994-1995, surveyed students in grades 7-12 within schools and randomly selected a sample of these students for in-home surveys, with a stratified, core sample of n=12,105 and total sample of n=20,745, including special groups. Special groups included supplemental samples based on ethnicity, genetic relatedness and adolescents living in the same household, adoption status and disability (Harris, 2005). Students were selected for in-home surveys based on stratification by grade and sex within schools, then selected by random sample from each school to participate in the home survey. The response rate for Wave I was 79%. Wave III was found to sufficiently represent the Wave I sample even with attrition due to the application of Wave III sampling weights. A parental in-home survey was also conducted and for each youth participant, a parent, preferably the resident mother was asked to complete a survey on a range of topics including aspects of neighborhood, health, family, education, employment, and interaction with child. The students selected for in-home surveys were followed up with in 1996 for Wave II (n=14,738) when in grades 8-12, in 2001-2002 and Wave III (n=15,170) when they were young adults (18-26). 77.4% of the original Wave 1 sample was able to be surveyed again in 2008-2009 for Wave IV as adults; with 15,170 of the Wave I youth also answering Wave III questions (24-32) (Add Health, 2013; Harris et al., 2009; Harris, 2005).

Waves I and III contain the most vital information for the purposes of the research questions for this dissertation study and, therefore, questions from these waves were included in the analyses. Wave II was excluded because data collection occurred only one year after the original Wave I data collection while participants were still adolescents. The goal of the study was to indicate whether a pregnancy occurred at any point during adolescence, necessitating a wave in which participants over the age of 18 reported on whether they ever experienced pregnancy before the age of 18. Wave III includes follow-up after seven years, allowing the longitudinal measurement of whether adolescent pregnancy was experienced among youth in the sample (Add Health, 2013). Using subpopulation analysis, the final sample size was comprised of participants who reported information regarding pregnancy history and answered all questions representing variables in the present study (N=9235).

Measures

Social determinants of health from the Add Health survey include measures from all five Healthy People 2020 Social Determinants of Health Framework areas of education, economic stability, social and community context, health and healthcare, and neighborhood and built environment (Healthypeople2020.gov, 2013) (Table 5a-e). Demographic characteristics included in the analyses are age, race/ethnicity, and gender.

Measures from both Wave I and Wave III were used. Only participant data that is included in both Wave I and Wave III was analyzed. In Wave I, data was used from both the adolescent in-home interview and the parental in-home interview. Measures from the Wave I adolescent in-home survey include questions covering education, employment, household structure, criminal activities, access to health services, and neighborhood. Wave III data was used from the adolescent in-home interview to measure pregnancy as well as social determinants

of health that were not measured in Wave I, but specifically refer to events that occurred during adolescence. Measures in Wave III include the month and year for each pregnancy, allowing for an analysis to see if participants experienced a pregnancy during adolescence. Several questions on social determinants from Wave III ask specifically about adolescence (e.g., At any time during your adolescence, when you were between 12 and 18 years old, did you regularly participate in volunteer or community service work?), therefore these questions were also used to analyze social determinants of health as an adolescent.

The Wave III survey includes measures of pregnancy with options regarding the result of the pregnancy, whether in live birth, abortion, miscarriage, or stillbirth (Table 6). Pregnancy is measured by the indication of whether a pregnancy occurred within each stated relationship (e.g. "Please indicate whether your relationship with {INITIALS} included a pregnancy"). In addition to pregnancy outcome, the date that the pregnancy ended is also recorded. Data from Waves I and III were then compared for links between social determinants of health and pregnancy. This allowed for a comparison of exposure to many different social determinants as an adolescent and whether a pregnancy occurred at any point during adolescence. The exact wording of measures, including social determinant, key area, relationship to research question and proposed analyses are described below and displayed in Table 5, parts a-e.

Questions that include response options of "refused", "missing", "legitimate skip", "not applicable" or "don't know" were handled based on the percentage of missing data when analyzing the dataset. Depending on the amount of responses in each of these categories, decisions were made based on what to categorize as missing data and how to handle this missing data. Missing data is further discussed in the analyses section.

Demographics. Add Health measures age by asking "What is your birth date [month and year]?" For this study, age was measured by subtracting the date of the Wave I interview from the date of birth. Biological sex was measured by interviewer confirmation that the respondent's sex is male or female and was used as a dichotomous variable. Interviewers were instructed to ask participants their sex if necessary with additional options of "refused" and "don't know". Sex was dichotomized into male and female for the purposes of this study. Measures for race include the question "Which one category best describes your racial background." With response options of "White", "Black or African American", "American Indian or Native American", "Asian or Pacific Islander", "other", "refused", "legitimate skip", "don't know" and "not applicable". This question was analyzed by the five categories of racial background including "Other" as well as inclusion of the question regarding Hispanic or Latino origin. Participants were asked, "Are you of Hispanic or Latino origin?" with response options of "no", "yes", "refused" and "don't know".

Economic Stability. Economic stability was measured using four of five key areas as proxy measures, including *poverty*, *employment status*, and *access to employment*. The Healthy People 2020 Social Determinants of Health Framework key area of housing stability was not measured, as this concept was not adequately asked on the Add Health survey. Poverty was measured using the question "Are you receiving public assistance, such as welfare?" from the Wave I parent in-home survey. Response options include "no", "yes", "refused", and "missing". This question was dichotomized into "yes" and "no". Employment status was measured using the question "Do you work outside the home?" from the Wave I parent in-home survey. Response options include "no", "yes", "refused", and "missing". Access to employment was measured with the question "Do you work outside the home?" from the Wave I parent in-home

survey. Response options include “no”, “yes”, “legitimate skip”, “refused”, and “missing”. These questions were also be dichotomized into options of “yes” or “no”.

Education. Education was measured using four proxy measures, including high school graduation rates, school policies that support health promotion, school environments that are safe and conducive to learning and enrollment in higher education. High school graduation and enrollment in higher education were measured in Wave III and therefore may include responses that occurred after an adolescent pregnancy. These variables were included in the logistic regression model as controls. High school graduation rates are not available using Add Health data, so an individual-level metric of each respondent’s education was used for measurement. The question that was used is from the Wave III adolescent in-home interview and asks “What degrees or diplomas have you received?” with options for “GED or high school equivalency degree”, “high school diploma”, “associate or junior college degree – an AA”, “bachelor’s degree – a BA, AB, or BS”, “master’s degree – an MA or MS”, “doctoral degree- a PhD, DrPH, and so on”, or “professional degree – a DDS, JD, MD, DVM, and so on”. Response options included “not marked”, “marked”, “refused”, “not applicable”, or “missing”. This question was recoded into a dichotomous variable that indicates whether the participant marked “high school diploma”.

School Policies that Support Health Promotion was measured by the Wave I adolescent in-home individual-level survey question *“*Please tell me whether you have learned about each of the following things in a class at school: The foods you should and shouldn’t eat, the importance of exercise, smoking, the problems of being overweight, drinking, drug abuse, pregnancy, AIDS, what to do if a stranger approaches you, taking care of your teeth, what to do if someone chokes on food, safety at home, school or play, stress, how to handle conflict, where

to go for help with a health problem, the problems of being underweight, and suicide." Response options include "no", "yes", "refused" and "don't know". This question was analyzed as a count variable based on how many health education items were selected.

School environment was assessed by the Wave I adolescent in-home survey question "How much do you agree or disagree with the following: You feel safe in your school." Response options include "strongly agree", "agree", "neither agree or disagree", "disagree", "strongly disagree", "refused", "legitimate skip", and "don't know". Students interviewed during the summer were asked a variation of the question, "Last year, you felt safe in your school." This question remained a Likert scale ranging from "strongly agree" to "strongly disagree" for analyses.

Enrollment in higher education was measured by the question "What is the highest grade or year of regular school you have completed?" This question from the Wave III adolescent in-home survey includes response options ranging each year from "6th grade" to "5 or more years of graduate school" as well as "refused", "don't know", "not applicable", and "missing". This question was dichotomized to "yes, enrolled in higher education" or "no, did not enroll in higher education" with a cut off point for education after 12th grade.

Social and Community Context. Five critical components in the Healthy People 2020 Social Determinants of Health Framework were used for measurement of the social and community context including family structure, social cohesion, perceptions of discrimination and equity, civic participation, and incarceration/institutionalization.

Family structure was measured using the household roster from the Wave I adolescent in-home survey. This question asks, "Please tell me the first names of all the people, other than you yourself, who live in your household. If someone usually lives with you, but is away for a short

time, include him or her." This question also includes the age, sex, length of time living together and relationship with each person named. For the purposes of the analyses, this question was dichotomized into whether the participant lives in a single parent home.

Social cohesion was measured using two questions from the Wave I adolescent in-home survey. The first question asks "How much do you agree or disagree with the following statements: You feel close to people at your school." The second question asks for agreement or disagreement with the statement "You feel like you are a part of your school." If asked during the summer, students were asked about "Last year". Response options included "strongly agree", "agree", "neither agree or disagree", "disagree", "strongly disagree", "refused", "legitimate skip", and "don't know". These questions were analyzed as Likert scales ranging from "strongly agree" to "strongly disagree".

Perceptions of Discrimination and Equity was measured by the question from the Wave I adolescent in-home survey "How much do you agree or disagree with the following: Students at your school are prejudiced." If asked during the summer, students were asked about the previous year. Response options included "strongly agree", "agree", "neither agree or disagree", "disagree", "strongly disagree", "refused", "legitimate skip", and "don't know". This question was measured as a Likert scale ranging from "strongly agree" to "strongly disagree".

Civic participation was measured by the question "At any time during your adolescence, when you were between 12 and 18 years old, did you regularly participate in volunteer or community service work?" This question, from the Wave III adolescent in-home survey, includes response options of "no", "yes", "refused", "don't know" and "not applicable". This question was dichotomized into "yes" or "no".

Incarceration/Institutionalization was measured by a question from the Wave III adolescent in-home survey. The question asks "How many times were you arrested before you were 18?" Response options include listing times arrested from 1-30, "refused", "legitimate skip", "don't know", "not applicable", and "missing". This question was analyzed as a continuous variable.

Health and Healthcare. The Healthy People 2020 Framework includes three proxy measures for Health and Healthcare, two of which was used to measure this determinant area. These areas include access to health services and access to primary care. No questions addressing health technology were asked on the Add Health Survey. Access to Health Services was measured using a question from the Wave I adolescent in-home survey. The first question asks, "Has there been any time over the past year when you thought you should get medical care, but you did not?" Response options include "no", "yes", "refused" and "don't know". This question was dichotomized into "yes" or "no". Access to Primary Care was measured from the Wave I adolescent in-home survey, "In the past year have you had a routine physical examination?" with response options of "no", "yes", "refused", and "don't know". This question was dichotomized into "yes" or "no".

Neighborhood and Built Environment. Neighborhood and Built Environment was measured using two proxy measures of the four available as critical components of the Healthy People 2020 Social Determinants of Health Framework. Crime and violence as well as environmental conditions was assessed. No questions on the Add Health Survey fully address quality of housing or access to healthy foods.

Crime and violence was measured using the Wave I adolescent in-home survey question of "During the past 12 months, how often did each of the following things happen?: You saw

someone shoot or stab another person, someone pulled a knife or gun on you, someone shot you, someone cut or stabbed you, you got into a physical fight, you were jumped, you pulled a knife or gun on someone, you shot or stabbed someone." Response options include "never", "once", "more than once", "refused", "don't know", and "not applicable". This question was used as a count variable for how many violent events the participant selected that occurred once or more than once in the past 12 months.

Environmental conditions were examined from the Wave I parent in-home survey "In this neighborhood, how big a problem is litter or trash on the streets and sidewalks?" Response options include "no problem at all", "a small problem", "a big problem", "refused" and "missing". The three response options of whether a problem exists were used in the analysis of this question.

Pregnancy. Creating a variable from questions in the Wave III adolescent in-home survey Table of Pregnancies and Table of Relationships assessed pregnancy. The Table of Pregnancies is compiled with information including respondent identification number, romantic relationship number, relationship pregnancy number, date of beginning and end of pregnancy. The Table of Relationships asks a question regarding whether no pregnancies occurred in each relationship. Male and female respondents were asked about pregnancies that occurred during each past relationship. Females were asked whether they experienced one or more pregnancies with each relationship partners and males were asked whether their female relationship partner experienced one or more pregnancies. The outcome of each pregnancy is recorded with options of "miscarriage", "abortion", "single, stillbirth", "live birth", "pregnancy not yet ended", "multiple, no live birth", "multiple, involving a live birth and another outcome", and "missing". The month and year that each pregnancy ended or is expected to end is also recorded. This

question was used to create a variable of whether at least one pregnancy occurred for each participant before the age of 18. Date of birth, the date a pregnancy ended, and a question regarding whether no pregnancies occurred were used to calculate whether a participant experienced a pregnancy before the age of 18.

Data Analysis

Analyses included descriptive statistics, least squares regression analysis, bivariate testing, and logistic regression. Descriptive statistics included measures of demographics including age, race and gender as well as frequency counts of all social determinants of health variables. SAS Version 9.2 was used to conduct all analyses (SAS, 2008).

The Add Health sampling design involved clusters that were sampled with unequal probability, making the observations not independent or identically distributed. This required sample weights to be applied for analyses. The Add Health study team provides information on how to apply sample weights based on the desired analysis of the Add Health data (Chen & Chantala, 2014). The current study used a weight specified for the cross-sectional analysis of Wave III. Although this study used data from Wave I and Wave II, the outcome variable was from only one wave. Add Health data analysis guidelines indicate that when using covariates from multiple waves, but a predictor from only one wave, it is unnecessary to use the longitudinal weight (Chen & Chantala, 2014). In addition, to conduct a design-based analysis that will correctly analyze estimates of totals, ratios, and variances it was necessary to use strata and cluster variables in addition to weights to adjust for these factors (Chen & Chantala, 2014). Design type was also specified as “With Replacement” sample, meaning that schools were selected with replacement in sampling, a default setting in SAS.

Tests for Multicollinearity

Least squares regression analysis was conducted to test for multicollinearity. All predictors and the pregnancy outcome variable were entered into the regression model. Tolerance and variance inflation factor (VIF) was checked for indications of multicollinearity. The selected cut point to indicate multicollinearity was below 0.2 for Tolerance and above 5 for VIF, as tolerance is the inverse of VIF (Rogerson, 2001). No variables were found to have a tolerance above the cutoff point of 0.2. Additionally, no variables were found to have a VIF above the cutoff point of 5.

Missing Data

Missing data is an issue that often arises in social and behavioral science research and, thus, missingness was addressed where necessary during data analyses. Missing data occurs for a variety of different reasons; including non-response, refusal, and other random and/or systematic reasons (Buhi et al., 2008). The percentage of missingness was determined by frequency counts for each question and to see if patterns emerged to help identify the best technique to address missing data.

The majority of variables did not have more than 5% of missing cases. Those variables that did have missingness above 5% included questions from the parental Wave I survey and the dependent variable measuring adolescent pregnancy. The questions with missing data from the parental survey were as followed: receiving public assistance (12.4%), working outside home (12.2%), and unemployed but currently looking (12.2%). The missingness in parental survey questions predominantly reflects parents that did not participate in the parental survey, as fewer parents participated than corresponding youth.

The dependent variable measuring pregnancy before 18 had 18.9% missing data. This variable was created using information from the Wave III relationship table and pregnancy table. The missing data for this item can be explained in part by the survey design. In a screener, participants who had not experienced a relationship in the past 6 years were asked to press enter and skip the relationship table. Due to this, there was no differentiation between missing data caused by never having been in a relationship and missing data caused by refusal to answer this section of questions. Questions regarding pregnancy were only asked to those who first completed the relationship table.

This study utilized subpopulation analysis to handle missing data. Subpopulation analysis differs from list-wise deletion, in which observations are deleted from the dataset, in that subpopulation analysis allows the complex sampling design to be taken into account while analyzing a subset of data. In subpopulation analysis, those with complete data are included within the sample subpopulation and those with missing data, assumed to be at random, are given sample weights of zero (Bell et al., 2009). This method was recommended by Add Health developers in guidelines for analyzing Add Health Data (Chen & Chantala, 2014). If observations had been deleted, standard errors of the estimates could be incorrect because the software must be able to identify all primary sampling units (PSU) to correctly compute the variance estimate (Chantala, 2014). This method was also selected over other methods such as list-wise deletion or advanced methods such as multiple imputation due to the nature of the missing data, much of which was not at random (Little, 1992). The subpopulation in the present study included all participants who answered all questions associated with study variables (n=9204).

Bivariate Testing and Logistic Regression

Bivariate correlations were examined to explore whether relationships exist individually between social determinant of health and adolescent pregnancy. Bivariate tests were conducted between each social determinants of health measure and adolescent pregnancy. The Rao-Scott Chi-Square test was utilized for categorical variables due to the complex survey design. The Rao-Scott Chi-Square test is an adjusted statistic that takes survey design into account (Rao & Scott, 1984). Independent means t-tests were utilized for continuous variables. Effect sizes to analyze the magnitude of the relationship were calculated using Cohen's w for Chi Square tests and Cohen's d for t-tests (Cohen, 1977).

Bivariate analyses were also conducted to assess potential effects of study attrition. These tests explored whether students who were not surveyed at the Wave III had significant differences in variables representing social determinants of health than those who participated in both Wave I and Wave III. These analyses were conducted due to the potential that social determinants of health could be related to lack of participation in follow-up at Wave III.

Following bivariate testing, all variables were entered into a logistic regression model to test research question two, which assessed which key areas of social determinants of health have a relationship with adolescent pregnancy after controlling for other factors, as well as the strength and direction of the relationship. The model was run with and without controls for race, age and gender.

After bivariate tests, both statistically significant and non-significant predictors were entered into the logistic regression model. This method was selected due to the potential that a variable that was not significant on its own may have been significant within the model (Lo et al., 1995). Tjur's pseudo R-square and 95% confidence intervals were consulted from results of

the logistic regression and adjusted odds ratios (AOR) were also reported. Tjur's pseudo R-square is calculated by taking the difference of two means of predicted probabilities for each category of the dependent variable and used to assist in comparing the predictive power of competing logistic regression models (Tjur, 2009; Allison, 2013). Each predictor was removed from the model sequentially based on p-value to evaluate the subsequent change in Tjur's pseudo R-square (Allison, 2013).

Logistic regression was selected for the proposed study due to the binary outcome variable of whether a pregnancy was experienced before age 18. The literature on social determinants of health and relationships with adolescent pregnancy predominantly uses logistic regression as an analysis allowing this study to build on previous research (Maness & Buhi, 2015).

CHAPTER 4:

RESULTS

Results are based on the following research questions: 1) Is there a bivariate association between adolescent pregnancy and each element of the Social Determinants of Health? 2) If an association exists, then a) what is the strength and direction of the association and b) does the association remain after controlling for additional factors?

Demographics and Descriptive Statistics

The final sample from the subpopulation of participants with complete information on all study variables was 9204. Participants were predominantly white (57.2%, n=5261) and fairly evenly split between male (46.4%, n=4275) and female respondents (53.5%, n=4929) (Table 6). There was a mean age of 15.8 years at Wave I (n=9204). Among participants in the study sample, 403 reported a pregnancy before the age of 18 (4.4%).

Among items measured from the Wave III survey, the majority of participants reported receiving a high school diploma (84.5%, n=7778) and 57.9% reported enrollment in higher education (n=5328). Also measured in Wave III, less than half of participants reported community service work before the age of 18 (45.3%, n=45.3%). The mean number of violent acts reported by participants in the past year was .53 (s.d. =.019).

Of items measured from Wave I, parents of participants most commonly reported working outside the home (75.3%, n=6931), not being unemployed (94.6%, n=8703), and not receiving public assistance (92.2%, n=8484). More than half of parent respondents reported litter

or trash not to be a problem in their neighborhood (55.4%, n=5101). Nearly a third of participants (29.1%) reported living in a single parent household (n=2678). Participants also reported having been taught a mean of 13.7 out of 17 health education items in school (s.d.=.11) and over two-thirds of respondents reported to agree or strongly agree that they felt safe at school (68.6%, n=6322), close to others (67%, n=6171), and like a part of their school (74.1%, n=6820). Over two-thirds of participants reported having a physical examination within the past year (66.3%, n=6103) and 19.5% reported not receiving medical care when they thought they needed it in the past year (n=1798). Less than half of participants agreed (28.2%, n=2598) or strongly agreed (14.5%, n=1336) that students at their school were prejudiced.

Table 5. Descriptive statistics of study variables (N=9204)

Variable	**N** **M**	**%** **SD (95% CI)**
Age	15.8	.12 (15.6-16.0)
(Biological) Sex		
Male	4275	46.4%
Female	4929	53.5%
Race		
Hispanic/Latino	1415	15.4%
Black/African American	1732	18.8%
Asian/Pacific Islander	526	5.7%
Native American/American Indian	191	2.1%
Other	77	.08%
White	5261	57.2%
Receiving Public Assistance (Parent)		
Yes	720	7.8%
No	8484	92.2%
Work Outside Home (Parent)		
Yes	6931	75.3%
No	2273	24.7%
Unemployed, but Looking (Parent)		
Yes	501	5.4%
No	8703	94.6%
Received High School Diploma		
Yes	7778	84.5%
No	1426	15.5%
Number of 17 Health Education Items Taught in School	13.7	.11 (13.5-14.0)

Table 5 (Continued)

Variable	N M	% SD (95% CI)
Feel Safe in School		
Strongly agree	2252	24.4%
Agree	4070	44.2%
Neither agree or disagree	1676	18.2%
Disagree	916	10.0%
Strongly disagree	290	3.2%
Enrolled in Higher Education		
Yes	5328	57.9%
No	3876	42.1%
Single Parent Household		
Yes	2678	29.1%
No	6526	70.9%
Feel Close to People at School		
Strongly agree	1813	19.7%
Agree	4358	47.3%
Neither agree or disagree	1887	20.5%
Disagree	851	9.2%
Strongly disagree	295	3.2%
Feel Like a Part of School		
Strongly agree	2400	26.1%
Agree	4420	48.0%
Neither agree or disagree	1335	14.5%
Disagree	756	8.2%
Strongly disagree	293	3.2%
Students at School are Prejudiced		
Strongly agree	1336	14.5%
Agree	2598	28.2%
Neither agree or disagree	2253	22.5%
Disagree	2137	23.2%
Strongly disagree	880	9.6%
Regular Participation in Volunteer or Community Service Work		
Yes	4171	45.3%
No	5033	54.7%
Number of Times Arrested before 18	.11	.01 (.08-.14)
Needed Medical Care and Did Not Receive in Past Year		
Yes	1798	19.5%
No	7406	80.5%
Had a Routine Physical Examination in Past Year		
Yes	6103	66.3%
No	3101	33.7%
Number of Violent Acts Involved in during Past Year	.53	.019 (.49-.57)

Table 5 (Continued)

Litter or Trash a Problem in the Neighborhood (Parent)		
No problem at all	5101	55.4%
A small problem	3580	38.9%
A big problem	523	5.7%
Reported Pregnancy before 18		
Yes	403	4.4%
No	8801	95.7%

Note: All numbers are rounded to one decimal place. In some cases this results in total percentages in excess of 100%. Sample size and percentages are weighted.

Bivariate Tests

Results of bivariate testing provided indications of individual associations between social determinants of health and adolescent pregnancy. These tests do not include the direction of each association, for which logistic regression was conducted and will be discussed in the following section.

Nine of the 17 social determinants of health variables showed a statistically significant relationship with adolescent pregnancy in bivariate testing (Table 7). These variables included three items from the parental survey, including receiving public assistance ($p<.0001$, Cohen's $w=.08$), being unemployed but looking for employment ($p=.0013$, Cohen's $w=.04$), and reporting trash as a problem in the neighborhood environment ($p<.0001$ Cohen's $w=.06$).

Additional relationships were found in the areas of education and social and community context including: receiving a high school diploma ($p<.0001$, Cohen's $w=.08$), enrollment in higher education ($p<.0001$, Cohen's $w=.11$), and living in a single parent household ($p<.0001$, Cohen's $w=.08$). Regular participation in community service ($p<.0001$, Cohen's $w=.05$), not receiving medical care in the past year when needed ($p=.03$, Cohen's $w=.26$), and involvement in violent acts in the past year ($p=.02$, Cohen's $d=.40$) also showed a statistically significant relationship with adolescent pregnancy.

The frequencies of the Chi Square tests can be utilized to infer the directionality of the outcomes of these results. All of the significant variables indicate a greater frequency of adolescent pregnancy among participants reporting a negative social determinant of health. For example 9.3% (n=67) of participants who reported a pregnancy had parents receiving public assistance versus 4.0% (n=336) of participants whose parents did not report public assistance.

Items that were not statistically significant in bivariate testing included having a parent working outside the home; feeling safe at school, close to others, and like a part of school; prejudice of peers; having a routine physical examination in the past year; number of health education items taught in school; and number of arrests before age 18. Effect sizes for all variables were found to be small (Table 7). For Chi Square tests, all tests of Cohen's w no effect sizes were larger than .11, indicating a small effect size. The largest effect size from t-tests using Cohen's d was .4, also indicating a small to medium effect size.

Table 6. Bivariate analyses of social determinant variables and adolescent pregnancy

Variable	**Pregnancy before 18 N=403**	**No Pregnancy before 18 N=8801**		
Rao-Scott Chi Square	**Frequency (weighted %)**	**Frequency (weighted %)**	**p-value**	**Cohen's w**
Parent Receiving Public Assistance				
Yes	67 (9.3%)	653 (90.7%)	<.0001*	.08
No	336 (39.6%)	8148 (99.2%)		
Parent Working Outside Home				
Yes	285 (4.1%)	6646 (95.9%)	.17	.02
No	118 (5.1%)	2155 (94.8%)		
Parent Unemployed, but Looking				
Yes	36 (7.2%)	465 (92.8%)	.0013*	.04
No	369 (4.2%)	8365 (95.8%)		
Received High School Diploma				
Yes	278 (3.6%)	7500 (96.4%)	<.0001*	.08
No	125 (8.8%)	1301 (91.2		

Table 6 (Continued)

Variable	Pregnancy before 18	No Pregnancy before 18		
Rao-Scott Chi Square	**Frequency (weighted %)**	**Frequency (weighted %)**	**p-value**	**Cohen's w**
Feel Safe in School				
Strongly agree	82 (3.6%)	2170 (96.4%)	.12	.04
Agree	174 (4.3%)	3896 (95.7%)		
Neither agree/disagree	74 (4.2%)	1602 (95.8%)		
Disagree	57 (6.2%)	859 (93.8%)		
Strongly disagree	16 (5.5%)	274 (94.5%)		
Enrolled in Higher Education				
Yes	141 (2.6%)	5187 (97.4%)	<.0001*	.11
No	262 (6.8%)	3614 (93.2%)		
Two Parent Household				
Yes	222 (3.4%)	6304 (96.6%)	<.0001*	.08
No	181 (6.8%)	2487 (93.2%)		
Feel Close to People at School				
Strongly agree	77 (4.2%)	1736 (95.8%)	.47	.03
Agree	169 (3.9%)	4189 (96.1%)		
Neither agree/disagree	92 (4.9%)	1795 (95.1%)		
Disagree	49 (5.8%)	802 (94.2%)		
Strongly disagree	16 (5.1%)	279 (94.9%)		
Feel Like a Part of School				
Strongly agree	82 (3.4%)	2318 (96.6%)	.23	.03
Agree	199 (4.5%)	4221 (95.5%)		
Neither agree/disagree	66 (4.9%)	1269 (95.1%)		
Disagree	44 (5.8%)	712 (94.2%)		
Strongly disagree	12 (4.1%)	281 (95.9%)		
Students at School are Prejudiced				
Strongly agree	59 (4.4%)	1277 (95.6%)	.10	.04
Agree	99 (3.8%)	2499 (96.2%)		
Neither agree/disagree	102 (4.5%)	2151 (95.5%)		
Disagree	91 (4.3%)	2046 (95.7%)		
Strongly disagree	52 (5.9%)	828 (94.1%)		
Regular Participation in Volunteer or Community Service Work				
Yes	120 (2.9%)	4051 (97.1%)	<.0001*	.05
No	283 (5.6%)	4750 (94.4%)		
Needed Medical Care and Did Not Receive in Past Year				
Yes	100 (5.6%)	1698 (94.4%)	.03*	.26
No	303 (4.1%)	7103 (95.9%)		
Had a Routine Physical Examination in Past Year				
Yes	250 (4.1%)	5853 (95.9%)	.21	.02
No	153 (4.9%)	2948 (95.1%)		

Table 6 (Continued)

Litter or Trash a Problem in the Neighborhood				
No problem at all	191 (3.7%)	4931 (96.3%)	<.0001*	.06
A small problem	172 (4.8%)	3416 (95.2%)		
A big problem	42 (8.0%)	483 (92.0%)		
t-tests (DF=128)	**t-value**	**S.E.**	**p-value**	**Cohen's d**
Number of 17 Health Education Items Taught in School	-1.45	.31	.15	-.30
Number of Times Arrested before 18	.84	.12	.40	.10
Number of Violent Acts Involved in during Past Year	2.45	.07	.02*	.40

*Statistically significant p<.05

Logistic Regression

All social determinants of health variables were included in the logistic regression model, regardless of statistical significance in bivariate testing. This method was selected due to the potential for variables that were not statistically significantly related in bivariate testing to have significance in relation to other variables in the logistic regression model (Lo et al., 1995). Age, sex and race were included as control variables in the logistic regression model.

The logistic regression model was run with and without race as a control variable to determine whether to include race as a control in the final model. This was conducted due to discussion of whether or not race should be included as a control in a study that involves social determinants of health variables, such as prejudice, that may be inextricably related to race. Removing race from the model did not change any of the significant relationships with the outcome variable, but reduced overall model fit. Tjur's pseudo R-square decreased from .0496 with all controls, to .0286 without race as a control. Sex as a control in the logistic regression model indicated that males had lower odds of reporting involvement in a pregnancy than females (AOR=.32, p=<.0001, 95% CI [.24-.52]).

Non-statistically significant predictors were removed from the model one at a time to determine the best overall model fit. Tjur's pseudo R-square was used in the context of this study to compare competing models. No removals of variables increased the value of the Tjur's pseudo R-square and all predictors and controls were retained in the final model (Tjur's R^2= .0496).

After adjusting for age, race and sex, 6 of the 17 social determinants of health predictors were found to be significantly associated with adolescent pregnancy in the logistic regression model (Table 7). These predictors included feeling close to others in school (AOR=.28, p=.02, 95% CI [.10-.78]), living in a two parent home (AOR=.72, p=.01, 95% CI [.53-.94]).), reporting litter or trash to be a problem in the neighborhood (AOR=1.66, p=.03 95% CI [1.05-2.62]), receipt of high school diploma (AOR=.72, p=.03, 95% CI [.53-.97]), enrollment in higher education (AOR= .43, p<.0001, 95% CI [.30-.63]), and participation in volunteering or community service (AOR =.72, p=.04, 95% CI [.53-.99]). All three control variables were significant in the model: race (p=.004), sex (p<.0001), and age (p=.03).

These significant results were among measures in the social three determinant areas of **social and community context**, **neighborhood and built environment**, and **education**. None of the measures from the social determinant areas of economic stability and health and healthcare were found to have significant results in the logistic regression model. Results are discussed in detail below based on social determinants of health areas. All results are after adjusting for age, race and sex.

Social and Community Context

Participants living in a two parent home were found to have 0.72 lower odds of reporting an adolescent pregnancy than those living in a single parent home (p=.01, 95% CI [.53-.94]). Those who regularly volunteered or participated in community service prior to the age of 18 had

.72 lower odds of reporting an adolescent pregnancy (p=.04, 95% CI [.53-.99]). In comparison with those who strongly did not feel like a part of school, participants who gave responses in all other categories (disagree, neither disagree/agree, agree, strongly agree) had lower odds of reporting an adolescent pregnancy. No significant results were indicated for the measures of prejudice among peers or involvement with the criminal justice system.

Neighborhood and Built Environment

Results for litter or trash being a problem in the neighborhood were contrary to what was expected. Compared to participants with parents who reported litter being a big problem, participants with parents who reported it as a small problem (AOR=1.87, p=.006, 95% CI [1.20-2.90]) or no problem at all (AOR=1.66, p=.03 95% CI [1.05-2.62]) had higher odds of reporting an adolescent pregnancy. Measures of crime and violence were not found to be significant with adolescent pregnancy.

Education

The two significant measures in education were both measured in Wave III, which introduces the possibility that measures of high school graduation and enrollment in higher education occurred after the age of 18. Despite the potential difference in temporality, these measures were retained to examine relationships with adolescent pregnancy. Participants who were enrolled in higher education had .43 lower odds of reporting a pregnancy as those who did not enroll in higher education (p<.0001, 95% CI [.30-.63]). Participants who received a high school diploma also showed lower odds to have reported an adolescent pregnancy (AOR=.72, p=.03, 95% CI [.53-.97]). No significant results were found for school policies promoting health or feeling safe in school.

Table 7. Results of logistic regression analysis for social determinants of health and adolescent pregnancy

Social Determinant Variable	β	S.E.	Wald χ^2	p-value	β^e	95% CI
Intercept	2.60	1.21	4.62	.03*		
Age	0.11	0.05	4.56	.03*	1.12	(1.01-1.24)
Race	0.13	0.04	8.22	.004*	1.13	(1.04-1.24)
Sex	-1.04	0.19	29.20	<.0001*	0.35	(0.24-0.52)
Parent Receiving Public Assistance	0.28	0.23	1.45	0.23	1.32	(0.84-1.79)
Parent Working Outside Home	0.21	0.19	1.18	0.28	1.23	(0.85-1.787)
Parent Unemployed, but Looking	0.24	0.25	089	0.34	1.27	(0.77-2.09)
Received High School Diploma	-0.33	0.15	4.75	0.03*	0.72	(0.53-0.97)
Feel Safe in School						
Strongly Agree	0.08	0.34	0.05	0.82	1.09	(0.56-2.09)
Agree	-0.16	0.29	0.30	0.58	0.85	(0.49-1.50)
Neither Agree/Disagree	0.03	0.35	0.01	0.94	1.03	(0.52-2.04)
Disagree	-0.35	0.34	1.01	0.32	0.71	(0.36-1.39)
Strongly Disagree	-	-	-	-	-	-
Enrolled in Higher Education	-0.84	0.19	19.72	<.0001*	0.043	(0.30-0.63)
Two Parent Household	-0.34	0.14	5.98	0.01*	0.72	(0.54-0.94)
Feel Close to People at School						
Strongly Agree	0.19	0.45	0.18	0.67	1.21	(0.50-2.89)
Agree	0.39	0.40	0.95	0.33	1.48	(0.67-3.27)
Neither Agree/Disagree	0.27	0.36	0.58	0.45	1.31	(0.65-2.63)
Disagree	0.15	0.36	0.18	0.67	1.17	(0.58-2.37)
Strongly Disagree	-	-	-	-	-	-
Feel Like a Part of School						
Strongly Agree	-1.29	0.53	5.92	0.02*	0.28	(0.10-0.78)
Agree	-1.38	0.44	9.67	0.002*	0.25	(0.11-0.60)
Neither Agree/Disagree	-1.25	0.42	8.69	0.003*	0.29	(0.13-0.66)
Disagree	-1.32	0.45	8.43	0.004*	0.27	(0.11-0.65)
Strongly Disagree	-	-	-	-	-	-

Table 7 (Continued)

Social Determinant Variable	β	S.E.	Wald χ^2	p-value	β^e	95% CI
Students at School are Prejudiced						
Strongly Agree	0.12	0.27	0.20	0.66	1.13	(0.67-1.91)
Agree	0.31	0.24	1.62	0.20	1.36	(0.85-2.17)
Neither Agree/Disagree	0.15	0.24	0.39	0.53	1.16	(0.73-1.86)
Disagree	0.52	0.28	3.41	0.06	1.68	(0.97-2.91)
Strongly Disagree	-	-	-	-	-	
Regular Participation in Volunteer or Community Service Work	-0.32	0.02	4.13	0.04*	0.72	(0.53-0.99)
Needed Medical Care and Did Not Receive in Past Year	0.19	0.15	1.53	0.22	1.21	(0.89-1.62)
Had a Routine Physical Examination in Past Year	0.13	0.13	1.02	0.31	1.14	(0.88-1.47)
Litter or Trash a Problem in the Neighborhood						
No problem at all	0.51	0.23	4.72	0.03*	1.66	(1.05-2.62)
A small problem	0.62	0.23	7.61	0.006*	1.87	(1.20-2.90)
A big problem	-	-	-	-	-	-
Number of 17 Health Education Items Taught in School	0.03	0.03	1.05	0.31	1.03	(0.97-1.10)
Number of Times Arrested before 18	-0.69	0.06	1.31	0.25	0.93	(0.83-1.05)
Number of Violent Acts Involved in during Past Year	-0.11	0.07	2.30	0.13	0.90	(0.78-1.03)

*Statistically significant $p<.05$

Note. Tjur's $R^2= .0496$

Additional Results: Non-Response in Wave III and Social Determinants of Health

Additional bivariate tests were run based on a potential limitation to the study. The present study excluded Add Health participants who were lost to follow up after Wave I, leaving the present study unable to examine relationships between social determinants of health and adolescent pregnancy for Wave I participants who did not continue on to participate in Wave III.

The attrition rate between Waves I and III could have affected outcomes of the present study. This study was unable to measure adolescent pregnancy among those lost to attrition because adolescent pregnancy was measured from variables in Wave III. This study only included participants who participated in both Waves I and III, therefore excluding those who were lost to attrition after Wave I. Participants who were lost to follow up and therefore not eligible to be a part of the current study could potentially have had exposure to different social determinants of health than those who were able to participate in Wave III. For instance, life circumstances based on social determinants of health themselves could have been a barrier to follow up.

Although not related to the specific research questions of this study, attrition was explored due to its potential to have had an effect on study related outcomes. Due to potential differences in social determinants of health among participants lost to follow up, bivariate tests were run for each social determinant of health variable to compare Wave I responses between those who participated in both Waves I and III and those lost to follow up after Wave I (Table 6).

A subgroup was created for those who only participated in Wave I based on participant ID. These participants were compared with participants who continued to participate through Wave III using Chi Square and t-tests. This analysis could shed light on whether there were differences at Wave I among social determinants of health among those who were ultimately lost to follow up and those who continued in the longitudinal study. Statistically significant differences were found between groups for 8 of 13 social determinant of health variables measured at Wave I. Reported effect sizes were found to be small for all results, excluding a medium effect size for number of health education items taught in school (Cohen's d= .5) and a large effect size for involvement in violent acts in the past year (Cohen's d=-.9).

Table 8. Bivariate associations in social determinants of health between participants lost to follow up after Wave I and those who participated in Wave III

Variable	**Wave I participation only N=5,575**	**Wave I and Wave III participation N=15,170**		
Rao-Scott Chi Square	**Frequency (weighted %)**	**Frequency (weighted %)**	**p-value**	**Cohen's w**
Parent Receiving Public Assistance				
Yes	439 (11.8%)	1043 (8.5%)		
No	3269 (88.1%)	11252 (91.5%)	<.0001*	.06
Parent Working Outside Home				
Yes	2678 (71.9%)	9090 (73.7%)	0.02*	.03
No	1047 (28.1%)	3236 (26.3%)		
Parent Unemployed, but Looking				
Yes	246 (6.6%)	691 (5.6%)		
No	3472 (93.4%)	11640 (94.4%)	.05	.02
Feel Safe in School				
Strongly agree	1010 (22.6%)	3309 (23.5%)	.007*	.04
Agree	2037 (45.6%)	6261 (44.5%)		
Neither agree/disagree	769 (17.2%)	2560 (18.2%)		
Disagree	473 (10.6%)	1448 (10.3%)		
Strongly disagree	183 (4.1%)	489 (3.5%)		
Two Parent Household				
Yes	1603 (37.9%)	9510 (70.3%)	<.0001*	.09
No	2621 (62.1%)	4021 (29.7%)		
Feel Close to People at School				
Strongly agree	902 (7.9%)	2784 (19.8%)		
Agree	9029 (78.7%)	6588 (46.9%)	.261	.02
Neither agree/disagree	893 (7.8%)	2882 (20.5%)		
Disagree	474 (4.2%)	1324 (9.4%)		
Strongly disagree	177 (1.5%)	483 (3.4%)		
Feel Like a Part of School				
Strongly agree	1126 (25.2%)	3581 (25.5%)		
Agree	2040 (45.6%)	6672 (47.4%)	.049*	.03
Neither agree/disagree	673 (15.0%)	2102 (14.9%)		
Disagree	457 (10.2%)	1241 (8.8%)		
Strongly disagree	176 (3.9%)	467 (3.3%)		
Students at School are Prejudiced				
Strongly agree	642 (14.4%)	1985 (14.2%)	.904	.01
Agree	1214 (27.2%)	3940 (28.1%)		
Neither agree/disagree	1094 (24.5%)	3430 (24.5%)		
Disagree	1079 (24.2%)	3305 (23.6%)		
Strongly disagree	430 (9.6%)	1366 (9.7%)		
Needed Medical Care and Did Not Receive in Past Year				
Yes	916 (20.0%)	2892 (20.2%)		
No	3669 (80.0%)	11411 (79.8%)	.847	.0006

Table 8 Continued

Variable	Wave I participation only N=5,575	Wave I and Wave III participation N=15,170		
Rao-Scott Chi Square	**Frequency (weighted %)**	**Frequency (weighted %)**	**p-value**	**Cohen's w**
Had a Routine Physical Examination in Past Year				
Yes	2953 (61.6%)	9252 (64.8%)	.462	.008
No	1619 (38.4%)	5033 (35.2%)		
Litter or Trash a Problem in the Neighborhood				
No problem at all	2007 (54.1%)	6752 (54.2%)	.039*	.03
A small problem	1429 (38.5%)	4812 (39.7%)		
A big problem	272 (7.3%)	738 (6.1%)		
t-tests (DF=128)	**t-value**	**S.E.**	**p-value**	**Cohen's d**
Number of 17 Health Education Items Taught in School	2.64	0.14	.0092*	.5
Number of Violent Acts Involved in during Past Year	-5.09	0.03	<.0001*	-.9

*Statistically significant p<.05

Note: Only includes variables measured at both Waves I and II

CHAPTER 5:

DISCUSSION

Overview of Findings

This research is important to the field of public health due to its ability to empirically analyze multiple social determinants of health and adolescent pregnancy among one large sample of youth. Incorporating social determinants of health research into adolescent pregnancy prevention efforts has the potential to assist in eliminating health disparities through developing interventions that target social determinants with links to adolescent pregnancy. Overall, findings supported the relationship between adolescent pregnancy and several measures of the social determinants of health based on the Healthy People 2020 Social Determinants of Health Framework. These findings give support for specific areas, particularly in relation to education and social and community context, in which to focus resources and interventions in adolescent pregnancy.

Results of bivariate testing indicated that nine social determinants of health were associated with adolescent pregnancy, a number that reduced to six in the final logistic regression model. However, it should be noted that the effect sizes used in bivariate testing of associations between adolescent pregnancy and social determinants of health were small. This indicates that although nine social determinants of health were statistically significant, the magnitude of their effect was not large. These findings impact the claims that can be made based on these findings. Past research on adolescent pregnancy and social determinants of health has a

paucity of studies that utilized effect sizes (Maness & Buhi, 2013). Due to this, it is difficult to compare the magnitude of the results of the present study to previous research. Future research should continue to include measures of effect to further explore the magnitude of the relationships between social determinants of health and adolescent pregnancy.

The majority of the findings of the logistic regression model are consistent with previous research in adolescent pregnancy. These include areas related to education, community involvement and family structure to reduce adolescent pregnancy (Maness & Buhi, 2015). For example previous research supports an empirical relationship between adolescent pregnancy and living in a single parent home that were also found in this study (Barnett & Papini, 1991; Hillis et al., 2004; Lang et al., 2012; Oettinger, 1999). However, other areas that have previously been linked to adolescent pregnancy such as poverty and incarceration were not found to be significant in this study. Although previous research has shown significant findings in this area, there is also previous research with non-significant findings linking incarceration and/or poverty with adolescent pregnancy (East et al., 2010; Moore & Chase-Lansdale, 2001; Rodgers & McGuire, 2012; Crosby & Holtgrave, 2006; Raneri & Wiemann, 2007, Young et al., 2004; Thompson et al., 2008). Differences in outcomes could vary based on the measures used and differences in study design. The measurement of these items as well as methodological quality are important to explore in future research to understand how these items correlate, or do not correlate with adolescent pregnancy.

This study included reports of both male and female involvement in pregnancy. The control variable for sex indicated that males had lesser odds of involvement in a pregnancy than females. These results could be attributed to several factors. Males could have been unaware of their involvement in a pregnancy and therefore have not responded to the question. Due to the

structuring of the survey which only measured pregnancy among those who reported at least one romantic or sexual relationship, some males may have had involvement in a pregnancy that they did not consider part of a relationship. An additional factor may have been females who became pregnant with older partners who were not surveyed as part of the Add Health study.

The variables of receiving a high school diploma and enrollment in higher education were significantly related to adolescent pregnancy. This information is useful in that it indicates a relationship in which participants who did not have an adolescent pregnancy had higher odds of reporting high school graduation and enrollment in higher education. However, the measures used in this study for education must be viewed differently than other measures in the study due to the temporality of these questions. Participants were not asked if they graduated high school and/or enrolled in higher education prior to the age of 18 and may have completed these goals at an older age. This is in opposition to the other measures, which measured each social determinant prior to age 18. The implications of this for the current study is the potential that participants who experienced an adolescent pregnancy were less likely to graduate high school and enroll in higher education because the adolescent pregnancy preceded these events. Previous research indicates that having a child as an adolescent can be a barrier to higher education in itself (Perper et al., 2010). Therefore, in this study, measures of high school graduation and enrollment in higher education show a relationship with adolescent pregnancy of which the temporality is uncertain.

The amount of trash in one's neighborhood was also significantly related to adolescent pregnancy, but not in the direction that was expected. Previous research has linked aspects of neighborhood to adolescent sexual behavior, although not specifically to pregnancy (Cubbin et al., 2005). The one study in the recent systematic review of social determinants of health and

adolescent pregnancy that included neighborhood conditions was not found to be significantly related to pregnancy before the age of 20. In the present study, the measure of trash in one's neighborhood may not adequately measure aspects of environmental conditions related to adolescent pregnancy. This question was a parental perception of whether trash was a problem in the neighborhood and perception is a different measure than an actual determination of the amount of trash in a neighborhood. In addition, the question did not describe what constitutes a trash problem, for instance, this question could have been perceived as litter or as something such as irregular garbage disposal service. In order to more adequately measure environmental conditions in relation to adolescent pregnancy, it may be beneficial to develop questions to specifically measure neighborhood disorganization and capture items such as broken windows, green spaces, and safety of neighborhood structures that could interrelate with the safety and ability to engage in activities in the neighborhood.

The measures of the social determinant area health and healthcare did not produce significant results. The previously conducted systematic review did not result in any findings for health and healthcare, as no studies fell within the inclusion criteria. It is possible that due to the secondary nature of this study, the measures used did not adequately capture the specific issues related to these areas that could have possible links to adolescent pregnancy. For example, a question in health and healthcare asked whether the participant had received a physical exam in the past year, but not whether information regarding contraception or pregnancy prevention was received. In addition, the question measuring whether a participant did not go to the doctor within the past year when they thought they should have may not adequately capture access to care.

The area of economic stability did not have significant findings in this study. This is one of the areas with the largest majority of previous research relating poverty to adolescent pregnancy. Previous research has found an association between measures of economic stability and adolescent pregnancy (Berry et al., 2000; Corcoran et al., 2000; Lau et al., 2013; Moore & Chase Lansdale, 2001; Sabo et al., 1999). The current study used parental report of public assistance, working outside the home, and unemployment to measure areas of poverty, employment status and access to employment. Previous studies finding links between economic stability and adolescent pregnancy included measures of living below the poverty line at age 14 (Berry et al., 2000), parental income (Corcoran et al., 2000; Sabo et al., 1999), Family income at percent of poverty level (Lau et al., 2013), income-needs ratio (Moore & Chase-Lansdale, 2001), income inequality (Crosby & Holtgrave, 2006). However, additional studies in this area with similar measures did not find relationships with adolescent pregnancy. These include studies with measures of family poverty (East et al., 2010; Crosby & Holtsgrave, 2006; Young et al., 2004), family welfare (Moore & Chase-Lansdale, 2001), community poverty (Rodgers & McGuire, 2012), and limited economic resources (Raneri & Wieman, 2007). The disparities in findings between measures of economic stability and adolescent pregnancy require further exploration into the use of measures and potential differences in study populations. No measures included in the previously conducted systematic review of social determinants of health and adolescent pregnancy contained information on reliability and validity, so it is difficult to compare across studies. This reinforces the need to evaluate the way that social determinants of health are defined and operationalized in research.

Incarceration as a teenager was also not found to be significantly related to adolescent pregnancy in the logistic regression model. A study measuring incarceration in the previous

systematic review of adolescent pregnancy and social determinants of health indicated no significant relationship between being charged with a misdemeanor, being on probation or charged with a felony and adolescent pregnancy (Thompson et al., 2008). In contrast, past research has found the incarceration of a family member to be associated with adolescent pregnancy (Hillis et al., 2004). Incarceration of a family member differs from the concept of incarceration of the participant themselves. This concept could be related to family structure or to factors outside of the social determinants of health framework such as or familial/parental closeness or monitoring, both of which have been linked with adolescent pregnancy in previous research (Miller et al., 2001).

In addition to supporting findings reported in the previously conducted systematic review of adolescent pregnancy and social determinants of health, results of this study reflect elements of previous research related to positive youth development and adolescent pregnancy prevention (Gavin et al., 2010). This includes measures such as feeling like a part of one's school and regular volunteering or community service participation. Feeling like a part of one's school was included under the education area of social determinants of health to measure school environments that are safe and conducive to learning. Volunteering and community service was included in the present study under the area of social and community context to measure civic participation. However, both of these elements are present in the concept of positive youth development, an area with extensive research in relation to adolescent pregnancy that has been studied apart from the concept of social determinants of health. This research gives to previously established associations with adolescent pregnancy, enhances the literature in these areas and lends support to further exploring the pathways that link these areas to individual behavior leading to adolescent pregnancy.

It should be noted that in this study, the overall Tjur's pseudo R-square value in the logistic regression model was low. With a range of 0 to 1 for this statistic, results indicated a value of .0496 as the highest Tjur's pseudo R-square value. This value was the highest value found even after removing combinations of predictors based on non-significant. It is not uncommon for pseudo R-square values to be lower in logistic regression than in linear regression. Tjur's pseudo R-square is useful to compare competing logistic regression models rather than to report the proportion of explained variance (Allison, 2013).

Bivariate testing indicated that participants lost to follow up had significantly different results in social determinants of health than those who also participated in Wave III. This information is important for the current study because it indicates a relationship between social determinants of health and follow-up at Wave III. If participants facing more difficult circumstances related to social determinants of health were not able to participate in Wave III, this could potentially affect the findings related to adolescent pregnancy and social determinants of health. Since these youth were lost to follow-up we do not know how many of them additionally had or caused an adolescent pregnancy. However, the effect sizes of the majority of these relationships were low. Although unavoidable in the secondary nature of this study, these findings are useful for the planning of future studies utilizing primary data collection. It emphasizes the importance of trying to retain the most participants as possible over a longitudinal study involving social determinants of health if the social determinants of health themselves may be reasons involved in why participants are lost to follow-up.

Limitations

This study is not without limitations. There is not currently consensus in the field of public health on how social determinants of health are defined and what variables they include.

Therefore, this research may have excluded or defined determinants differently than other research in this area. Due to the nature of secondary data analysis, the questions were previously defined and not specifically tailored to the purpose of this study.

Questions in this study were selected in the proposed analyses to best represent each determinant area, but may not fully cover each key area or are asked in a way that does not best reflect the social determinant of health. One example of this is the issue of temporality with the questions regarding receipt of high school diploma and enrollment in higher education. Since these questions were asked at Wave III, it cannot be determined if participants were more likely to graduate from high school and enroll in higher education because they did not experience pregnancy as an adolescent.

An additional limitation is the language in this section that modifies the word relationship in the relationship and pregnancy tables used to create the dependent variable of pregnancy before age 18. Participants were not included in the relationship table if they did not report at least one romantic or sexual relationship. The language in this section emphasizes the word relationship introducing a potential bias to only report romantic relationships rather than any person the participant engaged with in sexual activity. Although the introduction to the section states "the next part of the interview is concerned with any romantic or sexual relationships you have had at any time since the summer of 1995", each further description only states "relationship" without further description. For example, the screener in which participants enter partner names has a pop-up box that states "Please double-check the name you just entered. Is this the name or nickname of a partner with who you have been in a relationship since June 1995?" This introduces the possibility that sexual activity outside of a committed relationship may not have been captured by this table. In addition, it was not able to be interpreted as to

whether nonresponse for pregnancy questions were due to refusal to answer or not being included in the relationship table due to indicating a lack of a previous relationship. This discrepancy was confirmed by an Add Health data manager (J. Tabor, personal communication, December 9, 2014).

In addition, use of the Add Health dataset was collected in the early 1990s and may represent a generation of adolescents that have significantly different views and/or circumstances than adolescents today. Societal changes have occurred in the past few decades since Add Health Wave I data was first collected. These societal changes may have had an effect on how youth answered the Add Health survey in the early 1990s as opposed to how a participant of a similar age today may answer the survey. These changes are represented in the generational differences between the participants in the Add Health survey and adolescents today. Millennials are those who were born in the early 1980s to 2000, and are teenagers and young adults today. The youth who participated in the Add Health survey were considered a part of Generation X, those born from 1965 to 1979 (Kupperschmidt, 2000). Generational differences are broad strokes of how those born in a similar range of years that grew up witnessing similar societal and economic trends and events (Kupperschmidt, 2000). Millennials have come of age in a time of economic recession and have often been attributed with valuing intrinsic rewards such as personal growth over economic success. Generation Y grew up in a less financially unstable time in the U.S. when divorce was on the rise and are generally characterized by motivation, a push towards the necessity of higher education, and a shift towards single parent or divorced family structure (Kahn & Galambos, 2014; Smola & Sutton, 2002). It should also be noted that participants in the Add Health study were adolescents prior to the internet era. The internet is a source of health information not available to youth in the present study. This is related to the fact that health

technology was a social determinants of health concept not measured on the Add Health survey. Studies associate Generation X with financial and family insecurity, individualistic behavior, adaptation to technology and diversity. Millennials are identified as opinionated, born into a technological world and more likely to engage as social activists (Smola & Sutton, 2002).

These concepts do not adequately describe all youth based on their generation, but could point to some differences between those surveyed in the Add Health study and those surveyed today. The rise in technology has been one of the most marked trends between these two generations, as Millennials were born into using the same types of technology that previous generations had to learn. This opportunity gives rise to different ways of communicating and connecting with others that could indicate marked differences in responses to a survey on adolescent health and contextual factors. In turn, generational differences could have an impact on how youth would answer the wide variety of questions on the Add Health in-home survey.

Finally, attrition is an issue that could have affected results of the study. Although attrition rates from the Add Health Study were relatively low, 22.6% of the sample was not followed up with at Wave III. Due to this, an additional analysis was run to test whether participants who did not follow up at Wave III had significant differences in responses to questions measuring social determinants of health than students who were followed up with at Wave III. Results of the bivariate testing were significant in eight of the social determinant areas. This is a limitation because there is evidence that participants that were lost to follow up as a group had different responses to study questions than those in the final study sample.

Strengths

Despite the limitations noted above, this research includes a multitude of strengths. Utilizing secondary data allowed for a large and nationally representative sample size.

A broad range of social determinants of health were examined among a single sample of respondents. To the author's knowledge, the broad range of social determinants of health has not previously been studied among one sample in this topic area. This allowed for multiple social determinants of health to be analyzed within a single logistic regression model, to understand which social determinants of health showed an empirical relationship with adolescent pregnancy.

In addition, the use of the Healthy People 2020 Social Determinants of Health Framework provided an underlying support for the breadth of determinants analyzed. The use of a framework strengthened the study by providing consistent measures and a basis on social determinants of health that have been identified as vital to address this decade. The in depth exploration of the Healthy People 2020 Social Determinants of Health Model also lead to a discussion with the developers of this model regarding the specific intent of many of the developed terms. The use of this framework is evolving and this study provides one of the first direct applications of this particular framework to an empirical study. There is potential for increased specifications on definitions within each of the key areas of the Healthy People 2020 Social Determinants of Health Framework and the expansion of this framework to use with similar studies involving primary data collection or different sample populations.

Results of this research may allow for future research and practice to be directed at social determinant areas that have shown an empirical relationship with adolescent pregnancy. The proposed research went beyond individual level factors in assessing adolescent pregnancy to provide additional ways to address a vital public health issue. This contribution is important particularly to the area of adolescent pregnancy research, in which social determinants of health are an approach that may address lingering health disparities among specific groups in the United States by targeting areas that are not reached through existing interventions.

Finally, this research can provide a platform for increased dialogue on the research and application of social determinants of health. Consensus is needed in the field regarding how social determinants of health are defined, operationalized and applied to create public health change. This consensus is needed not only in the topic area of adolescent pregnancy, but in the field of public health as a whole. In order to create public health change, it is necessary for researchers to be working off a common definition and have access to models and measures that can be operationalized in the social determinants of health research and public health practice. A first step to this change is to acknowledge the current disparate applications of social determinants of health research and to work towards a more cohesive approach to operationalization.

Implications

The implications of this research can inform future public health research and programming as well as provide support for federal funding in social determinants of health, both related to adolescent pregnancy and other areas of public health. The implications of this study in terms of future research, practice and policy are further explored below.

Research. Future research can further analyze the specific key areas of the social determinants of health that showed an empirical relationship with adolescent pregnancy in this study. These areas predominantly lie in education and social and community context. This evidence can be further explored through additional studies that examine the pathways between social determinants of health to individual behavior. Research in this area will allow for improved understanding of how social determinants of health impact adolescent pregnancy.

Selecting a framework and definitions for social determinants of health in this work have highlighted the need for a consensus on the definition of social determinants of health. This area

related to definitions of social determinants of health is another key area for future research. There is a breadth of definitions of social determinants of health, many of which are vague and lacking in description. In addition, when social determinants of health are defined there is often a lack of examples on how to operationalize such a broad theme.

In order to create effective change based on the social determinants of health, it is vital for public health researchers to clarify the key concepts behind what we speak about when we use the term social determinants of health, as well as how to best operationalize the components of social determinants of health. The term social determinants of health is widely used yet poorly defined. This research utilized a framework for social determinants of health as well as provided definitions and operationalization for each measure of social determinants of health. Therefore this study has the potential to increase the discussion regarding what is meant when discussing social determinants of health and what items should be included or excluded in a working definition.

Future research can involve creating measures that directly assess items from the Healthy People 2020 Social Determinants of Health Framework. After creating firm definitions of social determinants of health and its components, the next step is to create a tool in which to measure these items in primary data collection. Although the present study was limited to measures from secondary data collection, future research could be enhanced by using measures that more specifically analyze social determinants of health and are developed for that specific purpose. The improvement of definitions and creation of measures related to the social determinants of health also provides room for future research to expand beyond the scope of adolescent pregnancy to include other issues related to adolescent sexual health, or the broader arena of public health. A future goal is to improve social determinants of health research in ways that it

can impact multiple public health issues and be a driving change that researchers can collaborate on with common definitions and tools utilized in more than one topic area.

Practice. It is vital to understand which social determinants of health have an empirical relationship with adolescent pregnancy in order to most effectively plan and implement interventions. Results of this research could provide support to interventions that are based upon evidence of the relationship between specific social determinants of health and adolescent pregnancy. Programs can be tailored to address the social determinants of health that have been found to be associated with adolescent pregnancy rather than addressing a multitude at once or those that have not shown evidence of a relationship.

This study provides support for programs to include social determinants of health in addition to individual and interpersonal behavior change. Federal funding of adolescent pregnancy prevention programs has predominantly been focused on individual and interpersonal behavior change. This study provides support to the addition of social determinants of health in creating programs to prevent adolescent pregnancy.

Although including social determinants of health in public health practice has not been widely unified, a 2013 supplement of Public Health Reports aimed to highlight interventions across a broad range of health topics that apply social determinants of health to public health practice (Public Health Reports, 2015). This special issue contained articles on using elements of the social determinants of health to improve occupational safety and health among immigrant workers, protect labor rights, reduce racial discrimination, improve community conditions, and reduce racial and ethnic health disparities (Flynn et al., 2015; Bhatia et al., 2015; Schaff et al., 2015; Ferdinand et al., 2015; Ramos et al., 2015; Hardy et al., 2015). Many of these interventions function at the policy level, for example the collaboration between the Institute for

Occupational Safety and Health and the Mexican Ministry of Foreign Affairs to promote occupational safety and health among Mexican immigrant workers through better documentation and internal capacity (Flynn et al., 2015). Other examples include working with authorities to enforce labor laws, creating local policy agendas, partnering with community centers to reduce discrimination, and rezoning areas to create healthy neighborhoods (Bhatia et al., 2015; Schaff et al., 2015; Ferdinand et al., 2015; Johnson Thornton et al., 2015). It should be noted that in this supplement specifically created to translate the social determinants of health to practice, articles do not work based off of a unified definition or framework and are most commonly based on policy change.

Interventions that include the social determinants of health and adolescent pregnancy also exist. The President's Teen Pregnancy Prevention Initiative has included a focus on communitywide initiatives in order to reduce health disparities in adolescent pregnancy (CDC, 2013). Although this initiative is ongoing, goals include increasing the adoption of community wide resources and increase capacity of community partners to select and implement evidence-based programs. One stated goal of this initiative is to raise awareness among community partners of the link between teen pregnancy and social determinants of health. However, there is no mention of the fact that many links are understudied or not fully understood. Examples of how the President's Teen Pregnancy Prevention Initiative is including social determinants of health are provided describing ongoing or recent interventions in 9 states (CDC, 2013). A team in Alabama analyzed community level data to identify specific social determinants associated with teen pregnancy and trained staff to understand this relationship. In Georgia, faith based leaders and Juvenile court were engaged to reduce pregnancy. In Connecticut, the Health Equity Index was used to highlight associations between adolescent pregnancy and select social

determinants in order to select areas with the highest needs for interventions. Additional examples include raising community awareness in Massachusetts and North Carolina, focusing interventions on underserved youth in New York City and Pennsylvania, and including the juvenile justice and foster care system to target high risk youth (CDC, 2013). The majority of these initiatives utilize the social determinants of health to identify youth in order to involve them in interpersonal or individual level modes of behavior change rather than to intervene at the social determinants level itself.

A social determinants of health approach has the potential to enhance, rather than replace, current programs to help eliminate the pockets of health disparities in adolescent pregnancy in the U.S. Research in social determinants of health should not be thought of as a substitution for the current work in individual and interpersonal level programs, many of which have been found to be evidenced-based and have created positive change in adolescent pregnancy prevention. The utility of incorporating aspects of social determinants of health into adolescent pregnancy prevention is to find a way to eliminate pockets of health disparities that current interventions may be missing. If these health disparities, whether racial/ethnic or geographic, have ties to social determinants of health, it is worth incorporating these findings into adolescent pregnancy interventions. Future research is necessary to best enhance interventions to address multiple aspects of adolescent pregnancy prevention, whether on a social level or in combination with the individual and interpersonal levels.

Policy. The majority of currently federally funded adolescent pregnancy prevention programs are designed to intervene at the levels of individual or interpersonal behavior change. This research provides support for increasing funding for initiatives that include social determinants of health. In order to implement programs that emphasize the role social

determinants of health play in adolescent pregnancy prevention, it is first necessary for policy change to provide funding support for these types of programs. In addition, funding is necessary for additional research on the operationalization of social determinants of health and examining pathways to individual behavior change.

The previous implications regarding research and practice can only be effective if policy is in place to provide national attention and funding to adolescent pregnancy prevention. The social determinants of health have begun to gain national attention, but additional work is necessary to move this work into the national spotlight. Federal funding allocated to adolescent pregnancy prevention is a large resource for ongoing efforts to reduce adolescent pregnancy prevention in this country and a vital necessity to continue to eliminate existing health disparities in this area.

Conclusion

In conclusion, the findings of this study support increased areas of research and intervention in social determinants of health related to areas of education and social and community context. Results of this study provide information that can be utilized in the allocation resources to best address social determinants of health that show a link with adolescent pregnancy. Areas of future research can further explore the areas in which social determinants of health show a relationship with adolescent pregnancy and interventions can be tailored to specifically address these areas.

In addition, this study provides a springboard for further discussion of social determinants of health in the field of public health to reach a higher consensus in use of definitions and frameworks. This opportunity to refine definitions of social determinants of health also lends itself to the development of new measures for use in primary data collection.

The measures used from the Add Health dataset were not specifically created with the intent to measure the social determinants of health. Future research can focus on refining constructs to develop new measures with the ultimate goal of primary data collection of social determinants of health measures based on the Healthy People 2020 Social Determinants of Health Framework.

Applying elements of the social determinants of health to adolescent pregnancy prevention efforts has the potential to assist in the elimination of health disparities and enhancement of current adolescent pregnancy interventions.

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APPENDICES

Appendix A: Add Health Social Determinants of Health Measures Matrix

A. Measurement of the relationship between the social determinant area of economic stability and adolescent pregnancy

Critical components/key issues	**Research question**	**Measures from Add Health survey**	**Variable Name**	**Add Health wave and survey**	**Data Type**	**Analyses**
Poverty Definition: The poverty level is based on money income and does not include noncash benefits, such as food stamps. Poverty thresholds reflect family size and composition and are adjusted each year using the annual average Consumer Price Index level. (Healthypeople.gov, 2013).	What is the strength and direction of a relationship between poverty and adolescent pregnancy?	A21. Are you receiving public assistance, such as welfare? Response Options: 0 No 1 Yes 6 Refused . Missing	PA21	Wave I Parent in-home survey	Dichotomous	Chi Square Logistic Regression
Employment Status Definition: The U.S. Census defines employment status as whether individuals in the civilian non-institutional population did work for pay or profit within the last week or were temporarily	What is the strength and direction of a relationship between parental employment status and adolescent pregnancy?	A13. Do you work outside the home? 0 Response Options: 1 No Yes 6 Refused . Missing	PA13	Wave I Parent in-home survey	Dichotomous	Chi Square Logistic Regression

absent from a job or business in the last week (U.S. Census, 2004).						
Access to Employment Definition: Access to Employment is the opportunity for a person to enter into employment, either for themselves or for others (Eurofound, 2011).	What is the strength and direction of a relationship between parental access to employment and adolescent pregnancy?	A16. Are you unemployed right now, but looking for a job? Response Options: 0 No 1 Yes 6 Refused 7 Legitimate skip . Missing	PA16	Wave I in-home parent survey	Dichotomous	Chi Square Logistic Regression
Housing Stability (e.g., homelessness, foreclosure) Definition: Housing stability has been defined as having difficulty paying rent, spending more than 50% of household income on housing, having frequent moves, living in overcrowded conditions, or with friends and relatives. There is no standard definition to assess housing instability (Kushel et al., 2006).	What is the strength and direction of a relationship between housing stability and adolescent pregnancy?	Not measured.	N/A	N/A	N/A	N/A

B. Measurement of the relationship between the social determinant area of education and adolescent pregnancy

Critical components/key issues	Research question	Measures from Add Health survey	Variable Name	Add Health wave and survey	Data Type	Analyses
High School Graduation Rates Definition: Graduation with a regular diploma 4 years after starting 9th grade (healthypeople.gov, 2013).	What is the strength and direction of a relationship between high school graduation and adolescent pregnancy?	Section 7: Education What degrees or diplomas have you received? GED or high school equivalency degree high school diploma Associate or junior college degree – an AA Bachelor's degree – a BA, AB, or BS Master's degree – an MA or MS Doctoral degree- a PhD, DrPH, and so on Professional degree – a DDS, JD, MD, DVM, and so on Response Options for each: 0 Not marked 1 Marked 6 Refused 8 Don't know 9 Not applicable . Missing	H3ED2 H3ED3 H3ED4 H3ED5 H3ED6 H3ED7 H3ED8	Wave III In-home survey	Dichotomous. Graduated from high school yes/no	Chi Square Logistic Regression
School Policies that Support Health Promotion Alternate definition: A health promoting school is one that constantly strengthens its capacity as a healthy setting for living, learning and working (WHO, 2014).	What is the strength and direction of a relationship between school policies that support health promotion and	Section 4: Taught in School: Please tell me whether you have learned about each of the following things in a class at school: The foods you should and shouldn't eat The importance of exercise Smoking The problems of being overweight Drinking Drug abuse Pregnancy AIDS	H1TS1 H1TS2 H1TS3 H1TS4 H1TS5 H1TS6 H1TS7 H1TS8 H1TS9 H1TS10 H1TS11 H1TS12	Wave 1 Adolescent in-home survey	Count variable of how many items selected	Chi Square Logistic Regression

	adolescent pregnancy?	What to do if a stranger approaches you Taking care of your teeth What to do if someone chokes on food Safety at home, school or play Stress How to handle conflict Where to go for help with a health problem The problems of being underweight Suicide Response Options: 0 No 1 Yes 6 Refused 8 Don't know	H1TS13 H1TS14 H1TS15 H1TS16 H1TS17			
School Environments that are Safe and Conducive to Learning Definition: A positive school climate is the product of a school's attention to fostering safety; of a supportive academic, disciplinary, and physical environment; and of respectful, trusting, and caring relationships throughout the school community no matter the setting (AIR, 2014).	What is the strength and direction of a relationship between school environments that are safe and conducive to learning and adolescent pregnancy?	Section 5: Academics and Education: 24: How much do you agree or disagree with the following: *[If SCHOOL YEAR:]* You feel safe in your school. *[If SUMMER:]* Last year, you felt safe in your school. Response Options: 1 Strongly agree 2 Agree 3 Neither agree or disagree 4 Disagree 5 Strongly disagree 6 Refused 7 Legitimate skip 8 Don't know	H1ED24	Wave 1 Adolescent in-home survey	Ordinal	Chi Square Logistic Regression

Enrollment in Higher Education Definition: Enrollment in a 2 or 4 year college (healthypeople.gov, 2013).	What is the strength and direction of a relationship between enrollment in higher education and adolescent pregnancy?	Education: What is the highest grade or year of regular school you have completed? 6 6th grade 7 7th grade 8 8th grade 9 9th grade 10 10th grade 11 11th grade 12 12th grade 13 1 year of college 14 2 years of college 15 3 years of college 16 4 years of college 17 5 or more years of college 18 1 year of graduate school 19 2 years of graduate school 20 3 years of graduate school 21 4 years of graduate school 22 5 or more years of graduate school 96 Refused 98 Don't know 99 Not applicable . Missing	H3ED1	Wave III In-home survey	Recode to dichotomize to education above 12th grade or no education above 12th grade.	Chi Square Logistic Regression

C. Measurement of the relationship between the social determinant area of social and community context and adolescent pregnancy

Critical components/key issues	**Research question**	**Measures from Add Health survey**	**Variable Name**	**Add Health wave and survey**	**Data Type**	**Analyses**
<u>Family Structure</u> Definition: The combination of relatives that comprise a family. Considers the presence or absence of: legally married spouses or common law partner; children; and in the case of economic families, other relatives. Economic family refers to a group of two or more persons who live in the same dwelling and are related to each other by blood, marriage, common-law or adoption. (statcan.gc.ca, 2012).	What is the strength and direction of a relationship between family structure and adolescent pregnancy?	Section 11: Household Roster: Please tell me the first names of all the people, other than you yourself, who live in your household. If someone usually lives with you, but is away for a short time, include him or her. Response options: What is {NAME}'s relationship to you? If REL = "father" or "mother," ask Q.6. 6. [Hand R show card 13m/f.] Which description best fits {NAME}'s relationship to you? 1 biological father 2 stepfather 3 adoptive father 4 step/adoptive father 5 foster father 6 other 7 biological mother 8 step mother 9 adoptive mother 10 step/adoptive mother 11 foster mother 15 12 other 96 refused 97 legitimate skip	H1HR3A	Wave I Adolescent in-home survey	Dichotomize to living in a single parent household (yes/no).	Chi Square Logistic Regression
<u>Social Cohesion</u>	What is the strength and	Academics and Education: How much do you agree or	H1ED19 H1ED20	Wave 1	Ordinal	Chi Square

Alternate Definition: The extent of connectedness and solidarity among groups in society (Kawachi & Berkman, 2000)	direction of a relationship between social cohesion and adolescent pregnancy?	disagree with the following statements: *[If SCHOOL YEAR:]* You feel close to people at your school. *[If SUMMER:]* Last year, you felt close to people at your school. How much do you agree or disagree with the following statements: *[If SCHOOL YEAR:]* You feel like you are part of your school. *[If SUMMER:]* Last year, you felt like you were part of your school. Response Options: 1 Strongly agree 2 Agree 3 Neither agree or disagree 4 Disagree 5 Strongly disagree 6 Refused 7 Legitimate skip 8 Don't know		Adolescent in-home survey		Logistic Regression
<u>Perceptions of Discrimination and Equity</u> Alternative definition: A behavioral manifestation of a negative attitude, judgment or unfair treatment towards members of a group (Banks et al., 2006)	What is the strength and direction of a relationship between perceptions of discrimination and equity and adolescent pregnancy?	Academics and Education: 21. (How much do you agree or disagree with the following:) *[If SCHOOL YEAR:]* Students at your school are prejudiced. *[If SUMMER:]* Last year, the students at your school were prejudiced. Response Options: 1 Strongly agree 2 Agree	H1ED21	Wave I Adolescent in-home survey	Ordinal	Chi Square Logistic Regression

		3 Neither agree or disagree 4 Disagree 5 Strongly disagree 6 Refused 7 Legitimate skip 8 Don't know				
Civic Participation Alternate Definition: Civic engagement refers to the ways in which citizens participate in the life of a community in order to improve conditions for others or to help shape the community's future (Adler & Goggin, 2005).	What is the strength and direction of a relationship between civic participation and adolescent pregnancy?	Section 30: Civic Participation and Citizenship: 1. At any time during your adolescence, when you were between 12 to 18 years old , did you regularly participate in volunteer or community service work? Don't count things like washing cars or selling candy to raise money. Response Options: 0 No 1 Yes 6 Refused 8 Don't know 9 Not applicable . Missing	H3CC1	Wave III In-home survey	Dichotomous	Chi Square Logistic Regression
Incarceration/ Institutionalization Alternate definition: Incarceration/Institutionalization: Being held in a in a prison, jail, or other confinement facility (BJS, n. d.).	What is the strength and direction of a relationship between incarceration/institutional-ization and adolescent pregnancy?	Section 27: Involvement with the Criminal Justice System 5. How many times were you arrested before you were 18? Response Options: Times arrested range 1-30 96 Refused 97 Legitimate skip 98 Don't know 99 Not applicable . Missing	H3CJ5	Wave III In-home survey	Continuous	t-test Logistic Regression

D. Measurement of the relationship between the social determinant area of health and healthcare and adolescent pregnancy

Critical components/key issues	**Research question**	**Measures from Add Health survey**	**Variable Name**	**Add Health wave and survey**	**Data Type**	**Analyses**
<u>Access to Health Services- including clinical and preventative care</u> Definition: Healthy People 2020 defines access to health services as having four components: Health insurance coverage Services: Usual and ongoing source of care Timeliness: ability to provide care quickly after a need is recognized (e.g., time spent waiting in doctors' offices and emergency departments, time between identifying a need for specific tests and receiving services) Workforce: There has been a decrease in number of primary care physicians	What is the strength and direction of a relationship between access to health services and adolescent pregnancy?	Section 3: General Health: 26. Has there been any time over the past year when you thought you should get medical care, but you did not? Response Options: 0 No 1 Yes 6 Refused 8 Don't know	H1GH26	Wave I Adolescent in-home survey	Dichotomous	Chi Square Logistic Regression

(Healthypeople.gov, 2013).						
Access to Primary Care- including community-based health promotion and wellness programs Definition: Having a primary care provider as a usual source of care (Healthypeople.gov, 2013).	What is the strength and direction of a relationship between access to primary care and adolescent pregnancy?	Section 7: Access to Health Services: 1. In the past year have you had a routine physical examination? Response Options: 0 No 1 Yes 6 Refused 8 Don't know	H1HS1	Wave I Adolescent in-home survey	Dichotomous	Chi Square Logistic Regression
Health Technology Definition: Health communication and health information technology (IT) make up the context and the ways professionals and the public search for, understand, and use health information, significantly impacting their health decisions and actions. (Healthypeople.gov, 2013).	What is the strength and direction of a relationship between health technology and adolescent pregnancy?	Not measured.	N/A	N/A	N/A	N/A

E. Measurement of the relationship between the social determinant area of neighborhood and built environment and adolescent pregnancy

Critical components/key issues	**Research question**	**Measures from Add Health Survey**	**Variable Name**	**Add Health wave and survey**	**Data Type**	**Analyses**
<u>Quality of Housing</u> Alternate Definition: Housing quality includes factors such as ventilation, lighting, disease vectors in the home, and overcrowding, which can affect health (WHO, n.d.).	What is the strength and direction of a relationship between quality of housing and adolescent pregnancy?	Not measured.	N/A	N/A	N/A	N/A
<u>Crime and Violence</u> Definition Violence: Healthy People 2020 measures indicators of violence including homicide, fire-arm related deaths and injuries, physical assault, physical fighting among adolescents, bullying among adolescents, weapon carrying by adolescents on school property, child maltreatment, intimate partner violence (including physical, sexual, psychological	What is the strength and direction of a relationship between crime and violence and adolescent pregnancy?	Section 31: Fighting and Violence: During the past 12 months, how often did each of the following things happen? 1. You saw someone shoot or stab another person. 2. Someone pulled a knife or gun on you. 3. Someone shot you. 4. Someone cut or stabbed you. 5. You got into a physical fight. 6. You were jumped. 7. You pulled a knife or gun on someone. 8. You shot or stabbed someone. Response Options: 0 Never 1 Once 2 More than once 6 Refused 8 Don't Know	H1FV1 H1FV2 H1FV3 H1FV4 H1FV5 H1FV6 H1FV7 H1FV8	Wave I Adolescent in-home survey	Count variable of how many occurred once or more in the past 12 months	Chi Square Logistic Regression

and stalking) , rape, abusive sexual contact, non-contact sexual abuse, intentional self- harm, and children's exposure to violence. Definition Crime: Healthy People 2020 includes an indicator of adolescent and young adults, including violent crimes, property crimes, and victimization from crimes of violence.		9 Not applicable				
<u>Environmental Conditions</u> Definition: An environment free of hazards, such as secondhand smoke, carbon monoxide, allergens, lead, and toxic chemicals, helps prevent disease and other health problems. (Healthypeople.gov, 2013).	What is the strength and direction of a relationship between environmental conditions and adolescent pregnancy?	A33. In this neighborhood, how big a problem is litter or trash on the streets and sidewalks? Response options: 1 No problem at all 2 A small problem 3 A big problem 6 Refused . Missing	PA33	Wave I parent in-home survey	Categorical	Chi Square Logistic Regression
<u>Access to Healthy Foods</u> Definition: Access to healthy foods includes convenient physical	What is the strength and direction of a relationship between	Not measured.	N/A	N/A	N/A	N/A

access to grocery stores and other retailers that sell a variety of healthy foods; prices that make healthy choices affordable and attractive; a range of available healthy products; and adequate resources for consumers to make healthy choices (Letsmove.gov, n.d.).	access to healthy foods and adolescent pregnancy?					

F. Demographic Measures

Measure (Wave III)	**Add Health Questions**	**Variable Name**	**Add Health Survey and Wave**	**Data Type**	**Analyses**
Age	Section 1: Overview and Demographics 1.Confirm birth date. [month and year]	H3OD1M H3OD1Y	Wave III in-home survey	Continuous	Descriptive statistics; used as a control in logistic regression
Hispanic Origin	Section 1: Overview and Demographics 1. Are you of Hispanic or Latino Origin? 0 No 1 Yes 6 Refused 8 Don't know 9 Not applicable	H3OD2	Wave III in-home survey	Dichotomous	Descriptive statistics; used as a control in logistic regression
Race	Section 1: Overview and Demographics 4. What is your race? You may give more than one answer. White Black or African American American Indian or Native American Asian or Pacific Islander Response options: 0 Not marked 1 Marked	H3OD4A H3OD4B H3OD4C H3OD4D	Wave III in-home survey	Categorical	Descriptive statistics; used as a control in logistic regression

	6 Refused 8 Don't know 9 Not applicable				
Gender	Section A: Setup of CAPI Interview Respondent's Gender 1 Male 2 Female	BIO_SEX3	Wave III in-home survey	Dichotomous	Descriptive statistics; used as a control in logistic regression

Appendix B: Add Health Pregnancy Measures Matrix

Add Health measure of pregnancy.

Measure	Research Question	Add Health Questions	Variable Name	Add Health Survey and Wave	Data Type	Analyses
Pregnancy	1) What is the strength and direction of individual relationships between each key area of social determinants of health and adolescent pregnancy? 2) After controlling for other factors, which key areas of social determinants of health have a relationship with adolescent pregnancy?	Section 18: Table of pregnancy Romantic Relationship Number 1-48 Relationship Pregnancy Number 1-8 2. Please indicate the [month and] year in which this pregnancy ended or is expected to end—the due date. If you are not sure of an ending date, enter your best guess. 9. Please indicate whether your relationship with [INITIALS] included a pregnancy.	H3TP2M H3TP2Y H3TR9	Wave III Adolescent in-home survey	Categorical	Logistic regression (outcome variable for predictor variables in previous tables)

Appendix C: IRB Exemption Letter

USF
UNIVERSITY OF
SOUTH FLORIDA

RESEARCH INTEGRITY AND COMPLIANCE
Institutional Review Boards, FWA No. 00001669
12901 Bruce B. Downs Blvd., MDC035 • Tampa, FL 33612-4799
(813) 974-5638 • FAX (813) 974-7091

6/10/2014

Ellen Daley, PhD, MPH
Community and Family Health
13201 Bruce B Downs Blvd., MDC 56
Tampa, FL 33612

RE: **NOT Human Research Activities Determination**
IRB#: Pro00017726
Title: Secondary Analysis of National Longitudinal Study of Adolescent Health (Add Health)

Dear Dr. Daley:

The Institutional Review Board (IRB) has reviewed the information you provided regarding the above referenced project and has determined the activities do not meet the definition of human subjects research. Therefore, IRB approval is not required. If, in the future, you change this activity such that it becomes human subjects research, IRB approval will be required. If you wish to obtain a determination about whether the activity, with the proposed changes, will be human subjects research, please contact the IRB for further guidance.

All research activities, regardless of the level of IRB oversight, must be conducted in a manner that is consistent with the ethical principles of your profession and the ethical guidelines for the protection of human subjects. As principal investigator, it is your responsibility to ensure subjects' rights and welfare are protected during the execution of this project

Also, please note that there may be requirements under the HIPAA Privacy Rule that apply to the information/data you will use in your activities. For further information about any existing HIPAA requirements for this project, please contact a HIPAA Program administrator at 813-974-5638.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

V Jorgensen MD

E. Verena Jorgensen, MD, Chairperson
USF Institutional Review Board