BRIDGING THE GAP: FERTILITY TIMING IN THE UNITED STATES, THEORETICAL VANTAGE POINTS, EFFECTIVE PUBLIC POLICY, AND PREVENTION DESIGN

by

Elizabeth H. Tilley

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____ Date:

Melissa Barnett

____ Date:

Stephen T. Russell

____ Date:

Adela C. Licona

____ Date:

____ Date:

Final approval and acceptance of this dissertation is contingent upon the candidate's submission of the final copies of the dissertation to the Graduate College.

I hereby certify that I have read this dissertation prepared under my direction and recommend that it be accepted as fulfilling the dissertation requirement.

____ Date:

Dissertation Director: Melissa Barnett

STATEMENT BY AUTHOR

SIGNED: Elizabeth H. Tilley

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ABSTRACT

The United States has one of the highest teen pregnancy rates among developed countries and ranks third overall in rates of teen pregnancy out of thirty countries in the Organization for Economic Cooperative Development, OECD (UNICEF, 2007). However, as a country we are spending an enormous amount of money on teen pregnancy prevention programs. For example, the Office of Adolescent Health has implemented grant funding opportunities for teen pregnancy prevention programs and provides approximately $105 million to states to design these programs. These programs include personal responsibility education and abstinence only education (http://www.hhs.gov/ash/oah/oah-initiatives/tpp). If we are spending this much on these programs, why do we still have one of the highest teen pregnancy rates among developed countries?

Based on what we have learned from current prevention efforts, the goal of this dissertation is two-fold, to introduce alternative theoretical approaches for prevention design and test determinants and protective factors of sexual risk-taking in adolescence. To obtain these goals, this dissertation was written using the three paper option that contains a theoretical paper and two empirical papers that test hypotheses of determinants of sexual risk-taking in adolescence and possible factors that protect youth from engaging in sexual risk-taking, such as school-wide communication and sexual education. The theoretical paper introduces alternative theoretical approaches to not only target individual behavior that may be risky, but also target the contextual constraints in which teens are operating. The empirical papers analyze possible determinants and protective factors for sexual risk-taking in youth.

CHAPTER 1 INTRODUCTION

The United States has one of the highest teen pregnancy rates among developed countries and ranks third overall in rates of teen pregnancy out of thirty countries in the Organization for Economic Cooperative Development, OECD (UNICEF, 2007). However, as a country we are spending an enormous amount of money on teen pregnancy prevention programs. For example, the Office of Adolescent Health has implemented grant funding opportunities for teen pregnancy prevention programs and provides approximately $105 million to states to design these programs. These programs include personal responsibility education and abstinence only education (http://www.hhs.gov/ash/oah/oah-initiatives/tpp). If we are spending this much on these programs, why do we still have one of the highest teen pregnancy rates among developed countries?

Determinants of Sexual Risk-taking

Socioeconomic status is a term that is common in the social sciences. Most social scientists equate it to economic status without considering much more than income. According to Dutton & Levine (1989), it is a composite of economic status, as indicated by income; social status, measured by education; and work status as measured by occupation; however, there is more that needs to be considered. Matthews, Gallo, & Taylor (2010) document the association between socioeconomic status, psychosocial factors, and health. Specifically, they posit a model of how low SES and position in the social hierarchy affect emotional and cognitive responses in individuals, which are directly linked to health behaviors and outcomes, such as morbidity and mortality. Several factors may account for the relationship between poverty and higher rates of morbidity and mortality. These factors include, but are not limited to, exposure to environmental toxins, lack of health insurance or access to higher quality preventative health care, and less availability of higher quality nutrition due to costs (Evans, 2004; Matthews, Gallo, & Taylor, 2010) Morbidity and mortality rates are the largest correlates to fertility timing (Ellis et al., 2009). The lower availability of resources and the higher stress associated with less availability of resources contributes to these adverse health and mortality outcomes which drive fertility timing rates. We must consider societal discourse regarding status, overt and covert, because it is also linked to what the model put forth by Matthews, Gallo, & Taylor (2010). We must also consider the environments in which children develop as more than income, education, and work. Social inequality can be broadly defined as the phenomenon of groups within a society not having equal social status.

Social inequality is not the same as economic inequality, which refers to disparities in the distribution of economic assets and income. While economic inequality is caused by the unequal accumulation of wealth, social inequality exists because the lack of wealth in certain areas prohibits people from obtaining the same housing, health care, and education, as the wealthy, in societies where access to these social goods depends on wealth. An additional component of social inequality is that of the perception of status within groups. Economic inequality does not account for individual perception and psychological responses to the inequality (Matthews, Gallo, & Taylor, 2010).

Teen pregnancy is not the social problem we need to target with prevention programs

An argument that is often made when discussing the problem of teen pregnancy publicly is that earlier pregnancies are associated with some adverse outcomes for teen mothers and the children of teen mothers. There are high social, economic, and health costs for all who are affected by teen pregnancy. For example, some teen parenting has been linked to higher rates of abuse and neglect for children born to teen mothers (Ellis, et al., 2003; Furstenburg, Brooks-Gunn, &

Chase-Lansdale, 1989). Most consistently documented are the adverse outcomes among teen mothers themselves. Teen mothers have higher rates of welfare dependency and joblessness, and lower rates of educational attainment (often resulting from being forced out of school and ongoing education). Children of teen mothers have also exhibited lower cognitive test scores, academic achievement scores, and higher rates of problem behavior in school (Elfebein, 2003; Furstenburg, et al., 1989; Rich-Edwards, 2002).

However, the work of Males (2010) argues that these problems seen in teen mothers are also seen in the communities in which teen mothers live. The adverse outcomes associated with earlier childbirth are, at least part, a reflection of the environment they live in. Specifically, the adverse outcomes that we document as being a product of earlier fertility timing are actually associated with the high rates of poverty and that poverty is a bigger predictor of adverse outcomes than early childbirth. For example, the concern over teenage childbearing and welfare dependence does not always account for the fact that this welfare dependence may be more a product of single motherhood than of teenage parenthood (Coley & Chase-Lansdale, 1998). Additionally, if the concern about welfare dependency among adolescent mothers is tied to higher rates of welfare dependency among single parents, then the focus on adolescent mothers is misguided because more children are born to single mothers in their twenties than teenage single mothers (Foster & Hoffman, 1996). Finally, studies that assess the relationship between teen motherhood and adverse outcomes associated with early childbirth compared to siblings show that there is considerable influence of familial background and demographic characteristics that affect adverse outcomes. For example, children born to adult siblings of teenage mothers have higher than average rates of adverse outcomes such as behavioral and cognitive delays due to confounds associated with familial environment (Harden, et al., 2007).

Although the research on lifetime effects of teen pregnancy has demonstrated that children and teenage parents are resilient to these problem outcomes in later years (Geronimus, 1996), particularly among African Americans, the fact remains that earlier child-bearing may have a negative impact on the quality of life for these teen mothers and their children because our societal infrastructure does not easily allow for opportunities once young women do become pregnant. For example, in order to receive any TANF benefits, teen mothers must live with their parents, or in an adult supervised setting and stay in school (www.acf.hhs.gov). This provides extra constraints on teens who do not have a choice to live with an adult once they do get pregnant and is just one of the many examples on how we might change a seemingly simple rule within our policies that may actually help those we state we wish to help.

Poverty, Reproduction, and Health

A full review of the documented health outcomes associated with poverty and the empirical work that has been done surrounding this issue can be found in a recent review published by Adler & Stewart (2010). Health disparities and differences in life expectancy are associated with income inequality in the United States. The differences in real income between the top income earners and the lowest income earners in this country have increased over the last 30 years. Real income can be defined as what your dollar can actually purchase. While inflation may confuse this definition, it is easy to understand the concept if we think about the amount of groceries or the type of housing that can be bought with a paycheck. The numbers may look bigger, but what we are able to buy is less. According to the U.S. Census Bureau, income for the lowest to the highest income quintiles increased 1%, 9%, 15%, 25%, and 53%, respectively (Adler & Stewart, 2010). With these differences in ability to purchase comes an inability to buy adequate health care, nutrition, and housing. The lower purchasing power of the poor leads to higher mortality rates among the poor. For example, Evans (2004) documents a wide variety of adverse surroundings that individuals living in low-income neighborhoods must face, such as noise pollution, degradation of buildings, and higher rates of violence. However, one theory cannot accommodate the multiple systems involved in reproductive timing. Additional theories are needed to inform a fuller understanding of contextualized individual reproductive behavior. For this reason, other theories can be introduced and articulated or connected to one another to achieve a better and more comprehensive understanding the concept of fertility timing in order to effectively design prevention programs and inform policy. These prevention programs might entail targeting context rather than individual behavior. Again, the problem may not be individual fertility timing at all, but rather the factors, such as educational and employment opportunities or correlates to life expectancy and health outcomes that may be better targets of prevention programs.

CHAPTER 2 PRESENT STUDY

Purpose of Dissertation

The purpose of this dissertation is to introduce a broader lens that might ultimately allow researchers to view the determinants of teenage pregnancy more clearly. For example, is teen pregnancy an isolated problem for individual adolescents, or is it an adaptive response to a broader societal problem? The majority of prevention programs target “high-risk” individuals, meaning low-income minorities who have higher rates of earlier fertility timing in this country, but these programs do not address the context, including economic and social inequality, in which high-risk individuals are developing. If teen pregnancy is viewed as an adaptive response to a systemic problem, how might we revise our current prevention approaches to accommodate this view?

Based on what we have learned from current prevention efforts, the goal of this dissertation is two-fold, to introduce alternative theoretical approaches for prevention design and test determinants and protective factors of sexual risk-taking in adolescence. To obtain these goals, this dissertation was written using the three paper option that contains a theoretical paper and two empirical papers that test hypotheses of determinants of sexual risk-taking in adolescence and possible factors that protect youth from engaging in sexual risk-taking, such as school-wide communication and sexual education. The theoretical paper introduces alternative theoretical approaches to not only target individual behavior that may be risky, but also target the contextual constraints in which teens are operating. The empirical papers analyze possible determinants and protective factors for sexual risk-taking in youth.

Theoretical Paper

The theoretical paper provides unique alternatives to the standard intervention frameworks that are marginally successful. A major component of these alternatives is combining seemingly disparate theories to address the determinants of sexual risk-taking for teens. Bridging the work of feminist theorists, demographers, biologists, and economists will contribute to a greater understanding of the antecedents to sexual risk-taking and the impact of policy creation and prevention efforts of this phenomenon. Specifically, this paper considers three different theoretical perspectives and how these perspectives can more adequately inform policy and prevention design. These theoretical perspectives include life history theory, the bioecological model of development, and standpoint theory. Life history theory (Chisholm, 1993; Stearns, 1992) is an evolution-informed theory that posits that species have evolved to make various trade-offs. For example, animals make trade-offs between reproductive effort and somatic effort in response to particular environmental conditions, such as mortality rates or resource availability (e.g., food, housing). For the purpose of this paper, life history theory is used to address within-species variation. The bioecological model (Bronfenbrenner & Morris, 2006) posits that individuals develop within a series of nested contexts, including proximal environments such as family and more distal environments such as national culture or governmental policies. Each of these contexts interacts with each other and influences individual developmental pathways. Standpoint theory (Harding, 1987) posits that scientific inquiry can be enhanced by including the views and experiences of the individuals who are being investigated in order to create more appropriate and effective research questions.

The problem with current prevention design lies in the theoretical approaches used to provide a foundation for prevention programs. We need to go beyond designing programs that address individual responsibility. While this is an important component to be included in any prevention program, it does not acknowledge the broader social systems that are constructing opportunities and possibly life course pathways for individuals. The current programs do not fully address teen pregnancy, or more appropriately, earlier fertility timing, as an adaptive response to environmental conditions.

Empirical Papers

Both empirical papers use data from the National Longitudinal Study of Adolescent Health for analyses. These data included four time points or waves that data were gathered.
The first wave of data was gathered between 1994 and 1995. Data were first gathered from youth in grades 7 through 12 at schools. Data were then gathered during in-home interviews with a portion of the students who first completed the school questionnaires (N = 12,105). Wave I includes data gathered from school administrators and parents. Wave II was conducted in 1996 and excluded youth from Wave I who had graduated or who were included in the Wave I disabled sample. Wave III data were gathered in 2001 and 2002. The age range of respondents was 18 to 26 years old. Wave IV data were gathered in 2007 and 2008. These data included social, economic, psychological, and health circumstances of the original participants. Participants also retrospectively reported on reproductive outcomes, which allowed for the inclusion of a teen pregnancy variable in these analyses. Waves I, II, and IV were used in these analyses as data from Wave III did not include data on family functioning.

The Add Health design is also unique in that it includes contextual variables, such as families, peer groups, schools, and neighborhood/community level data as provided by the US Census, Centers for Disease Control and Prevention, the National Center for Health Statistics, the Federal Bureau of Investigation, and other databases. The inclusion of these data allowed for an in-depth analysis of many variables that are considered to be life history parameters.

The first empirical paper tests the determinants of teen pregnancy and sexual risk-taking by using a longitudinal model to analyze influences from times one and two on the reproductive outcomes at time four. This empirical paper uses Life history theory (Chisholm, 1993; Stearns, 1977), which is an evolution-informed theory that posits that species have evolved to make various trade-offs based on environmental conditions that either support long-term outcomes or short-term outcomes. These trade-offs include contributing more energy towards growth and physiological maintenance versus reproduction. Life history parameters, such as mortality rates, poverty (proxy for access to resources), and population density are tested in these analyses. Additionally, important proximal level variables such as family functioning and parent support are tested. Findings show that living within an urban setting and report of low parental warmth by teens were the strongest predictors of likelihood of teen pregnancy. These findings suggest that while distal level life history parameters are important in determining the likelihood that teen pregnancy may occur, family level variables, such as parental monitoring and warm supportive parenting are important considerations as well.

The second empirical paper uses a life history and ecological systems framework to assess the influence of state, community, and school level policies on sexual risk-taking in youth. Additionally, this paper assess the influence of parent reports of financial strain and poverty to determine what may protect youth from engaging in sexual risk-taking. A two way interaction effect of gender and parent report of financial strain was found for sexual risk-taking outcomes in youth such that girls from families who did not report financial strain had the lowest sexual risk-taking outcomes. These findings suggest the influence of financial strain on sexual risk-taking through its effects on parenting effectiveness may vary by gender.

CHAPTER 3 DISCUSSION

The goal of this dissertation was to introduce alternative theoretical approaches for prevention design and test determinants and protective factors of sexual risk-taking in adolescence.

The theoretical paper discussed the combination of three seemingly disparate theories to better inform teen pregnancy and/or sexual risk-taking prevention design, while the These theories alone do not fully address the phenomenon of sexual risk-taking in youth; however, when combined, components of these theories can allow prevention scientists to take the first step at establishing an effective prevention program, that of understanding the ultimate explanation of earlier fertility timing. Each theory provides a unique way of viewing fertility timing. Life history theory can provide a broad lens to adaptive human behavior in response to environmental cues and constraints. The bioecological model can address the systems and processes associated with fertility timing, and standpoint theory addresses the situated knowledges of youth living in particular contexts. When combined, these theories can build upon one another to reflect all of the important angles that need to be considered in teen pregnancy prevention. Using a combination of these theories for prevention design will be complicated. One must account for individual perceptual states and cognition as well as adaptive physiological responses to environmental constraints. These environmental constraints include the correlates of social and economic inequality. The bottom-line is that designing an effective prevention program requires uprooting foundations used as a base to design prevention programs and thinking outside of the established parameters. A fundamental paradigm shift is needed. The empirical papers both showed the importance of the influence of contextual factors, parental support, and parent-child relationships on adolescent sexual risk-taking. Papers one and two provide an alternative option for re-appropriating funds for teen pregnancy and sexual risk-taking prevention programs. The results in these papers suggest one very important prevention possibility. While we cannot target overall poverty under current economic conditions, we may be able to spend prevention dollars on parenting skills. The interaction results in this paper suggest that targeting how parents respond to financial strain may be beneficial for youth as well. Future studies could include investigation of parenting practices that mediate the association between financial strain and sexual risk-taking. Due to the stratified sampling design, it will be important to test these models using other sources of data as well; however, both analyses provide evidence for reviewing and revising current prevention approaches.

What can be done?

How can the combination of these theoretical approaches more accurately inform prevention design? First, we must use a life history approach and look at fertility timing as an adaptive response of individuals to environmental constraints. If the aim of a prevention program is to prevent particular behaviors, we must understand WHY individuals engage in the behavior. In doing so, we must also incorporate standpoint theory in order to understand the perspectives of the individuals living within these constraints. Once we have defined the constraints, we can use the bioecological model and begin to target the environmental factors influencing behavior, such as child and family welfare policy. In order to target the environmental factors, we must acknowledge the broader problem of how funds are allotted to social programs in this country. This third aspect will be the most difficult and must be implemented initially at a local level.

State programs such as First Things First (FTF; www.azftf.gov) in Arizona are an example of a potentially promising model for designing teen pregnancy and sexual risk-taking prevention programs. FTF targets the broader problem of funding social programs, begins early in development, and conceptualizes development within the environmental contexts. A basic component of FTF is that it is regionally specific and accounts for local ownership, leadership, and participation in programs at the community level. This basic component supports the notions of standpoint theory in that it allows for individuals to participate in the development and maintenance of programs.

To avoid entrapment by the political process associated with revisions of welfare policy, FTF is funded by taxes on cigarettes sold in the state. The focus of this tax-funded program is educating early childhood caregivers, parents, and community members on better quality child-care, healthy lifestyle choices, family communication, and community services. Their mission is to ensure that children receive adequate health and childcare to prepare them to arrive at school ready to succeed.

As with FTF, a teen pregnancy prevention program will need to target these areas, but also provide an avenue to opportunities that many youth living in poverty are not able to find or see. FTF can provide a general model of a teen pregnancy prevention program that targets the ultimate sources of variation in fertility timing, social and economic inequality. As reviewed in the theoretical paper, significant evidence suggests that teen pregnancy is adaptive under certain conditions (Burton, 1999; Geronimus, 1987; Ellis et al., in press). These conditions are represented by morbidity and mortality rates which are related to access to education, occupation, and preventative health care. How might we begin to change those conditions? Comprehensive early education and intervention programs like FTF provide an answer to this question.

Addressing areas such as diet and nutrition early in life is linked to teen pregnancy prevention because health disparities among the poor contribute to higher rates of morbidity and mortality, which in turn affect fertility timing. How health care is federally funded and provided to low-income individuals is beyond the scope of this paper, but this area would probably be one of the largest components of an effective teen pregnancy prevention program. Of the current annual funds of $105 million to prevent teen pregnancy, there may be room to consider redistributing a small portion of the funds to physicians in low-income communities to implement revisions in health care delivery that could be tested for effectiveness on long-term health outcomes.

FTF and other similar state-adopted programs target school readiness in young children (www.azftf.gov). While this program is not designed to prevent teen pregnancy, many of its components are useful in preventing the cycle of predictors of early fertility timing, such as educational and occupational opportunities. The problems are morbidity and mortality rates linked closely to social inequality. FTF is a model that proposes that prevention of inadequate school readiness should begin early in life. Teen pregnancy prevention should begin early in life as well. By targeting health behavior and education as well as the policies that are tied to funding the opportunities associated with health and education early in life, we can reduce teen pregnancy rates in this country; however, if we try to address teen pregnancy rates with band-aid approaches for youth beginning at age 12, we will not reduce teen pregnancy rates in this country. By starting a program earlier in life, preventionists can begin to build an infrastructure for change and opportunity.

While it is never too late to provide opportunities to anyone, it may be difficult to change behavior once individuals have learned the constraints within which they are operating within.

People make unconscious adaptive behavioral choices based on acquired experience over their lifetimes. To tell them that they have “other opportunities” as long as they revise their behavior is counterintuitive. Starting early and providing true avenues to change environmental constraints is the best prevention method. Early prevention work will not initially address sexual behavior, but health outcomes such as diet, nutrition, exercise, and enriching educational opportunities for all children.

Finally, the opportunities afforded to youth across all economic strata are not equal. Programs that offer avenues to opportunity will need to be implemented. The purpose of providing clear pathways to education and employment links the basic evolved responses of fertility timing to accessibility of resources as well. Providing community resources that offer individuals the basic skills to succeed in school and employment can minimize the barriers to obtaining adequate resources in life. For example, the Perry Preschool project that began in the 1960’s resulted in 50% fewer teenage pregnancies in the children who participated in the high quality program versus those in the control group (Shweinhart, 2004). Again, federal funds are already distributed through programs to provide funds for education and training. There is room for revising how these funds are allotted to provide more effective educational and occupational opportunities.

This broadly described design sounds overly-simplistic and impossible to achieve given the current state of the economy in the U.S. because the problem with designing most prevention programs is fear of cost. Most programs are looking to get the most “bang for their buck”. For example, many programs offer contraceptive advice to teens who are already sexually active (Jemmott, Jemmott, & Fong, 1998). These programs do show mild reductions in teen pregnancy or sexual risk-taking in the short-term, but overall, early fertility timing rates are high in the U.S.

As shown by Duncan and Magnuson (2002), there are ways to redistribute funds that may not require implementing a “teen pregnancy prevention program”. Teen pregnancy prevention could be executed alongside programs that are already in place, but also incorporate the needs of these individuals, as stated by the individuals themselves. The social policy changes suggested by Duncan and colleagues along with programs addressing school readiness and early childhood well-being, such as First Things First, can be combined to establish foundations that allow youth to seek alternate options to early fertility timing because they do address the broader problem of social and economic inequality by ensuring access to more equal opportunities for youth from all contexts.

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APPENDIX A: THEORY: TEEN PREGNANCY AND PREVENTION DESIGN

Paper is submitted for publishing to Journal of Primary Prevention

Bridging the Gap: Fertility Timing in the United States, Theoretical Vantage Points, Effective Public Policy, and Prevention Design

Elizabeth H. Tilley

University of Arizona

Abstract

This theoretical paper takes an ecologically articulated approach to understanding public policy and teen pregnancy prevention. This paper proposes that teen pregnancy is an adaptive response to environmental constraints such as economic and social inequality. Alternative theoretical perspectives to the ones that are currently used should be implemented in order to design more effective teen pregnancy prevention programs. These alternative perspectives include life history theory, the bioecological model of development, and standpoint theory. The use of an evolutionarily and environmentally informed feminist perspective may be our best approach to truly understanding earlier fertility timing and designing prevention programs that address the contexts that individuals adaptively respond to by engaging in behavior that our society deems to be "risky." Finally, this paper proposes a potential prevention approach that incorporates these theoretical foundations and suggests alternative ways to design teen pregnancy prevention programs.

Keywords: Teen Pregnancy Prevention, Sex Education, Social Inequality, Health Disparities, Fertility Timing, Adaptive Response, standpoint theory, bioecological theory, life history theory, evolutionarily informed feminist perspective

Introduction

The United States has one of the highest teen pregnancy rates among developed countries and ranks third overall in rates of teen pregnancy out of thirty countries in the Organization for Economic Cooperative Development, OECD (UNICEF, 2007). However, as a country we are spending an enormous amount of money on teen pregnancy prevention programs. For example, the Office of Adolescent Health has implemented grant funding opportunities for teen pregnancy prevention programs and provides approximately $105 million to states to design these programs. These programs include personal responsibility education and abstinence only education (http://www.hhs.gov/ash/oah/oah-initiatives/tpp). If we are spending this much on these programs, why do we still have one of the highest teen pregnancy rates among developed countries?

The purpose of this trans-disciplinary theoretical review paper is to introduce a broader lens that might ultimately allow researchers to view the problem of earlier fertility timing more clearly. For example, is teen pregnancy an isolated problem for individual adolescents, or is it an adaptive response to a broader societal problem? The majority of prevention programs target "high-risk" individuals, meaning low-income minorities who have higher rates of earlier fertility timing in this country, but these programs do not address the context, including economic and social inequality, in which high-risk individuals are developing. If teen pregnancy is viewed as an adaptive response to a systemic problem, how might we revise our current prevention approaches to accommodate this view?

Based on what we have learned from current prevention efforts, the goal of this paper is to inform these scientists of ways in which we can incorporate a broader set of considerations by expanding the theoretical lens and not only target individual behavior that may be risky, but also target the contextual constraints in which t teens are operating.

Bridging the work of feminist theorists, demographers, biologists, and economists will contribute to a greater understanding of the antecedents to earlier fertility timing and the impact of policy creation and prevention and educational efforts on this phenomenon. Much like the concept of using a mixed methods approach for empirical papers, this paper introduces a mixed theories approach with the hope that a uniquely trans-disciplinary product will follow. Specifically, this paper considers three different theoretical perspectives and how these perspectives can more adequately inform policy and prevention design. These theoretical perspectives include life history theory, the bioecological model of development, and standpoint theory. Life history theory (Chisholm, 1993; Stearns, 1992) is an evolution-informed theory that posits that species have evolved to make various trade-offs. For example, animals make trade-offs between reproductive effort and somatic effort in response to particular environmental conditions, such as mortality rates or resource availability (e.g., food, housing). For the purpose of this paper, life history theory is used to address within-species variation. The bioecological model (Bronfenbrenner & Morris, 2006) posits that individuals develop within a series of nested contexts, including proximal environments such as family and more distal environments such as national culture or governmental policies. Each of these contexts interacts with each other and influences individual developmental pathways. Standpoint theory (Harding, 1987) posits that scientific inquiry can be enhanced by including the views and experiences of the individuals who are being investigated in order to create more appropriate and effective research questions.

The problem with current prevention design lies in the theoretical approaches used to provide a foundation for prevention programs. We need to go beyond designing programs that address individual responsibility. While these are important components to be included in any prevention program, they do not acknowledge the broader social systems that are constructing opportunities and possibly life course pathways for individuals. The current programs do not fully address teen pregnancy, or more appropriately, earlier fertility timing, as an adaptive response to environmental conditions.

Earlier fertility timing is a phrase that represents a neutral view of individual adaptive responses to constraints. Teen pregnancy is a term originally introduced by Planned Parenthood in the early 1970s as a marketing campaign for birth control (Nathanson, 1991). While the original intent of the term's use is commendable, it is now a term loaded with social meaning that should be avoided when discussing adaptive responses to environmental constraints. These constraints are represented by economic and social inequality. Once we identify the societal constraints, we can begin to design effective prevention programs that address real social problems rather than individual responses to those societal constraints.

This paper will first provide a brief description of each of theories that go beyond pathologizing early fertility timing and how they can be used to more effectively inform public policy and prevention design for programs targeting earlier fertility timing. Perhaps it is not the earlier fertility timing that needs to be prevented, but rather certain contextual aspects will need to be targeted to effectively use the millions of dollars distributed by the Office of Adolescent Health. Finally, a brief description of possible prevention programs following the model outlined in this paper will be presented.

Literature Review

Importance of Topic

As stated previously, data from the Organization for Economic Cooperative Development (UNICEF, 2007) show that the United States ranks very high in early fertility rates (72 per 1000 in 2006), when compared to other developed countries, (Barrett & McKay, 2010). The US ranks third overall in rates of pregnancy between ages 15 and 19 out of thirty countries. Earlier fertility timing rates are related to many adverse health and developmental outcomes. For example, we also rank very poorly on child outcomes such as educational opportunities, and child safety measured by infant mortality, rates of injury between ages 0 – 19, rates of preventative health services, and global risk-taking behaviors of youth (UNICEF, 2007). While some have argued that early fertility timing is a major contributor to the intergenerational transmission of poverty (Lopez, 2011), others contend that earlier fertility timing is a response to a societal problem that is also directly tied to poor developmental outcomes. Specifically, many poor developmental outcomes are correlated with teen pregnancy, but teen pregnancy is not necessarily the cause of these other poor developmental problems. UNICEF (2007) documented a negative correlation between amount of government expenditure on social programs and adverse outcomes, such as pregnancy during adolescence, for youth. When countries spend less than 5% of gross domestic product on social programs that include family and social benefits, they rank higher on adverse outcomes for youth. When countries spend more than 10% of gross domestic product on these types of social programs, adverse outcomes for youth decline substantially (UNICEF, 2007).

The variability of early fertility timing rates within the United States illustrates the foundational problem. Of data from 2005, New Mexico had 93 per 1000 pregnancies for females aged 15 - 19, Nevada had 90 per 1000, and Arizona had 89 per 1000. The states with the lowest rates of earlier fertility, New Hampshire, Vermont, and Maine, had 33 per 1000, 40 per 1000, and 43 per 1000 teen pregnancies respectively. These ranges show that there is also considerable variability between states on rates of earlier fertility timing. Unsurprisingly, the states with the highest rates also have the highest rates of poverty. Arizona and New Mexico ranked 2nd and 3rd in rates of poverty in 2009. According to Males (2010), the major factors, such as high rates of poverty, associated with earlier fertility timing are rarely addressed in prevention programs. The sexual behavior of adolescents are a reflection of the communities within which they occur, and poverty is the biggest correlate to unprotected sex and reproductive outcomes for *all* age groups within these communities. Teen pregnancy is not merely a product of teens having unprotected sex. Teenagers align their reproductive behavior with the disadvantaged communities in which they live such that the rate of unprotected sex in teens mirrors the rate of unprotected sex in adults within those same communities (Males, 2010). For example, the highest rates of teen pregnancy are among African American and Hispanic girls due to the confounds of poverty and race. Poverty is the largest predictor of earlier fertility timing; however, racial minorities make up the majority of individuals living in poverty in this country. For example, in the 2010 Census, African American had the highest poverty levels. Hispanic or Latino groups had very high poverty rates as well. Specifically, 27.1% of African Americans and 24.8% of Hispanic or Latino were at less than 100% of the poverty level compared to 12.5% of whites (http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_10_1YR_S1703&prodType=table). The highest rates of adult sexually transmitted infections and poverty are also concentrated among Hispanic and African American groups (Aral et al., 2008)).

These factors are important to consider, but when designing a prevention program, they are structural aspects of society that are not easily addressed. Despite the fact that a consistently strong correlate of fertility timing is economic inequality, it is often controlled for when conducting statistical analyses documenting risks for teen pregnancy sources that do this. Income inequality is correlated with multiple adverse outcomes; but tackling this problem is daunting because it appears to require deep-rooted changes of social and economic policies at the state and federal level. Therefore, when it comes to prevention work, individual behaviors are targeted because they are more easily addressed; however, targeting those behaviors is much like treating a symptom instead of the cause.

What has been done to prevent teen pregnancy and why it is not working

Rates in teen pregnancy have declined, particularly over the past 20 years (Santelli, Duberstein Lindberg, Finer, & Singh, 2007), but the primary reason for this decline is unclear, and American teen pregnancy rates remain higher than other OECD countries. According to an analysis conducted by Santelli and colleagues (2007), two behavioral changes among youth contributed to the decline, but these changes only account for a small portion of the decline. These changes included delay of sexual initiation and better usage of contraception. The most significant change that had an impact on teen pregnancy rates from the 1980s through the 1990s was the use of different birth control methods, such as the birth control pill (Santelli, et al., 2007). In this analysis of US pregnancy trends and contraceptive use data, 77% of the decline in pregnancy risk was associated with improved contraceptive use.

Additionally, various prevention programs have shown that including ethnically and culturally sensitive components in their programs does contribute to reduced sexual risk-taking (Jemmott, Jemmott, & Fong, 1992; Jemmott & Jemmott, 1992; Jemmott, Jemmott, Spears, Hewitt, & Cruz-Collins, 1992; Jemmott, Jemmott, & Fong, 1998; Oringanje, Meremikwu, Eko, Esu, Meremikwu, & Ehiri, 2010). But while these programs do show minimal effects, they typically do not measure sexual behavior more than 12 months following the intervention. The effects are on a limited scale because they are usually quite small and sexual behavior is not measured over long periods of time following the intervention. Moreover, the U.S. continues to have teen pregnancy rates are higher than in other developed countries.

While the United States federal government currently funds many programs such as the ones reviewed by Oringanje and colleagues (2010) through the Teen Pregnancy Prevention Initiative (TPPI) established in 2010, it is not clear why we do not see larger reductions in teen pregnancy. Why are we not seeing a reduction in teen pregnancy rates when compared to other countries in the OECD? This paper argues that the foundational target, individual behavior, of these prevention programs is wrong. While countries, such as Sweden, the Netherlands, and Great Britain, do offer similar family planning services and prevention programs to youth (Cromer & McCarthy, 1999; Resnick, 2003), they have already addressed the problem of how federal funds are spent on social programs, which include health care, early childcare, and employment benefits, such as amount of time available for maternity leave (UNICEF, 2007). Most research has documented the higher use of contraception among youth in these other countries, while they are reporting the same amount of sexual activity (Boonstra, 2002). It is difficult to separate whether the driving factor of these differences is use of contraception or how federal funds are spent on social programs that, perhaps, in other countries are used to effectively educate youth on contraceptive youth. As highlighted in the report by UNICEF (2007), the largest correlate of many outcomes associated with earlier fertility timing is how federal funds are spent on social programs.

The term “strong objectivity” refers to research that stems from those who have been left out of the standard creation of knowledge (Harding, 1987). Strong objectivity can best be thought of as a way to enhance scientific inquiry by expanding upon the typical or traditionally assumed neutral stance of social science. Harding informs the work presented in this paper by providing a philosophical approach to how we ask our research question that is needed in order to facilitate the pursuit of clear, well-rounded scientific inquiry. Current prevention programs, while minimally addressing culture and ethnicity, do not always fully incorporate an understanding of the lived experience of individuals who must navigate a world filled with resources that are not available to them in the same way that they are to others. This phenomenon will not only be associated with outcomes such as teen pregnancy, but with other factors such as less participation in the labor economy and higher dependence on welfare systems. It must be noted that these latter outcomes are a product of social constraints placed on individuals within particular contexts, and are not a product of a lack of acceptance of responsibility (Burton, 1990, Colen, Geronimus, & Phipps, 2006).

Many prevention programs incorporate focus groups to guide their design (Downs et al., 2004; Jemmott, Jemmott, & Fong, 1992), which aligns researchers with better understanding the stance of the teens themselves, but these programs typically use a social cognitive theory approach or a reasoned action approach to explain individual behavior (Jemmott, Jemmot, & Fong, 1992). Both approaches address individual responsibility and choices without fully addressing the broader context of program participants. For example, to fully address context, preventionists might need to start earlier than in adolescence, in the school or community setting. Indeed, some prevention researchers are suggesting the incorporation of community partners, such as faith-based organizations within the community, as a way to better inform prevention design (Goldberg, Frank, Bekenstein, Garrity, & Ruiz, 2011); however, many of these theorists do not account for antecedents to what our society considers to be adolescent sexual risk-taking (i.e., unprotected sex?).

Economists, developmentalists, evolutionists, and epidemiologists have attempted to establish some causal pathway between social policy, family-level dynamics, neighborhood factors, and individual characteristics and earlier ages of reproduction (Burton, 1990; Burton, 2007; Colen, Geronimus, Phipps, 2006; Duncan & Magnuson, 2003; Ellis et al., 2003; Geronimus, 1999; Geronimus, 2003; Harville, Boynton-Jarrett, Power, & Hypponen, 2010; Hippwell, Keenan, Loeber, & Battista, 2010; Russell & Lee, 2004; Santelli & Kirby, 2010; Yang & Gaydos, 2010). Thus far, correlations have been documented and some predictions can be made from this work. For example, promoting positive parenting practices has been shown to lead to reduced deviant behaviors, such as vandalism, in teens (van Loon, Granik, & Engels, 2011).

The problem with most prevention programs is that they target individual responsibility and choices without understanding the limited options with which individuals are faced. Instead of treating pregnant teens as problems, perhaps it is more productive to address their contextual constraints, such as poverty and unequal educational opportunities that impact their reproductive choices and fertility timing. The current prevention approaches take a mental health disease model stance on the subject of earlier fertility timing. A mental health disease model is by definition pathologizing and views teen pregnancy as a bad outcome or a risk that needs to be avoided (Johns, Dickens, & Clegg, 2011). This model fails to account for reproductive behavior as an adaptive response to environmental constraints, and consequently offers personal responsibility choices to individuals who are at risk for getting pregnant as a teenager. At a very simplistic level, these choices can be viewed as deciding to use contraception or not. The tools that most prevention programs provide are supposed to train youth to think through actions and make reasonable choices (Clark et al., 2005; Jemmott & Jemmott, & Fong, 1998). While these approaches are commendable in that they attempt to provide youth with decision-making skills, they also fail to understand the adaptive responses of the youth within a particular context.

Many view earlier fertility timing as a cause of poverty; however, this view needs to be changed. Early fertility timing is both a contributing factor and an adaptive response to poverty. A recent statement by Thomas Frieden, Director of the Centers for Disease Control and Prevention, declared that teen pregnancy needs to be prevented because it is source of the intergenerational transmission of social inequality (Lopez, 2011). His argument is that earlier fertility timing is not an outcome, but that it is a cause of the transmission of poverty over generations. Social inequality is indeed related to earlier fertility timing, as evidenced by the reports issued by UNICEF; however, is fertility timing a cause or an outcome related to structural constraints within our society? Theoretical foundations that provide a basis for understanding human behavior within the context of structural and social inequality are needed to create effective prevention programs.

Targeting the contextual factors associated with earlier fertility timing is the solution to establishing effective prevention programs. When these contextual factors have been addressed, fertility timing rates do indeed change. For example, Colen, Geronimus, & Phipps (2006) documented a dramatic decline in teen childbearing during the mid-1990s that was associated with higher paying employment opportunities for young African-American women. These women revised their priorities when societal constraints were changed and they were able to find work that made the effort worth it (Colen, Geronimus, & Phipps, 2006). Women who choose to engage in behavior that appears to be risky compared to engaging in behavior that is idealized and imposed by the dominant cultural norms can change this behavior when genuine opportunities are made available to them.

Social Inequality

Socioeconomic status is a term that is common in the social sciences. Most social scientists equate it to economic status without considering much more than income. According to Dutton & Levine (1989), it is a composite of economic status, as indicated by income; social status, measured by education; and work status as measured by occupation; however, there is more that needs to be considered. Matthews, Gallo, & Taylor (2010) document the association between socioeconomic status, psychosocial factors, and health. Specifically, they posit a model of how low SES and position in the social hierarchy affect emotional and cognitive responses in individuals, which are directly linked to health behaviors and outcomes, such as morbidity and mortality. Several factors may account for the relationship between poverty and higher rates of morbidity and mortality. These factors include, but are not limited to, exposure to environmental toxins, lack of health insurance or access to higher quality preventative health care, and less availability of higher quality nutrition due to costs (Evans, 2004; Matthews, Gallo, & Taylor, 2010) Morbidity and mortality rates are the largest correlates to fertility timing (Ellis et al., 2009). The lower availability of resources and the higher stress associated with less availability of resources contributes to these adverse health and mortality outcomes which drive fertility timing rates. We must consider societal discourse regarding status, overt and covert, because it is also linked to what the model put forth by Matthews, Gallo, & Taylor (2010). We must also consider the environments in which children develop as more than income, education, and work. Social inequality can be broadly defined as the phenomenon of groups within a society not having equal social status.

Social inequality is not the same as economic inequality, which refers to disparities in the distribution of economic assets and income. While economic inequality is caused by the unequal accumulation of wealth, social inequality exists because the lack of wealth in certain areas prohibits people from obtaining the same housing, health care, and education, as the wealthy, in societies where access to these social goods depends on wealth. An additional component of social inequality is that of the perception of status within groups. Economic inequality does not account for individual perception and psychological responses to the inequality (Matthews, Gallo, & Taylor, 2010).

Teen pregnancy is not the social problem we need to target with prevention programs An argument that is often made when discussing the problem of teen pregnancy publicly is that earlier pregnancies are associated with some adverse outcomes for teen mothers and the children of teen mothers. There are high social, economic, and health costs for all who are affected by teen pregnancy. For example, some teen parenting has been linked to higher rates of abuse and neglect for children born to teen mothers (Ellis, et al., 2003; Furstenburg, Brooks-Gunn, & Chase-Lansdale, 1989). Most consistently documented are the adverse outcomes among teen mothers themselves. Teen mothers have higher rates of welfare dependency and joblessness, and lower rates of educational attainment (often resulting from being forced out of school and ongoing education). Children of teen mothers have also exhibited lower cognitive test scores, academic achievement scores, and higher rates of problem behavior in school (Elfebein, 2003; Furstenburg, et al., 1989; Rich-Edwards, 2002).

However, the work of Males (2010) argues that these problems seen in teen mothers are also seen in the communities in which teen mothers live. The adverse outcomes associated with earlier childbirth are, at least part, a reflection of the environment they live in. Specifically, the adverse outcomes that we document as being a product of earlier fertility timing are actually associated with the high rates of poverty and that poverty is a bigger predictor of adverse outcomes than early childbirth. For example, the concern over teenage childbearing and welfare dependence does not always account for the fact that this welfare dependence may be more a product of single motherhood than of teenage parenthood (Coley & Chase-Lansdale, 1998). Additionally, if the concern about welfare dependency among adolescent mothers is tied to higher rates of welfare dependency among single parents, then the focus on adolescent mothers is misguided because more children are born to single mothers in their twenties than teenage single mothers (Foster & Hoffman, 1996). Finally, studies that assess the relationship between teen motherhood and adverse outcomes associated with early childbirth compared to siblings show that there is considerable influence of familial background and demographic characteristics that affect adverse outcomes. For example, children born to adult siblings of teenage mothers have higher than average rates of adverse outcomes such as? due to confounds associated with familial environment (Harden, et al., 2007).

Although the research on lifetime effects of teen pregnancy has demonstrated that children and teenage parents are resilient to these problem outcomes in later years (Geronimus, 1996), particularly among African Americans, the fact remains that earlier child-bearing may have a negative impact on the quality of life for these teen mothers and their children because our societal infrastructure does not easily allow for opportunities once young women do become pregnant. For example, in order to receive any TANF benefits, teen mothers must live with their parents, or in an adult supervised setting and stay in school (www.acf.hhs.gov). This provides extra constraints on teens who do not have a choice to live with an adult once they do get pregnant and is just one of the many examples on how we might change a seemingly simple rule within our policies that may actually help those we state we wish to help.

Poverty, Reproduction, and Health

A full review of the documented health outcomes associated with poverty and the empirical work that has been done surrounding this issue can be found in a recent review published by Adler & Stewart (2010). Health disparities and differences in life expectancy are associated with income inequality in the United States. The differences in real income between the top income earners and the lowest income earners in this country have increased over the last 30 years. Real income can be defined as what your dollar can actually purchase. While inflation may confuse this definition, it is easy to understand the concept if we think about the amount of groceries or the type of housing that can be bought with a paycheck. The numbers may look bigger, but what we are able to buy is less. According to the U.S. Census Bureau, income for the lowest to the highest income quintiles increased 1%, 9%, 15%, 25%, and 53%, respectively (Adler & Stewart, 2010). With these differences in ability to purchase comes an inability to buy adequate health care, nutrition, and housing. The lower purchasing power of the poor leads to higher mortality rates among the poor. For example, Evans (2004) documents a wide variety of adverse surroundings that individuals living in low-income neighborhoods must face, such as noise pollution, degradation of buildings, and higher rates of violence. However, one theory cannot accommodate the multiple systems involved in reproductive timing. Additional theories are needed to inform a fuller understanding of contextualized individual reproductive behavior. For this reason, other theories can be introduced and articulated or connected to one another to achieve a better and more comprehensive understanding the concept of fertility timing in order to effectively design prevention programs and inform policy. These prevention programs might entail targeting context rather than individual behavior. Again, the problem may not be individual fertility timing at all, but rather the factors, such as educational and employment opportunities or correlates to life expectancy and health outcomes that may be better targets of prevention programs.

Bringing Theories Together

The concept of articulation can best be described as a temporary connection of seemingly unrelated forces in order to achieve an outcome (Hall, 1981). According to Stuart Hall, articulating principles "operate by combining existing elements into new patterns or by attaching new connotations to them." This paper combines theoretical viewpoints that have previously not been used together, but when used to inform one another might shed light on the difficulties our society has encountered in reducing teen pregnancy rates. Life history and feminist standpoint theory are not typically used in conjunction with one another to inform empirical work. When reviewing and then articulating these theories, it is apparent that they share a common ground regarding the concept of fertility timing: The problem is not teen pregnancy, but rather the constraints faced by individuals within their ecological context. Earlier fertility timing is an adaptive and appropriate response to environmental cues and constraints.

Descriptions of Theories

This paper incorporates the theoretical perspectives of Life History theory, Bioecological theory, and Standpoint theory. Each of these theories provides a piece of an overall model that I seek to develop to bridge adaptive theory, system constraints, and varying power differentials within those systems and the policies that they influence. The goal of synthesizing the literature for this model is to build the foundation for creating effective policies and prevention efforts.

Life History Theory

One important theory that should be included in development of public policy regarding teen pregnancy incorporates an evolutionary theoretical approach. This incorporation could enhance policy creation and implementation. Teen pregnancy rates will not change until an adaptationist approach, using life history theory as a guide, is implemented to inform policy and prevention efforts (Johns, Dickins, & Clegg, 2011).

Life history theory is grounded in evolutionary theory and posits that species have evolved to make various trade-offs between survival and reproduction based on bio-energetic and material resources. These “trade-offs” affect many traits, which include age at weaning, age at sexual maturity, adult body size, age at first reproduction, number of offspring, litter size, birth spacing intervals, and parental investment (Chisholm, 1993; Ellis et al., 2009; Ellis, 2004). Life history theory was originally developed to explain variation of traits, such as litter size, *between* species. These traits represented an evolved response to resource availability and other contextual factors among different species. Species were expected to fall on a continuum, r-selected to K-selected, of trait outcomes. R is considered a “fast” strategy and K is considered the “slow” strategy. On the extreme end of r-selected species are animals, such as rabbits, that may temporarily produce more offspring than their environment is capable of maintaining

(Figuredo, Vasquez, Brumbach, & Schneider, 2007; Hill & Kaplan, 1999). As expected, rabbits have early reproductive development, small adult body size, large litters, and short birthing intervals. K-selected species have higher rates of parental investment, larger adult body size, longer gestation periods, later age at weaning, later age at sexual maturity, and later age at first reproduction. Humans fall on the extreme conservative end of K-selected species; however, there is considerable variation among humans in these traits.

Researchers using the life history approach to gain insight into human reproductive variation have explored mechanisms associated with plasticity of development and ecological indicators that may contribute to altering life history outcomes. These indicators include local mortality rates (either juvenile or adult), parental investment as a proximal indicator of ecological conditions, and harsh or unpredictable environmental conditions (Belsky, Steinberg, & Draper, 1991; Chisholm, 1993; Chisholm, 1999; del Giudice, Angeleri, & Manera, 2009; Ellis, 2004; Ellis, 2011; Ellison, 2003; Ellis, Figueredo, Brumbach, & Schlomer, 2009; Hill & Kaplan, 1999).

One component of life history theory includes plasticity. The concept of adaptive phenotypic plasticity (del Giudice, Ellis, & Shirtcliff, 2011; West-Eberhard, 2003) refers to the ability of an organism to alter development according to particular cues present in the organism's environment. A simplistic, yet elegant example of adaptive phenotypic plasticity can be demonstrated by the Arizona Caterpillar or *Nemoria arizonaria*. This caterpillar changes its morphology based on the food that it eats within the first three days of life. If it eats spring foliage, it will develop a body-type that allows it to blend within spring foliage. Conversely, if it eats summer foliage, it will develop a body-type that allows it to blend within summer foliage

(Hrdy, 2000). The morphological variations of the caterpillar allow it to camouflage itself, in the most effective manner, from predators. The caterpillar has evolved characteristics that allow it to respond to cues early in life and adjust its developmental pattern. As with the caterpillar, humans are able to adjust psychosocial behavior in order to prepare them to compete within a particular context (Figuredo, Vasquez, Brumbach, & Schneider, 2007). Variation in sexual development and sexual behavior are also adaptive responses to environmental cues (Chisholm, 1993); hence, earlier fertility timing can be viewed much like a differing morphological phenotype in the caterpillar. It is merely a response to environmental conditions that allows the individual to more adequately function (i.e., reproduce in alignment) within that specific context.

Many other examples of phenotypic plasticity occur in nature. These examples of plasticity provide support for within species variation according to life history parameters, such as adult body size. Each of these species alters morphology based on availability of nutrition. In humans, nutritional associations with life history parameters such as adult body size, age at reproductive capability, and number of offspring, has been documented as well (Ellis, 2004; Ellison, 2003; Gluckman & Hanson, 2005).

These components of life history theory are useful for one major reason: they highlight biological responses to environmental cues. The likelihood to engage in "risky sexual behavior" may be greatly influenced by adaptive physiological responses to environmental conditions. One major environmental cue is social inequality and the correlates of that inequality, such as chronic stress, higher mortality rates, lower life expectancy, and adverse health outcomes. Adler and colleagues (1993) have documented the association between socioeconomic status and health outcomes (Adler, Boyce, Chesney, Folkman, & Syme, 1993). These biological responses are not determinants that imprison people to one path or another; rather, they are explanations of human variation in physiological growth, fertility timing, and other health outcomes in response to real environmental constraints. They do not explain variation in power differentials, but are an explanation of response to access to resources and the power differentials associated with that access.

Attempts have been made to explain variation in human reproductive timing using the principles of adaptive phenotypic plasticity. For example, Belsky, Steinberg, and Draper (1991) developed psychosocial acceleration theory, a life history model that accounted for the interaction of the developing individual within the familial environment. According to this theory, , parents are the conduit between environmental characteristics and the developing child. If parents encounter an environment that is rich in resources with relatively low levels of uncertainty, this message will be transmitted to the child because parents will encounter less stress and be able to devote more time to their children. Conversely, if parents encounter an environment that has limited resource availability, high levels of resource unpredictability, or high mortality rates, this information will be transmitted to the child indirectly simply due to the stresses present in the immediate environment.

According to the original concept of psychosocial acceleration developed by Belsky, Steinberg, & Draper (1991), children would develop along one of two paths that are the extreme ends of a spectrum. These paths prepare the developing child to successfully reproduce in the environment he or she will most likely encounter. Parents indirectly tell the child which environment they will most likely encounter by the way they respond to the child, to each other, and to daily stresses. The first path, or Type I, would involve earlier sexual development and earlier onset of sexual activity. This path is characterized by a more stressful environment, higher marital discord, and inadequate resources while the child is developing. The second path, Type II, would involve later sexual development and initiation of sexual activity. This path is characterized by adequate resources, stable bonding between parents and child, and less stress overall. Both paths allow the child to develop appropriately to match the environmental conditions he or she will encounter. Of course, these paths fall along a continuum, with each type being on the extreme ends of the spectrum. Belsky and colleagues looked at how the relation between adverse environments with low or unpredictable resource availability and reproductive outcomes of offspring was mediated by parental influence. This model offers a simplistic explanation by describing the mechanism between parental stress and how that affects parenting behavior and how this in turn informs children of the world they will expect to encounter and has received empirical support in the literature (Ellis, 2004). It is a useful model to understand the pathway from external stressors experienced by parents to developing outcomes of children.

Evidence of the usefulness of the life history theoretical approach has been documented in the empirical work on social inequality, economic inequality, health status and fertility timing conducted by Arline Geronimus (1987, 1998, 1999, 2003, 2006). This work began with a demographic review of correlations among fertility timing, mortality rates, and income inequality in the 1980s, and has documented the associations between conditions of economic inequality and teen pregnancy outcomes. Beginning with her work in 1987 on practices identified as incentives for low-income minority teens to engage in earlier childbearing, Geronimus documented the associations among shorter life expectancy, uncertain health outcomes, and earlier age at childbearing (Geronimus, 1987). Geronimus has continued her evaluation of mortality rates, poverty, uncertain health outcomes, and economic opportunities throughout her work on teen childbearing (Colen, Geronimus, Phipps, 2006; Geronimus, 1999; Geronimus, 2003).

Within populations of high stress and health and life expectancy uncertainty, earlier childbearing is adaptive (Geronimus, 2003; Colen, Geronimus, & Phipps, 2006). If the argument is made that we want to reduce the intergenerational transmission of poverty or that we want to prevent teen pregnancy, it follows that equal opportunity to resources such as medical care, education, and employment are necessary. Genuine employment opportunities that are more than “working poverty” opportunities in an attempt to move people from welfare to work will be the only path to seeing a decline in earlier reproduction in populations who have little incentive to change this current behavior (Geronimus, 2003). There have been many studies that document the effects of offering redistribution in income on school achievement and on reduction of deviant behaviors in children and adolescents. (Akee, Copeland, Keeler, Angold, & Costello, 2010; Alderson, Gennetian, Dowsett, Imes, & Huston, 2008; Bloom, Kemple, Morris, Scrivener, Verma, & Hendra, 2000; Duncan, Morris, & Rodriques, 2011). For example, Akee et al., documented the effects of an increase in household income due to an introduction of casino profits in the middle of the longitudinal study. Children of families who received the casino profits had higher educational outcomes at age 21 and lower minor criminal offenses. (Akee, Copeland, Keeler, Angold, & Costello, 2010). These programs typically show a marginal improvement in educational achievement, child care enrollment, and occurrence of minor criminal offenses. The work of Colen, Geronimus, and Phipps (2006) documents a decrease in earlier fertility timing; however, the instrumental factor in this change was not simply providing income supplementation, but changes in opportunities as well. While income is important, opportunities for change are important, too. Finally, because the largest correlate to earlier fertility timing is morbidity and mortality (Ellis et al., 2009), we must consider access to appropriate preventative health care, educational (such as contraceptive and life skills), and occupational opportunities a factor to target for prevention.

The life history framework is an important contribution to designing teen pregnancy prevention programs for three different reasons. First, it offers an explanation of adaptive human behavior. Teens who have children are not merely engaging in risky behavior. They are responding to proximal and distal environmental cues such as mortality rates and access to resources. Second, life history theory provides a basis on which explanations for physiological mechanisms associated with earlier fertility timing can be built. For example, Belsky, Steinberg, & Draper (1991) documented a correlation between early stressful environments, earlier pubertal development, and earlier age at first birth. Third, the life history framework provides an evolutionary explanation (or ultimate explanation) for human behavior that is neutral regarding the outcome of teen pregnancy. Essentially, teen pregnancy is not necessarily a social problem. The antecedents and how we respond to the outcome are more important to consider when designing prevention programs.

Constraints placed on individuals by societal values and norms must be incorporated into a model of life history trade-offs while at the same time considering the complex interplay between cultural dynamics and biologically evolved traits. Lumsden and Wilson (1981) state that there are three aspects to life history traits among humans: biological, behavioral, and cultural (Lumsden & Wilson, 1985). The impact of cultural and social policy needs to be evaluated because humans have evolved to modify phenotypes based on learning and experience (Durham, 1978). However, evolutionary theory does not address the structural systems and policies that mediate the pathway between fertility timing and life expectancy to inform public policy and teen pregnancy prevention.

Bioecological Model

One model that attempts to incorporate the role of societal structure into adaptive biological development is the bioecological model, or Ecological Systems Theory (EST), originally proposed by Urie Bronfenbrenner (1977). By adding the function of social structure, this model enhances the life history concept of "trade-offs" made by species in order to coordinate material and bio-energetic resources. The model expands the concept of adaptive responses to resource availability within societies that have developed "civilized" rules for how to acquire these resources. People who are competing to get these resources also control access to them, depending upon social status. A model that assesses resource trade-off might hopefully address the subtle rules associated with social status and resource allocation.

The bioecological model of human development states that individuals are enmeshed within several levels of environmental systems that trigger the adaptive responses of individuals. While the life history model addresses the evolved adaptations to ultimate and proximate environmental factors, the EST model conceptualizes how that environment is organized and which processes and interactions between the environment and individual may be pertinent to individual development. To fully grasp the concept, one can envision a dartboard that has several rings surrounding the "bulls-eye". The bulls-eye represents the individual who falls in the middle of several rings. At the lowest level, but closest proximity, the individual is encircled by the microsystem, which includes the familial environment. For children growing up in environments where members of the family or neighborhood are bearing children at younger ages, this proximal environment may be providing cues that this behavior is not only acceptable, but possibly even necessary. The familial, neighborhood, and school environments of the microsystem are then encircled by the mesosystem, which is the relationship between two or more environments that the individual participates in. This system includes variables such as *interaction* between family and school environment. In higher poverty environments, if we look closely at the school systems interacting with family environments, we may see evidence of lack of access to higher education opportunities. This system is encircled by the exosystem, which includes settings, outside the individual's direct contact, that affect the individual indirectly by affecting others who come in contact with that person. Examples of the exosystem are the employers of an individual's parents. For individuals living in high poverty situations, the exosystem could include access to quality healthcare through employers. For example, while the parents may work, they may not have health benefits or the benefits may involve too costly insurance. Finally, all of these systems are encircled by the macrosystem, which encompasses the social order and cultural norms that an individual is affected by (Bronfenbrenner, 1977). The macrosystem is the mechanism through which decisions about resource allocation among groups and individuals occur within a particular social order. This system includes the policies affecting sexual education classes taught in different school districts, which may vary by funding and policies within districts (SIECUS, 2010).

Because this final large and encompassing system appears to be far-removed from the individual, it is difficult to quantify how this system affects factors such as pubertal development, health, or adverse outcomes such as teen pregnancy. However, the ability to conceptualize how this system operates within an evolutionary model is not difficult when we consider our evolved capability to adaptively respond to environmental constraints. According to Bronfenbrenner & Morris (2006), within an ecological context, developmental outcomes will be influenced mostly by interactions among the individual, environment, and the many systems within that environment. A key component of evolution is that the individual is always operating and adapting to environmental context. We have evolved the capacity to alter development and behavior based on environmental cues (Ellis, 2004). One way to incorporate the macrosystem level into individual development is through proximal processes. Proximal processes refer to the people, objects, and symbols that affect an individual on a regular basis. For example, more distal factors, such as federal policy regarding TANF benefits may affect the individual simply by food choices available. Additionally, a cultural view on fertility timing may impact an individual through media messages about teenage pregnancy, such as in television shows like Teen Mom or 16 and Pregnant.

In addition to external factors that affect the individual, life history theory and the bioecological model also incorporate individual physiological development. Bronfenbrenner appended the early version of his model to include genetic expression, physiological development, and the construct of time (Bronfenbrenner, 1986; Bronfenbrenner, 1994), while life history theory encompasses genetics, physiology, and individual development; therefore, understanding the internal and external factors that interact over time to produce adaptive outcomes is a general part of both of these models. By viewing earlier fertility timing as an adaptive response to the correlates of poverty, morbidity and mortality rates, one can see how public economic policy can be connected to an evolved capacity to incorporate and respond to social and economic constraints.

With the economic and welfare constraints, as represented by the macrosystem within the EST framework, the question of what can be done to change the economic deprivation and societal constraints that these individuals are born into and must face throughout development must be addressed. Greg Duncan's work provides insight into how child-focused programs in early childhood may alter later teen and adult outcomes. Duncan and Magnuson (2002) make the case, and provide simulated federal funding scenarios using data from U.S. welfare programs, for providing better quality child care, lower mandates on maternal employment for the poor, better nutrition, and better pre-natal and postnatal care for infants. The most crucial revision is to shift the policy focus from maternal employment through work over welfare programs to family well-being programs (Duncan & Magnuson, 2002). Specifically, it would be more beneficial to focus on providing positive pathways for viable and financially rewarding employment and options for high quality child-care rather than implementing unrealistic deadlines for women to work once they have had a child. One solution would be to revise where welfare dollars are allotted, such as excluding requirement of welfare to work for women who have children who are younger than 6 months old and providing tax credits for families with children making less than $60,000 a year (for a more detailed description, see Duncan and Magnuson, 2002)

Duncan's work is an important addition to the work on public policy and teen parenting because it indicates that there is a broad societal message that encourages a fear of public spending on social programs that do not state they are immediate bridges to gaining employment, and it provides evidence for the UNICEF conclusions, spending on social programs needs to be revised. It is important to consider the opportunities available to individuals in communities where teen pregnancy rates are higher. As a society, we need to ensure that these educational and employment opportunities are viable and rewarding for all individuals. When opportunities are changed, fertility timing changes as well (Colen, Geronimus, & Phipps, 2006), thus . fertility timing is in response to environmental constraints and opportunities (Burton, 1990; 2007; Colen, Geronimus, & Phipps, 2006; Geronimus, 2003).

Duncan and Magnuson offer seemingly simple economic solutions that do not add to government costs, but simply change where the dollars are allotted, for example, in order to provide high quality, low-cost childcare for infants. For example, they state that the existing child tax credit and child care tax credit be eliminated and TANF cash assistance be reduced. The program changes suggested by Duncan and Magnuson do not encourage welfare dependence, and these changes would have limits, such as amount of children that would receive benefits within families and time limits on when benefits would be distributed. While this example is not addressing teenage pregnancy prevention, it can be used as a model for how we spend money on teen pregnancy prevention programs. For example, we are spending a substantial amount of funds on abstinence only education and teen pregnancy prevention through community settings once youth have already reached an age (i.e., 12 – 13) where it may be too late. The funds that are already being used could be spent on programs that target earlier age periods and offer programs to young children that might help them with other opportunities later in life, such as school readiness, parent-child communications, and life skills education

In order to implement real change in teen pregnancy rates, we need to change how we view the problem of teen pregnancy and tackle social problems such as social and economic inequality.

Standpoint theory

One way to incorporate the contributions of social and economic inequality to fertility timing is to include the vantage point of the people affected by these inequalities. Standpoint theory (Harding, 1991) accounts for the unspoken voices, those who do not have power, that are not always represented in scientific inquiry. According to standpoint feminism, all standpoints are partial. When viewed through the concept of articulation, these partial standpoints can be used to inform each other. This theory can be used to address the lives and views of the teens themselves who may be affected by the policy created for them, but not by them. Policies to address risky sexual behavior among poor minorities have not been developed by them. The goal of incorporating standpoint theory is to acknowledge what youth can tell us of their experiences and how their knowledge might be beneficial in contributing to social policy and prevention programs that truly address their needs. Examples of how policies intended to help individuals that actually may cause more harm due to a lack of understanding of the individual circumstances can be found in the work on complex adaptive systems by Sterman (2006). An example of programmatic failure due to a lack of acknowledgement of individual perceptions and responses to contextual constraints is the Healthy for Life project. This prevention program used a social influences model to positively affect the health behaviors of middle-school students in areas such as sexuality, nutrition, and alcohol, tobacco, and marijuana use. After an assessment of long-term outcomes, no clear differences in rates of these outcomes were found among control and experimental groups (Moberg & Piper, 1998). Moberg & Piper (1998) speculated that this lack of intervention effect was due to a greater influence of social and community norms than programmatic factors on behavior of individuals within communities. These models used in prevention programs often do not account for the outcomes that may be relevant to success of the individual within particular contexts (Ellis et al., in press). Standpoint theory can also be used to inform our understanding of the power differential associated with social inequality. Research by Matthews, Gallo, & Taylor (2010) suggests that the psychosocial factors associated with income inequality, such as increased emotional stress and cognitive problems, play an important role in determining health outcomes which are linked to life expectancy. Standpoint theory can contribute to our understanding of individual perspectives of environmental constraints and how this may be connected to adverse health outcomes, life expectancy, and fertility timing.

Other research has documented how teen pregnancy is an adaptive response to socio-environmental constraints (Burton, 1990). In a study that reviewed the pregnancy patterns of an economically depressed minority group living in a small nonmetropolitan community, Burton found that women chose to have children at younger ages in order to create a system of family maintenance. Women engaged in a tightly woven interdependent care-giving situation that was adaptive based on environmental circumstances. This pattern of multi-generational dependency and care among the women was adaptive in that there were very few options for employment for these young women, fathers were usually not present to help care for children, and the life-expectancy of this group of women was much lower than the average life expectancy of women in the United States. The majority of income was provided by welfare benefits and women who did work had to move away in order to find jobs that paid well. The women who moved away and worked often sent money home to the groups of women who stayed in the economically depressed area to care for children and great-grandparents. While Burton's study documents the characteristics of only one community, it provides an example of how earlier fertility timing is adaptive, and it underscores the value of considering the motivations and viewpoints of individuals operating within contexts characterized by resource constraints.

These theories alone do not fully address the phenomenon of earlier fertility timing; however, when combined, components of these theories can allow prevention scientists to take the first step at establishing an effective prevention program, that of understanding the ultimate explanation of earlier fertility timing. Each theory provides a unique way of viewing fertility timing. Life history theory can provide a broad lens to adaptive human behavior in response to environmental cues and constraints, The bioecological model can address the systems and processes associated with fertility timing, and standpoint theory addresses the situated knowledges of youth living in particular contexts. When combined, these theories can build upon one another to reflect all of the important angles that need to be considered in teen pregnancy prevention. The work will be complicated. One must account for individual perceptual states and cognition as well as adaptive physiological responses to environmental constraints. These environmental constraints include the correlates of social and economic inequality. The bottom-line is that designing an effective prevention program requires uprooting foundations used as a base to design prevention programs and thinking outside of the established parameters. A fundamental paradigm shift is needed.

What can be done?

How can the combination of these theoretical approaches more accurately inform prevention design? First, we must use a life history approach and look at fertility timing as an adaptive response of individuals to environmental constraints. If the aim of a prevention program is to prevent particular behaviors, we must understand WHY individuals engage in the behavior. In doing so, we must also incorporate standpoint theory in order to understand the perspectives of the individuals living within these constraints. Once we have defined the constraints, we can use the bioecological model and begin to target the environmental factors influencing behavior, such as child and family welfare policy. In order to target the environmental factors, we must acknowledge the broader problem of how funds are allotted to social programs in this country. This third aspect will be the most difficult and must be implemented initially at a local level.

State programs such as First Things First (FTF; www.azftf.gov) in Arizona are an example of a potentially promising model for designing teen pregnancy prevention programs. FTF targets the broader problem of funding social programs, begins early in development, and conceptualizes development within the environmental contexts. A basic component of FTF is that it is regionally specific and accounts for local ownership, leadership, and participation in programs at the community level. This basic component supports the notions of standpoint theory in that it allows for individuals to participate in the development and maintenance of programs.

To avoid entrapment by the political process associated with revisions of welfare policy, FTF is funded by taxes on cigarettes sold in the state. The focus of this tax-funded program is educating early childhood caregivers, parents, and community members on better quality childcare, healthy lifestyle choices, family communication, and community services. Their mission is to ensure that children receive adequate health and childcare to prepare them to arrive at school ready to succeed.

As with FTF, a teen pregnancy prevention program will need to target these areas, but also provide an avenue to opportunities that many youth living in poverty are not able to find or see. FTF can provide a general model of a teen pregnancy prevention program that targets the ultimate sources of variation in fertility timing, social and economic inequality. As reviewed in this paper, significant evidence suggests that teen pregnancy is adaptive under certain conditions (Burton, 1999; Geronimus, 1987; Ellis et al., in press). These conditions are represented by morbidity and mortality rates which are related to access to education, occupation, and preventative health care. How might we begin to change those conditions? Comprehensive early education and intervention programs like FTF provide an answer to this question.
Addressing areas such as diet and nutrition early in life is linked to teen pregnancy prevention because health disparities among the poor contribute to higher rates of morbidity and mortality, which in turn affect fertility timing. How health care is federally funded and provided to low-income individuals is beyond the scope of this paper, but this area would probably be one of the largest components of an effective teen pregnancy prevention program. Of the current annual funds of $105 million to prevent teen pregnancy, there may be room to consider redistributing a small portion of the funds to physicians in low-income communities to implement revisions in health care delivery that could be tested for effectiveness on long-term health outcomes.

FTF and other similar state-adopted programs target school readiness in young children (www.azftf.gov). While this program is not designed to prevent teen pregnancy, many of its components are useful in preventing the cycle of predictors of early fertility timing, such as educational and occupational opportunities. The problems are morbidity and mortality rates linked closely to social inequality. FTF is a model that proposes that prevention of inadequate school readiness should begin early in life. Teen pregnancy prevention should begin early in life as well. By targeting health behavior and education as well as the policies that are tied to funding the opportunities associated with health and education early in life, we can reduce teen pregnancy rates in this country; however, if we try to address teen pregnancy rates with band-aid approaches for youth beginning at age 12, we will not reduce teen pregnancy rates in this country. By starting a program earlier in life, preventionists can begin to build an infrastructure for change and opportunity.

While it is never too late to provide opportunities to anyone, it may be difficult to change behavior once individuals have learned the constraints within which they are operating. within. People make unconscious adaptive behavioral choices based on acquired experience over their lifetimes. To tell them that they have “other opportunities” as long as they revise their behavior is counterintuitive. Starting early and providing true avenues to change environmental constraints is the best prevention method. Early prevention work will not initially address sexual behavior, but health outcomes such as diet, nutrition, exercise, and enriching educational opportunities for all children.

Finally, the opportunities afforded to youth across all economic strata are not equal. Programs that offer avenues to opportunity will need to be implemented. The purpose of providing clear pathways to education and employment links the basic evolved responses of fertility timing to accessibility of resources as well. Providing community resources that offer individuals the basic skills to succeed in school and employment can minimize the barriers to obtaining adequate resources in life. For example, the Perry Preschool project that began in the 1960's resulted in 50% fewer teenage pregnancies in the children who participated in the high quality program versus those in the control group (Shweinhart, 2004). Again, federal funds are already distributed through programs to provide funds for education and training. There is room for revising how these funds are allotted to provide more effective educational and occupational opportunities.

This broadly described design sounds overly-simplistic and impossible to achieve given the current state of the economy in the U.S. because the problem with designing most prevention programs is fear of cost. Most programs are looking to get the most "bang for their buck". For example, many programs offer contraceptive advice to teens who are already sexually active (Jemmott, Jemmott, & Fong, 1998). These programs do show mild reductions in teen pregnancy or sexual risk-taking in the short-term, but overall, early fertility timing rates are high in the U.S. As shown by Duncan and Magnuson (2002), there are ways to redistribute funds that may not require implementing a "teen pregnancy prevention program". Teen pregnancy prevention could be executed alongside programs that are already in place, but also incorporate the needs of these individuals, as stated by the individuals themselves. The social policy changes suggested by Duncan and colleagues along with programs addressing school readiness and early childhood well-being, such as First Things First, can be combined to establish foundations that allow youth to seek alternate options to early fertility timing because they do address the broader problem of social and economic inequality by ensuring access to more equal opportunities for youth from all contexts.

Conclusion

The average rates of teen pregnancy in the United States are much higher than the average rates in other OECD) countries. The United States ranks 5th out of 39 countries in rates of teen pregnancy (UNICEF, 2007). UNICEF argues for allotting more federal and state funding to social programs (UNICEF, 2007). Considering the statement made by the Director of the CDC regarding teen pregnancy as a mechanism for the intergenerational transmission of poverty, it is not difficult to see how our society views the broader societal problem of social and economic inequality. Specifically, if teenagers do not get pregnant, we will prevent poverty and save the government large amounts of money spent on teen mothers. This belief sends the message that poverty is not a societal problem, but rather an individual problem. The work reviewed in this paper indicates that individuals engaging in the behavior we wish to prevent are adaptively responding to environmental constraints.

In order to design an effective prevention program, an honest evaluation and thorough analysis of social inequality and its correlates will need to be conducted. Poverty cannot be "controlled" for statistically and ignored. The economic conditions associated with fertility timing and the co-factors of those economic conditions: stress, adverse health outcomes, and access to constrained educational and economic opportunity, need to be included in effective prevention design. Prevention programs aimed at reducing earlier fertility timing need to start early in life and do not necessarily have to address sexual behavior, but rather the broader problem of social and economic inequality. Sexual education is important, but lack of contraceptive understanding is not the root cause of earlier fertility timing; the root cause can be found in our societal structures that fail to provide genuine opportunities for better health, educational and occupational success.

When explicitly connected life history theory, standpoint theory, and bioecological theory work together to help us focus on the mediating factors between fertility timing and life expectancy. The mediating factors are indeed the real social problem that needs to be addressed. The articulation of these theories can therefore inform the design of effective prevention programs that target the mediating factors between fertility timing and life expectancy.

Teen pregnancy prevention programs designed to target individual behavior, choice, and responsibility are going to achieve minimal results in decreasing earlier fertility timing because they fail to target the true problems: social and economic inequality and related health problems and lack of opportunities associated with these real problems. It is time to change the theoretical foundations that inform our current prevention programs. We need to establish programs that start earlier in life that address the correlates of earlier fertility timing: poverty, access to adequate preventative health care, access to adequate nutrition, and access to education and occupational opportunities that provide more than working poverty circumstances, if we wish to effectively prevent earlier fertility timing.

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APPENDIX B: ECOLOGICAL FACTORS ASSOCIATED WITH TEEN PREGNANCY

Paper was prepared to submit to a Journal

Ecological factors associated with teen pregnancy: A Tobit Regression analysis

Elizabeth H. Tilley

Abstract

The United States has one of the highest teen pregnancy rates among developed countries and ranks third overall in rates of teen pregnancy out of thirty countries in the Organization for Economic Cooperative Development, OECD (UNICEF, 2007). However, as a country we are spending an enormous amount of money on teen pregnancy prevention programs. Prevention programs that target the underlying causes of fertility timing by using appropriate theoretical foundations are needed in order to prevent teen pregnancy, but empirical evidence of contributing factors to teen pregnancy is needed. Life history theory (Chisholm, 1993; Stearns, 1977) is an evolution-informed theory that posits that species have evolved to make various trade-offs based on environmental conditions that either support long-term outcomes or short-term outcomes. These trade-offs include contributing more energy towards growth and physiological maintenance versus reproduction. Important life history parameters, such as mortality rates, poverty (proxy for access to resources), and population density were tested in these analyses. Additionally, important proximal level variables such as family functioning and parent support were tested. Living within an urban setting and in neighborhoods of high poverty were the strongest predictors of likelihood of teen pregnancy. Implications for teen pregnancy prevention program design are discussed.

Introduction

The United States has one of the highest teen pregnancy rates among developed countries and ranks third overall in rates of teen pregnancy out of thirty countries in the Organization for Economic Cooperative Development, OECD (UNICEF, 2007). However, as a country we are spending an enormous amount of money on teen pregnancy prevention programs. For example, the Office of Adolescent Health has implemented grant funding opportunities for teen pregnancy prevention programs and provides approximately $105 million to states to design these programs. These programs include personal responsibility education and abstinence only education (www.cdc.org). If we are spending this much on these programs, why do we still have one of the highest teen pregnancy rates among developed countries? The goal of this paper was to test which factors contribute most to the risk of teen pregnancy. Using data from the Longitudinal Survey of Adolescent Health (Add Health), we explore proximal and distal factors as well as the interaction of these factors to gain a better understanding of risks associated with teen pregnancy.

The US ranks third overall in rates of pregnancy between ages 15 and 19 out of thirty countries. Earlier fertility timing rates are related to many adverse health and developmental outcomes such as educational opportunities, and child safety measured by infant mortality, rates of injury between ages 0 – 19, rates of preventative health services, and global risk-taking behaviors of youth (UNICEF, 2007). The direction of causation is difficult to untangle. While some have argued that early fertility timing is a major contributor to the intergenerational transmission of poverty (Lopez, 2011), others contend that earlier fertility timing is a response to intergenerational transmission of poverty and disadvantage that is also directly tied to poor developmental outcomes. Specifically, many poor developmental outcomes such as lower cognitive test scores and higher behavioral problems in school (Geronimus, 1987) are correlated with teen pregnancy, but teen pregnancy is not necessarily the cause of these other poor developmental problems. UNICEF (2007) documented a negative correlation between amount of government expenditure on social programs and adverse outcomes, such as pregnancy during adolescence, for youth. When countries spend less than 5% of gross domestic product on social programs that include family and social benefits, they rank higher on adverse outcomes for youth. When countries spend more than 10% of gross domestic product on these types of social programs, adverse outcomes for youth decline substantially (UNICEF, 2007).

The variability of early fertility timing rates within the United States illustrates the problem in more detail. Of data from 2005, New Mexico had 93 per 1000 pregnancies for females aged 15 - 19, Nevada had 90 per 1000, and Arizona had 89 per 1000. The states with the lowest rates of earlier fertility, New Hampshire, Vermont, and Maine, had 33 per 1000, 40 per 1000, and 43 per 1000 teen pregnancies respectively. These ranges show that there is also considerable variability between states on rates of earlier fertility timing. Unsurprisingly, the states with the highest rates also have the highest rates of poverty. Arizona and New Mexico ranked 2nd and 3rd in rates of poverty in 2009.

A full review of the documented health outcomes associated with poverty and the empirical work that has been done surrounding this issue can be found in a recent review published by Adler & Stewart (2010). Health disparities and differences in life expectancy are associated with income inequality in the United States. The differences in real income (i.e., what your dollar can actually purchase) between the top income earners and the lowest income earners in this country have increased over the last 30 years (Adler & Stewart, 2010). According to the U.S. Census Bureau, income for the lowest to the highest income quintiles increased 1%, 9%, 15%, 25%, and 53%, respectively (Adler & Stewart, 2010). With these differences in ability to purchase comes an inability to buy adequate health care, nutrition, and housing. The lower purchasing power of the poor is associated with higher mortality rates among the poor. For example, Evans (2004) documents a wide variety of adverse surroundings that individuals living in low-income neighborhoods must face, such as noise pollution, degradation of buildings, and higher rates of violence.

Life History Approaches to Teen Pregnancy

One theory that can account for variability in reproductive outcomes based on environmental conditions is life history theory. Life history theory was originally used to explain variation of traits, such as litter size, *between* species. These traits represented an evolved response to resource availability and other contextual factors among different species. Species were expected to fall on a continuum, r-selected to K-selected, of trait outcomes. On the extreme end of r-selected species are animals, such as rabbits, that may temporarily produce more offspring than their environment is capable of maintaining (Figuredo et al., 2007). As expected, rabbits have early reproductive development, small adult body size, large litters, and short birthing intervals. K-selected species have higher rates of parental investment, larger adult body size, longer gestation periods, later age at weaning, later age at sexual maturity, and later age at first reproduction. Humans fall on the extreme conservative end of K-selected species; however, there is considerable variation among humans on these traits. The focus of this paper is on variation of life history traits, particularly age at first birth, in humans.

Variation of life history traits in humans can be considered adaptive due to input given by contextual factors. Early reproduction (i.e., teen pregnancy) may be beneficial under certain conditions, such as in areas where mortality rates are higher and resource availability is unpredictable (Brumbach, Figueredo, & Ellis, 2009; Wilson & Daly, 1997). For example, Geronimus, Korenman, and Hillemeier (1994) found that African American teen mothers have higher rates of teen pregnancy, but healthier births than do their white counterparts. African Americans living in high poverty conditions experience lower life expectancy and greater rates of morbidity and mortality (Geronimus, Korenman, & Hillemeier, 1994). Earlier reproductive timing is a logical response to lower life expectancy within the life history framework. While teen pregnancy is considered an adverse outcome in our society, it may certainly be an adaptive mechanism within specific contexts according to the life history framework.

Because life history theory posits that fertility timing is part of an adaptive response to environmental conditions, it is important to understand what these environmental conditions may be when attempting to address early fertility timing as a social problem that must be prevented. Wilson & Daly (1997) systematically evaluated the contributing factors to timing of reproduction using census tract data on mortality rates, homicide rates, and measures of economic inequality. While comparing Chicago neighborhoods, they found that the neighborhoods with the highest life expectancies had later ages of fertility timing while the neighborhoods with the lowest life expectancies had earlier ages of fertility timing. They contend that this could be viewed as a family planning schedule as opposed to a lack of planning (Wilson & Daly, 1997).

Parent-Adolescent Relationships and Teen Pregnancy Risks

When considering the effects of broad statistical phenomena like local life expectancy on individual outcomes such as teenage pregnancy, it is important to understand how these broad phenomena affect individual outcomes. For example, not all teens who live in high poverty conditions become pregnant, suggesting the presence of specific family-based influences on fertility timing. Belsky, Steinberg, and Draper (1991) have proposed that humans have evolved plasticity in sexual development in order to "fit" within their environment, thus facilitating the appropriate reproductive strategy. Humans unconsciously monitor environmental cues in order to adjust physiological development to appropriately function within the environment that they will grow into. Their argument is that parents are the conduit between environmental conditions and the developing child. Parents will unconsciously tell children that they may expect a harsh environment and they may do this through parenting styles (Belsky, Steinberg, & Draper, 1991;). One specific mediator between stressful environmental conditions and the developing child is how parents respond to the stressful environmental conditions. For example, parents may be poor, but able to pay bills. For this reason, we not only included external variables, such as neighborhood poverty, but also variables that indicated how parents were functioning within these conditions. According to life history parameters, a harsher more unpredictable environment will lead to a faster life history, meaning earlier age at sexual debut and earlier fertility timing. For example, low parental monitoring has been shown to be related to higher risk for earlier sexual debut (Kincaid et al, 2011; Oberlander et al., 2011). While parental monitoring is an important contribution to increase in risk-taking behavior, it is also important to understand the quality of the relationship between youth and their parents, to determine other factors, such as how youth perceive communication and warmth that may play a key role in contributing to teen pregnancy outcomes. This paper proposes to investigate the relationship between environmental conditions such as poverty within a given area, familial conditions, such as perceived financial stress, warmth of parents, and reproductive outcomes of the individual child. Although a “faster” life history strategy may be adaptive within specific contexts, it is important to understand how individuals are protected and are able to thrive within these harsher contexts.

Present Study and Hypotheses

This study tested the hypothesis that distal ecological factors such as area mortality rates, crime rates, and poverty rates will significantly predict earlier fertility timing, but that more proximal factors such as familial functioning, parental perceived financial stress, and youth perception of family relationships will have a greater impact on the probability of the occurrence of earlier fertility timing. Data from the National Longitudinal Survey of Adolescent Health were used in this analysis. These data included four time points or waves that data were gathered.

Hypothesis to be tested

Following major predictions set forth by life history theory (Ellis, Figueredo, Brumbach, & Schlomer, 2009; Stearns, 1977), we would predict that fertility timing (i.e., teen pregnancy) will vary according to local mortality rates. Harshness within an environment, as evidenced by levels of morbidity and mortality, is one of the major predictors of variation in life history traits (Ellis, Figueredo, Brumbach, & Schlomer, 2009). For example, Wilson & Daly (1997) found that fertility timing occurred earlier in the life span when neighborhoods had low life expectancy (Wilson & Daly, 1997); however, this finding was in Chicago neighborhoods only. Geronimus, Bound, & Waidman (1999) showed an association between neighborhood levels of poverty and fertility timing in the densely populated urban areas of Chicago, Watts (Los Angeles), Harlem, and Detroit such that areas with dense populations and high levels of poverty also had higher rates of early fertility timing. However, based on the work of Ellis et al. (2009), the association between life history traits and fertility timing may also vary based on population densities and the competition and resource availability associated with these population densities. While studies have shown that there is a relationship between mortality and fertility timing in urban areas, it is important to see whether this relationship holds in rural areas. Based upon the results of Daly & Wilson's (1997) findings with census data as well as the findings of Geronimus (1992, 1993), we believe that the same relationships will appear in the Add Health dataset.

We also believe that main effects of important family level variables will be present as well because Belsky, Steinberg, & Draper (1991) proposed that parents are the conduit between harsh environmental conditions and their developing child. Parents relay environmental conditions by engaging in parenting behavior that prepares the developing child for the specific environment they are most likely to encounter. Psychosocial acceleration theory (Belsky, Steinberg, & Draper, 1991) posits that individuals will develop more quickly under conditions of environmental stress and that parents are the messengers of these stressful environmental conditions via their parenting styles. However, there is a substantial amount of research documenting the association between parental monitoring and risk-taking behavior in adolescence, so we have included parental monitoring as a control variable.

Reported parental financial stress may be a better predictor of individual development and, ultimately, fertility timing. Additionally, the family stress model of economic hardship (Conger et al., 2002) states that financial stress will affect family functioning, which will in turn affect individual developmental outcomes. For example, Conger et al. (2002) found that economic stress for parents, led to strained parent-child relationships, which were associated with higher incidence of risk-taking behavior in youth (Conger, McLoyd, Wallace, Sun, Simons, & Brody, 2002). Poverty and its correlates may be important contributing factors to fertility timing, but these contributions may depend upon how the parents react to the financial stresses associated with poverty.

Finally, life history theory predicts that juvenile mortality rates will be associated with rapid growth and development, including reproductive, when these mortality levels do not respond to differential parental allocation of resources among offspring (Ellis, Figueredo, Brumbach, & Schlomer, 2009; Stearns, 1977). The Add Health data provide age specific mortality rates for infants, children aged 1-4, children aged 5 – 14, and youth aged 15 – 24. We have chosen to test the same model but included different ages of mortality rates to contrast early mortality rates versus overall mortality rates

Our models included all external factors: mortality rates, crime rates, poverty rates, urbanicity; as well as family functioning variables: parental monitoring, parental support, parental response to financial stress, and an objective measure of parental income. Each model will include race, ethnicity, and age as control variables. Each model will vary only in the age range of mortality rates included. Therefore, results for 4 different models will be presented.

Methods

Data from the National Longitudinal Survey of Adolescent Health were used in this analysis. These data included four time points or waves that data were gathered.

Participants

While data were gathered for boys and girls, data used in these analyses were for girls only because they had reported age of first pregnancy by the fourth wave. The first wave of data was gathered between 1994 and 1995. Data were first gathered from youth in grades 7 through 12 at schools. Data were then gathered during in-home interviews with a portion of the students who first completed the school questionnaires (N = 12,105). Wave I includes data gathered from school administrators and parents. Wave II was conducted in 1996 and excluded youth from Wave I who had graduated or who were included in the Wave I disabled sample. Wave III data were gathered in 2001 and 2002. The age range of respondents was 18 to 26 years old. Wave IV data were gathered in 2007 and 2008. These data included social, economic, psychological, and health circumstances of the original participants. Participants also retrospectively reported on reproductive outcomes, which allowed for the inclusion of a teen pregnancy variable in this analysis. Waves I, II, and IV were used in these analyses as data from Wave III did not include data on family functioning. The Add Health design is also unique in that it includes contextual variables, such as families, peer groups, schools, and neighborhood/community level data as provided by the US Census, Centers for Disease Control and Prevention, the National Center for Health Statistics, the Federal Bureau of Investigation, and other databases. The inclusion of these data allowed for an in-depth inclusion of many variables that are considered to be life history parameters.

Data on reproductive timing were gathered through age 34 (time period 4 in the Add Health data set). In order to fully assess the possible determinants of teen pregnancy, analyses were conducted within the group of pregnancies that fell below age 20. Approximately 14% of the pregnancies within the Add Health dataset occurred before age 20; therefore the data were censored below the upper bound value of age 20. In order to conduct the analyses on censored data (meaning a small portion of the full sample that has been shortened by an upper or lower bound value), the tobit regression technique was used (Long, 1997). All analyses were conducted using SAS 9.2.

Analytic Plan

Measures

A combination of census tract variables, family-level variables, and individual-level variables were used in this analysis.

Control variables used in the analysis were *Ethnicity*, a dichotomous variable that was a yes or no question of whether the respondent was of Hispanic origin (0 = no, 1 = yes). *Race* was a dichotomous variable that indicated whether the respondent was Black or White (0 = no, 1 = yes). *Age* of the respondent was used as a control variable.

Census Variables included ***crude death rate, violent crime rate, poverty rate, and urbanicity***. The crude death rate is the total number of deaths divided by the total number of people in the population. The crude death rate is a general indicator of overall population health within a specific area. Urban versus rural area was a dichotomous variable that indicated whether the individual lived in a mostly rural area (0) or an urban area (1). Violent crime rate was a county level variable that included the proportion of violent crime by county that individuals lived in. Poverty rate was calculated by proportion of people living below poverty level within census tract of respondent.

Familial-level variables were ***parent report of financial strain, parent report of income, and child report of parent support***. Parent report of financial strain was a dichotomous variable that indicated whether parents had enough money to pay their bills (no = 0, yes = 1). Parent report of income was a continuous variable that was based on parent report of all income sources.

Parent report of education was a categorical variable that indicated highest level of education achieved by parent. 8^{th} grade or less = 1, more than 8^{th} grade but did not graduate high school = 2, trade or vocational school = 3, high school graduate = 4, GED = 5, vocational after high school = 6, went to college but did not graduate = 7, college graduate = 8, professional training beyond college = 9, no school = 10. Parent Support was a scale created from adolescent report of parental warmth and support. This scale includes a combination of reports on mother and father, when applicable. Examples of items included in the scale were, I feel my dad/mom supports me, my dad/mom is loving and warm, I am satisfied with our relationship, and I am satisfied with our communication.

Parental Monitoring was a scale created by parent-report items on how much they knew about friendships and activities with friends as well as how well they knew parents of friends. Family Structure data were gathered during the Wave I parenting interview. A series of questions were asked regarding who lived in the home with the target child, how often the target child saw non-residential parents, and what relationship the interviewee was to the target child. Family structure was created based on responses to these questions. Family structure is a 6 level categorical variable that includes family types of 2 biological/adoptive parents, single mother, mother plus unrelated other, single father, father plus unrelated other, and no parents in the home.

Results

Descriptive statistics for all relevant variables are presented in Table 1. Teen Pregnancy occurred at a rate of 14.1% in the overall sample (N = 11,454); however, the average age of pregnancy within the tobit model was 18.8 years. There were a total of 689 reported teen pregnancies within the Add Health data set and the final model included 4,027 observations. Teen pregnancy rates vary considerably by race/ethnicity. According to the Alan Guttmacher Institute, the overall teen pregnancy rate for teenaged girls aged 15 – 19 was 70 per 1000 in 2005; however, this number was 43 per 1000 for white girls, 123 per 1000 for African American, and 125 per 1000 for Hispanic (http://www.guttmacher.org/pubs/USTPtrends.pdf.)

The percentage of teen pregnancies within the Add Health sample is slightly higher than the average number of teen pregnancies. Correlations among key variables are presented in Table 2. As expected, neighborhood poverty, urbanicity, and violent crime were all highly correlated. Urbanicity and violent crime had the highest correlation, r (32278) = .44, $p < .001$ Coefficient estimates are presented in Table 3. The dependent variable was age of pregnancy and only teen pregnancies were included in the tobit analysis. Control variables were race, ethnicity, and age. Independent variables included were poverty rate, crime rate, urbanicity, parent income, parent report of financial strain, parental monitoring, and parental support (reported by the youth). When comparing the differences in effects of mortality rates within an area, there were no substantial differences among mortality rate age groups (i.e., mortality rates for infants versus aged 1 to 4) fertility timing; however, in support of ecological systems and life history theory, ecological factors such as poverty rates and urbanicity were significantly and substantially associated with teen pregnancy. For example, for every 1 unit increase in poverty rates, there is an expected 1.4 unit decrease in pregnancy age. ($\beta = -1.44$, SE = .02, $p < .001$). For every 1 unit increase in child report of parent support, there was an associated .14 increase in pregnancy age (β = .14, SE = .001, p < .001). Parental report of having enough money to pay their bills was associated with a .19 increase in pregnancy age (β = .19, SE = .004, p < .001). Living in an urban setting was associated with a .57 decrease in age of first pregnancy (β = -.*57*, SE = .005, p < .001). Mortality rates and crime rates, surprisingly, were significantly associated with earlier fertility timing, but not substantially. For example, for every 1 unit increase in mortality rates, there was a .006 increase in age at first birth (β = .006, SE = .001, p < .001). Parent income was also not significantly associated with fertility timing.

Discussion

The goal of this study was to investigate how the strength of familial processes, such as parental support, monitoring, and responses to stress, operate under conditions of ecological stress, such as neighborhood violence and poverty, and how the combination of these variables in turn contribute to risk for teen pregnancy. As predicted by Belsky, Steinberg, and Draper, parents are the conduit between environmental conditions and the developing child. Researchers using the life history approach to gain insight into human reproductive variation have explored mechanisms associated with plasticity of development and ecological indicators that may contribute to altering life history outcomes, particularly reproductive timing. These indicators include local mortality rates (either juvenile or adult), parental investment as a proximal indicator of ecological conditions, and harsh or unpredictable environmental conditions (Belsky, Steinberg, & Draper, 1991; Chisholm, 1993; Chisholm, 1999; del Giudice, Angeleri, & Manera, 2009; Ellis, 2004; Ellis, 2011; Ellison, 2003; Ellis, Figueredo, Brumbach, & Schlomer, 2009; Hill & Kaplan, 1999). Evidence of the usefulness of the life history theoretical approach has been documented in the empirical work on social inequality, economic inequality, health status and fertility timing conducted by (1987, 1998, 1999, 2003, 2006), Wilson and Daly (1997), and Krupp (2011); however these results have not been used to inform design of teen pregnancy prevention programs.

This paper attempted to test the Belsky, Steinberg, Draper (1991) model of parental communication of external environmental characteristics through a series of models looking at how these distal variables, such as mortality rates and overall poverty rates within a census tract, and parenting variables predict the likelihood of earlier fertility timing occurring. The model partially supported the inclusion of distal level variables in teen pregnancy prevention program design. For example, this model illustrated the importance of considering urbanicity, a proxy for population density which could be associated with higher risk taking for resources, in predicting the likelihood of teen pregnancy. This model also provided support for considering proximal level variables within the context of distal level variables. Specifically, poverty and parental report of financial strain as well as monitoring and support are important to consider in designing teen pregnancy prevention programs.

The strongest associations with lower age of first pregnancy were urbanicity, poverty, parental support, and parental monitoring. However, of all of these variables, urbanicity was one of the strongest correlates to earlier age at first birth. Urbanicity was a dichotomous variable that indicated whether the teen lived in an urban area or not. Living in an urban area was associated with higher poverty, violent crime, higher presence of African Americans, and less parental monitoring (see Table 2). Many studies look at living in an urban environment as a risk for adverse outcomes, such as violence, safety, drug usage, for youth (Andermen & Kimweli, 1997; Hong & Eamen, 2012; Mijanovich & Weizman, 2003). Gaining an understanding of why living in an urban area may be a risk factor for likelihood of teen pregnancy is an important avenue to explore. Population density may increase the likelihood of earlier fertility timing if it is connected to a higher crude death rate and higher incidence of violent crime, but this was not the case in this sample. While urbanicity was correlated with both violent crime and crude death rate, these two variables were not associated with teen pregnancy.

Parent support has been shown to be an important correlate for well-being of children and adolescents (Kincaid et al, 2011); however many studies look at parental monitoring as a more important predictor of likelihood of teen pregnancy or sexual risk-taking. As discussed, low parental monitoring has been shown to be related to higher risk for earlier sexual debut (Kincaid et al, 2011; Oberlander et al., 2011). As expected, parental monitoring had a slightly stronger association with later age of first pregnancy in youth.

How can these models inform our current teen pregnancy prevention approaches? Current prevention programs, while minimally addressing culture and ethnicity, do not always fully incorporate an understanding of the lived experience of individuals who must navigate a world filled with resources that are not available to them in the same way that they are to others. This phenomenon will not only be associated with outcomes such as teen pregnancy, but with other factors such as less participation in the labor economy and higher dependence on welfare systems. It must be noted that these latter outcomes are a product of social constraints placed on individuals within particular contexts, and are not a product of a lack of acceptance of responsibility (Burton, 1990, Colen, Geronimus, & Phipps, 2006).

A limitation of many prevention programs is that they target individual responsibility and choices without accounting for the limited options with which individuals are faced. Instead of treating pregnant teens as problems, perhaps it is more productive to address their contextual constraints, such as poverty and unequal educational opportunities that impact their reproductive choices and fertility timing. The biggest correlate to teen pregnancy in this sample was poverty. At a very simplistic level, reproductive choices can be viewed as deciding to use contraception or not. The tools that most prevention programs provide are supposed to train youth to think through actions and make reasonable choices (Clark et al., 2005; Jemmott & Jemmott, & Fong, 1998). While these approaches are commendable in that they attempt to provide youth with decision-making skills, they also fail to understand the adaptive responses of the youth within a particular context. For example, living in an urban environment may place teens at greater risk for teen pregnancy, due to crowding or varying levels of poverty that differ from rural area poverty. Moreover, the findings in this study suggest that parenting behaviors and parent-child communication need to be targeted in prevention programs, not just individual teen behavior.

Strengths and Limitations of this study

This study used data from the Longitudinal Survey of Adolescent Health to test models of proximal and distal predictors of likelihood of teen pregnancy occurring. The strength of Add Health is that it entails a multiple method and multiple reporter design, including youth report, teacher report, parent report, and census level data. Unfortunately, these data were not gathered on an annual basis, which may have provided a clearer picture on how family functioning contributes to teen pregnancy occurrence. If possible, testing the same models in a longitudinally designed study that assesses characteristics annually may provide more information. Additionally, it would be beneficial to include males in the analyses.

Future Directions

The results of this paper speak strongly to incorporating educational programs for parenting and improving parent-child relationships into prevention models, which translates into including parents in pregnancy prevention programs. This ultimately means that teen pregnancy prevention programs would need to start earlier, but this does not mean it would be too difficult to design prevention programs that include parenting training. Some prevention programs have been successful in providing a broader educational component to their design (Hawkins et al., 1999). For example, The Carrera Adolescent Pregnancy Prevention program focuses on family life education and other components; however, they start later in adolescence. Parenting education would need to start earlier in order to prevent risk-taking behavior.

In summary, the strongest association with earlier age at first birth was overall poverty rates in the area inhabited by each participant, followed by urbancity. While considering the

Belsky, Steinberg, Draper (1991) model of psychosocial acceleration, parental stress, monitoring, and support of youth were strongly associated with age of first pregnancy as well. While we cannot fully address poverty and the problems associated with poverty through teen pregnancy prevention initiatives, we can address some correlates to poverty through prevention. These correlates include basic educational programs for parents, such as monitoring, communication, diet, and stress management, but early in the life of the child. These correlates also include access to resources. The opportunities afforded to youth and their parents across all economic strata are not equal. Programs that offer avenues to opportunity may be more easily implemented than imagined. The purpose of providing clear pathways to education and employment allows us to eliminate an adaptive response to environmental conditions, that of earlier fertility timing. Providing community resources that offer individuals the basic skills to succeed in school and employment can minimize the barriers to obtaining adequate resources in life. For example, the Perry Preschool project that began in the 1960's resulted in 50% fewer teenage pregnancies in the children who participated in the high quality program versus those in the control group (Shweinhart, 2004). Again, federal funds are already distributed through programs to provide funds for education and training. There is room for revising how these funds are allotted to provide more effective educational and occupational opportunities in order to prevent a symptom, teen pregnancy, of a larger social problem, social and economic inequality.

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Tables

Table 1. Descriptive Statistics of Variables used in Analyses

Variable	Mean	SD	Range
Age Time 1	16.32	1.64	11 - 23
Reported Age of First Pregnancy	23.71	3.7	14 - 33
Percent Teen Pregnancy reported by Time 4	14.1%		
Urbanicity	.58	.49	0 - 1
Violent Crime	909.93	690.14	0 - 3072
Crude Death Rate	8.41	1.85	2.65 – 18.84
Parent Education	5.4	4.09	1 – 9
Parent Income	1130	0	9996
Parent Financial Stress	.82	.58	0 - 5
Parent Support	21.5	3.29	1 – 25

(combined)			
Parental Monitoring	2.6	.78	0 - 3

Table 2: Correlations among variables in analysis

Independent Variables	**Age**	**Race**	**Ethnicity**	**Urbanicity**	**Poverty**	**Death**	**Violent Crime**	**Parent Educ**	**Parent Income**	**Parent Stress**	**Parent support**	**Parent Monitor**
Respondent Age N	**1.0**	-.05** 23825	.02* 23825	.05** 23693	.006 23696	-.03** 23754	.07 23201	-.04** 20701	.02* 20348	-.01 20367	-.15** 23409	-.09** 20652
Race: White 0 = no, 1 = yes N	**.05**** **23825**	1.0 33307	.04** 33307	-.19** 32994	-.24** 33003	-.04** 33121	-.35** 32401	.005 28045	-.05** 27509	-.05** 27586	-.02** 32469	.12** 28045
Ethnicity: Latina or Non-Latina 0 = no, 1 = yes N	**.02**** **23825**	.04** 33396	1.0 33307	.18** 32994	.03** 33003	-.1** 33121	.17** 32401	-.11** 28045	.02** 27509	-.05** 27586	-.04** 32469	-.08** 28045
Urbanicity 0 = rural, 1 = urban N	.05** 23693	-.19** 32994	.18** 32994	1 32994	-.02** 32988	-.23** 32994	.44** 32278	-.02** 27812	.01* 27278	-.05** 27354	-.05** 32182	-.10** 27797
Neighborhood Proportion	.006 23696	-.24** 33003	.03** 33003	-.02** 32988	1.0 33003	.33** 33003	.21** 32287	-.11 27820	.05** 27286	-.09** 27362	.03** 32190	-.13** 27806

Living below 1989 federal poverty level												
Crude Death Rate (Census)	-.03** 23754	-.04** 33121	-.1** 33121	-.23** 32994	.33** 33003	1.0 33003	.17** 32401	-.02* 27907	.02** 27371	-.06** 27449	.04** 32297	-.001 27900
Violent Crime	.07** 23291	-.35** 32401	.17** 32401	.44** 32278	.21** 32988	-.23** 32401	1.0	-.02* 27280	.04** 26739	-.08** 26831	-.005 31605	-.15** 27263
Parent Education	.02* 20701	-.05** 28045	-.02** 28045	-.01* 27812	-.11** 27820	-.02* 27907	-.02* 27280	1.0 28045	.01 27317	.10** 27390	.02** 27620	.10** 27427
Parent Income	.02* 20348	-.05** 27509	.02** 27509	.01* 27278	.05** 27286	.02** 27371	.04** 26739	.01 27317	1.0 27509	.14** 26913	.006 27102	-.05** 26928
Parent Reported Financial Stress	-.01 20367	.05** 27586	-.05** 27586	-.05** 27354	-.09** 27362	-.06** 27449	-.08** 26831	.10** 27390	.14** 26913	1.0 27586	.002 27170	.06** 26996
Parent Support (child report)	-.15** 23409	-.02** 32469	-.04** 32469	-.05** 32182	.03** 32190	.05** 32297	-.005 31605	.02** 27620	.001 27102	.002 27170	1.0 32469	.08** 27657
Parental Monitoring (parental report)	-.09** 20652	.12** 28045	-.08*8 28045	-.10** 27797	-.13** 27806	.001 27900	-.15** 27263	.103** 27427	-.05** 26928	.06** 26996	.08*8 27657	1.0 28045

Table 3. Coefficients Predicting Teenage Pregnancy (N = 4,027)

Independent Variables	Degrees of Freedom	Estimate 1	Standard Error	T Value	Significance
Intercept	1	13.218	.029	450.69	<.0001
Age	1	.409	.001	317.54	<.0001
Race	1	.492	.004	99.99	<.0001
Ethnicity	1	-.24	.003	-74.32	<.0001
Urbanicity	1	-.568	.004	-.122.23	<.0001
Violent Crime	1	-.0001	.000004	-28.51	<.0001
Poverty	1	-1.44	.017	-83.06	<.0001
Mortality Rates	1	.006	.001	5.15	<.0001
Parent Income	1	.00004	0		
Parent Financial Strain	1	.187	.003	51.04	<.0001
Parent Support	1	.139	.001	233.02	<.0001
Parental Monitoring	1	.158	.003	63.08	<.0001
Sigma	1	3.33	.003	1062.13	<.0001

APPENDIX C: EFFECTIVENESS OF SCHOOL-LEVEL POLICIES ON SEXUAL RISK-TAKING

Paper was prepared to submit to a Journal

Sexual risk-taking in adolescence: A multi-level model investigating the protective role of sexual education through schools for youth living in high risk contexts

Elizabeth H. Tilley

Abstract

Using life history theory as a guide, this paper investigates the role of school level policies, family support, and community risk, such as poverty, unemployment, and crime rates, on sexual risk-taking in adolescence with data from the National Longitudinal Study for Adolescent Health. Specifically, this paper analyzed the effects of school-level policies, specifically sexual education courses being offered, in conjunction with parent reports of financial strain and census reported poverty levels to determine whether sexual education may protect youth living in high-risk situations from engaging in sexual risk-taking. Offering sexual education courses at the school level was significantly associated with a reduction in sexual risk-taking for youth. Implications for policy development and prevention program design at the school district level are discussed.

Introduction

Teen pregnancy is a social phenomenon that continues to get substantial media coverage in the United States (www.nationalcampaign.org). While teen pregnancy rates are declining in this country, our rates are still very high compared to other industrialized countries. We are third overall in rates of teen pregnancy out of thirty countries according to data from the Organization for Economic Cooperative Development (OECD). While there is much research looking at the effectiveness of sexual education programs (Jemmott & Jemmott, 1998, 1999, 2002, 2005) and behavioral training prevention programs, our teen pregnancy rates remain higher than other developed countries. Data comparing nations on social program expenditures show that teen pregnancy rates are correlated with amount of government expenditure on social programs (UNICEF, 2007). When countries spend less than 5% of gross domestic product on social programs that include family and social benefits, they rank higher on adverse outcomes for youth. When countries spend more than 10% of gross domestic product on these types of social programs, adverse outcomes for youth decline substantially (UNICEF, 2007). While there is a substantial amount of research documenting the association of poverty and teen pregnancy (Colen, Geronimus, & Phipps, 2006; Geronimus, 1987), there is less research investigating the protective role of programs that are already in place. The primary goal of this study is to investigate the ways in which school-level policies regarding sexual education impact sexual risk-taking in adolescence, particularly for youth living in areas that have higher crime, poverty, and unemployment rates.

Policy and Sexual Risk-taking in Adolescence

There is considerable variability between states on rates of earlier teen pregnancy, and these patterns closely match levels of poverty within states. For example, Arizona and New Mexico ranked 2nd and 3rd in rates of poverty in 2009 and 2nd and 4th in teen pregnancy rates, whereas New Hampshire had the lowest poverty and teen pregnancy rankings (source). While poverty is highly correlated with teen pregnancy rates, there are complex cultural, racial, and policy differences between the states that likely influence poverty and adolescent reproductive behavior.

It is important to investigate other broad mechanisms that may account for state-level differences because teen pregnancy rate variation between states is not solely determined by poverty level. Some research has shown that variation in teen pregnancy rates by state is also associated with the differences in public policy within states, even among states with similar demographic compositions. For example, rates of teen pregnancy declined rapidly in California between 1991 and 2006 (46%), but rates in Texas declined only 19% during this same time period (Santelli & Kirby, 2010). Yang & Gaydos (2010) found that implementation of specific contraception programs for low-income teens was associated with reduction in teen births regardless of teen age or race. California and Texas both have similar rates of poverty within their states; however, they varied in reduction of rates of teen pregnancy due to the sexual education policy differences between states.

Sexual risk-taking in adolescence may not always lead to unwanted pregnancy; however, the rates of sexually transmitted infections among adolescents are cause for alarm. A high percentage of teens are sexually active. More than two-thirds of adolescents report engaging in sexual activity before age 19, but only 10 to 20% of adolescents use condoms consistently (Kotchick, Shaffer, Forehand, & Miller, 2001; Terry-Humen, Manlove, & Cottingham, 2006). Approximately 26% of girls between the ages of 14 and 19 are infected with at least one of the most common STIs (Forhan et al., 2008). Nearly half of the STI diagnoses per year occur in adolescents aged 15 to 24, even though that age group comprises only one quarter of the sexually active population (Weinstock, et al., 2004). Because of these high rates of STIs, it is important to understand the complex determinants of sexual risk-taking in youth.

How Do We Prevent Sexual Risk-taking?

Effective prevention strategies must first acknowledge the complexity of the systems within which individuals develop (Miller & Page, 2007; Sterman, 2006), particularly when the goal is to encourage change in behavior that, for reasons such as local life expectancy or lack of employment opportunities, may be adaptive within certain contexts (Chisholm, 1993; Geronimus, 1999; West-Eberhard, 2003). Because the individual is enmeshed within several systems (e.g., family, school, employers, neighborhood) that interact with each other and the individual (Bronfenbrenner & Morris, 2006; Yoshikawa & Hsueh, 2001), prevention strategists must acknowledge these multiple layers. There is a bi-directional relationship between the individual and these systems which is governed by feedback processes that make it difficult to unravel causal direction, specifically when considering the multiple correlates of teen pregnancy. For example, there is substantial research considering associations between teen pregnancy and intergenerational transmission of poverty. Some argue that teen pregnancy contributes to persistent poverty (Lopez, 2011) and others argue that it is a symptom of poverty (Geronimus, 1999;; Males, 2010). Gaining insight into which policies and programs will reduce teen pregnancy rates and risky sexual behavior associated with those rates, at a community or school based level, may be the first step in effective teen pregnancy prevention, particularly when we consider the evidence for providing contraceptive options at the community-level in the work presented by Yang and Gaydos (2010).

Life History Theory and Prevention Design

The theoretical framework informing the development of effective policies and programs to reduce adolescent sexual risk taking should also incorporate the varying contextual constraints of individuals. In addition to ecological systems theory an evolutionary theoretical approach could inform the development and implementation of effective public policy regarding teen pregnancy. According to recent work published by Johns and colleagues (2011), the relatively high rate of teen pregnancy and sexual risk-taking will not be substantially reduced until a prevention approach that utilizes a theory that includes a broader picture of context, which includes evolutionary origins of human behavior, is developed (Johns, Dickins, & Clegg, 2011). While this statement appears strong, the message is that we need to gain an understanding of the fundamental reasons that individuals may engage in behavior that seems contrary to what is "good" for them. For example, statistics show that women who have teen pregnancies, have higher rates of poverty, unemployment, and welfare dependence. Teen mothers have higher rates of welfare dependency and joblessness, and lower rates of educational attainment (often resulting from being forced out of school and ongoing education). Children of teen mothers have also exhibited lower cognitive test scores, academic achievement scores, and higher rates of problem behavior in school (Elfebein, 2003; Furstenburg, et al., 1989; Rich-Edwards, 2002). According to these statistics, why would anyone want to have a teen pregnancy? Life history theory accounts for this seemingly unintelligent behavior.

Life history theory is grounded in evolutionary theory and posits that species have evolved to make various trade-offs between survival and reproduction based on bio-energetic and material resources. These "trade-offs" affect many traits, which include age at weaning, age at sexual maturity, adult body size, age at first reproduction, number of offspring, litter size, birth spacing intervals, and parental investment (Chisholm, 1993; Ellis et al., 2009; Ellis, 2004). Life history theory was originally developed to explain variation of traits, such as litter size, *between* species. These traits represented an evolved response to resource availability and other contextual factors among different species. Species were expected to fall on a continuum, r-selected to K-selected, of trait outcomes. R is considered a “fast” strategy and K is considered the “slow” strategy. On the extreme end of r-selected species are animals, such as rabbits, that may temporarily produce more offspring than their environment is capable of maintaining (Figuredo, Vasquez, Brumbach, & Schneider, 2007; Hill & Kaplan, 1999). As expected, rabbits have early reproductive development, small adult body size, large litters, and short birthing intervals. K-selected species have higher rates of parental investment, larger adult body size, longer gestation periods, later age at weaning, later age at sexual maturity, and later age at first reproduction. Humans fall on the extreme conservative end of K-selected species; however, there is considerable variation among humans in these traits. Indicators of variability in life history strategies are age at sexual debut, number of partners, use of contraception, and age at first birth (Ellis, 2004); hence, this study tested a composite of these indicators as an outcome measure.

Factors influencing the development of life history parameters, specifically faster human life history strategies include elevated local mortality rates (either juvenile or adult), low-levels of parental investment as a proximal indicator of ecological conditions, and harsh or unpredictable environmental conditions (Belsky, Steinberg, & Draper, 1991; Chisholm, 1993; Chisholm, 1999; del Giudice, Angeleri, & Manera, 2009; Ellis, 2004; Ellis, et al., 2012; Ellison, 2003; Figueredo, Brumbach, & Schlomer, 2009; Hill & Kaplan, 1999). One construct that maps onto life history indicators is that of socioeconomic status. Socioeconomic status (SES) is indicative of resource availability as well as quality of nutrition, quantity of exercise, family structure, educational opportunities, mortality rates, and neighborhood crime (Evans, 2006). Additionally, the inability to effectively predict resource flow (i.e., unpredictability) in low income areas may hasten the reproductive strategies favored by individuals (Ellis, Figueredo, Brumbach, & Schlomer, 2009). SES is a proxy for how resources are allocated and how individuals adapt to availability of fewer resources. The lowest levels of SES are concentrated among minority populations within the United States (Browning, Leventhal, & Brooks-Gunn, 2004; Duncan, Brooks-Gunn, & Klebanov, 1994). Therefore, when using a framework that involves the evolved response to trade-offs of material and bio-energetic resources, it is imperative to examine the role of SES and minority status in conjunction with reproductive development and adverse outcomes such as teen pregnancy.

The health-related patterns associated with SES should be considered when designing teen pregnancy prevention programs because they are a proxy for important life history predictors such as morbidity and mortality. Adler and colleagues (1993) have found an inverse relationship between SES and health, as well as behavioral problems. This relationship has been called “the gradient” because lower SES is associated with the most adverse health outcomes, such as obesity and the complications that accompany it and the relationship with these adverse health outcomes decreases as SES increases. Therefore, a person who has the lowest SES will have the highest adverse health outcomes and a person with the highest SES will have the least adverse health outcomes (Adler, Boyce, Chesney, Folkman & Syme, 1993; Adler et al., 1994; Chen, Boyce & Matthews, 2002). When combining these findings with the predictions of life history theory, it is clear that poverty and health will be related to reproductive outcomes. Specifically, life history theory states that reproductive timing will be associated with morbidity and mortality rates within an area. Individuals living in contexts that have higher unpredictability of resource availability and higher rates of morbidity and mortality would be predicted to have earlier age at sexual debut, more sexual partners, less usage of contraception, and earlier age at first birth because it is adaptive to produce more offspring given lower life expectancy.

Poverty, morbidity, and mortality are highly correlated (Geronimus, 1999). Browning, Leventhal, & Brooks-Gunn (2004) found that neighborhood level poverty accounted for a majority of the variance associated with sexual risk-taking in African American youth, above and beyond family processes, peer influences, and developmental risk factors. This finding corroborates the predictions of life history theory in that local-area conditions that indicate resource availability and unpredictability will predict life history strategies. Faster life history strategies, while adaptive within specific contexts of unpredictable resources, are considered sexual risk-taking by societal standards, especially given linkages to adolescent pregnancy and increased risks for contracting STIs. For example, STIs are more common among communities that have problems with access to healthcare, poverty, unemployment, and economic discrimination (Aral, et al., 2008; Lindberg, et al., 2008).

There is a plethora of literature that documents the association between SES and teen pregnancy (Browning, Leventhal, Brooks-Gunn, 2006; Colen, Geronimus, Phipps, 2003; Luker , 1996). The ideal target for prevention programs would be poverty, but ameliorating family poverty is well beyond the scope of most prevention program funding.

Finally, according to the Belsky, Steinberg, Draper Psychosocial Acceleration Model, parents are the conduit through which environmental information is transferred to the child; however, perhaps parents are responding to stress inappropriately. An additional component to test would be the financial or environmental strain felt by parents. This paper tested the impact of neighborhood poverty versus how parents felt they could handle this poverty and whether either of these factors were more highly associated with sexual risk-taking outcomes.

Another area to target for prevention researchers would be educational or contraception policies at the state or school-level because variation in state level programs has been shown to be associated with adolescent sexual risk-taking (Yang & Gaydos, 2010). In an effort to more fully understand the complex interactions between school policies and individual and local SES disadvantage, this paper analyzed whether school level sexual education programs protect youth from engaging in sexual risk-taking.

Gender

In addition to these broader mechanisms, this paper seeks to investigate the role of individual factors, such as gender, that might explain the variation in effectiveness of community-level prevention programs. There are mixed effects of sexual risk-taking prevention programs for boys and girls. Based on prediction set forth in life history, resource availability and unpredictability contribute to reproductive strategies taken by individuals; however, this may vary as a function of gender.

Using a life history theory approach, Simpson et al., (2012) found that early exposure to unpredictable environments, before age six, contributed to earlier sexual activity in males. Simpson and colleagues speculate that this may be due to periods of heightened developmental sensitivity and that some cues are more relevant to developing children than others. For example, they cite the work of Belsky et al., (2012), that found the relationship between early unpredictability and sexual risk-taking in youth was mediated by levels of maternal sensitivity and depression; however, why these relationships vary by gender is not known.

Prevention research has shown mixed results for reduction of sexual risk-taking in boys and girls. For example, Coyle and colleagues (2004) found that boys who participated in a randomized controlled experimental sexual risk-taking prevention program had a significantly lower rate of sexual initiation by 9th grade, but girls did not. The CAS-Cabrera program, an intensive daily program that runs all through the school year for youth aged 13 – 15, however, showed a significant increase in condom-usage for girls, but no significant changes for boys. In light of the work done by Simpson and colleagues (2012), unpredictability (as indicated by poverty and fluctuating resource availability), may play an important role in who these prevention programs work for due to the energy needed to reproduce that varies by gender. For example, females expend more energy in order to reproduce due to time involved in pregnancy and caring for infants. Based on life history theory, we would predict that unpredictable environments would allow for males to reproduce more often; hence sexual education programs may be more effective for girls living in unpredictable, high-risk environments than for boys.

Present Study

Research Questions and Hypotheses

The goal of this study is to understand the multiple factor s that may play a role in who may benefit the most from school-level sexual education programs. Given evidence for the associations between economic and social policies, gender, and reproductive or sexual risk-taking outcomes, several questions emerge. By using ecological and evolutionary theoretical foundations as a guide to understanding these questions, we may provide useful information for prevention strategists.

Hypothesis One

First, policies obviously do have an effect on reproductive outcomes, as evidenced by the work of Yang and Gaydos (2010). Many states implement policies, such as offering sexual education within public high schools (SEICUS, 2010), but do not necessarily mandate funding for those requirements. Our first research question is whether the presence of sexual education within a school is associated with sexual risk-taking behavior in youth? We hypothesize that youth who attend schools that offer sexual education will have lower rates of sexual risk-taking.

Hypothesis Two

Second, while there may be direct effects of poverty and particular policies on the reproductive activity of youth, policies may be more relevant for particular youth. Given the overwhelming demographic evidence of the association between poverty and sexual risk-taking behavior, does the presence of sexual education policies benefit poorer youth? We hypothesize that youth from high risk communities, as indicated by census tract poverty, unemployment , and crime rates will benefit more from the offering of sexual education programs at school.

Hypothesis Three

Third, life history theory states that poverty will contribute to differences in reproductive strategy because it is a proxy for harshness and unpredictability. The work of Belsky, Steinberg, and Draper (1991) suggests that an important conduit of environmental factors to the child is the parent. Is overall poverty more important, or does parental perception of this poverty play a more prominent role in determining how the child will develop? For example, are parents who manage harsh or unpredictable conditions effectively expressing different information about the environment and does this affect risk-taking behavior of their children? When parents feel they cannot meet their bills, as indicated by report of financial strain in Add Health, this indicates poor ability to manage harsh or unpredictable conditions. Hypothesis three is that parental responses to stress will have a larger association with youth sexual risk-taking than overall the more proximal contextual variables. Hypothesis four is that offering sexual education programs within a school will vary as a function of gender.

Methods

Data from the National Longitudinal Survey of Adolescent Health (Add Health) were used in this analysis. These data included four time points or waves that data were gathered.

Participants

The first wave of data was gathered between 1994 and 1995 from youth in grades 7 through 12 at schools. A total of 97, 998 students participated in the school-administered portion of the Add Health survey. Data were then gathered during in-home interviews with a portion of the students who first completed the school questionnaires (N = 12,105). Wave I includes data gathered from school administrators and parents. Wave II was conducted in 1996 and excluded youth from Wave I who had graduated or who were included in the Wave I disabled sample. Wave III data were gathered in 2001 and 2002. The age range of respondents was 18 to 26 years old. Wave IV data were gathered in 2007 and 2008. These data included social, economic, psychological, and health circumstances of the original participants. Participants also retrospectively reported on reproductive outcomes, which allowed for the inclusion of a teen pregnancy variable in this analysis. Waves I, II, and IV were used in these analyses as data from Wave III did not include data on family functioning.

The Add Health design is also unique in that it includes contextual variables, such as families, peer groups, schools, and neighborhood/community level data as provided by the US Census, Centers for Disease Control and Prevention, the National Center for Health Statistics, the Federal Bureau of Investigation, and other databases. The inclusion of these data allowed for an in-depth examination of many variables that are considered to be life history parameters. The present sample included 846 participants at Wave 4 who had answered questions in the In-Home Interview at Wave 1, who also had answers to questions about number of sex partners and age at first pregnancy (or first time getting partner pregnant) at Wave 4. Approximately 49% were female and 51% were male. The 846 participants in this analysis attended 126 schools randomly sampled across the United States.

Measures

Sexual Risk Taking. The dependent variable was a composite of reproductive behavior that included number of sex partners (self-report at time 4), use of contraception (report of how often used contraception on a 1 – 5 scale), and teen pregnancy outcomes (reported age of first pregnancy by time four). These items were standardized and then averaged with a Cronbach's alpha of .63.

Covariates. Control variables used in the analysis were ethnicity, a dichotomous variable that was a yes or no question of whether the respondent was of Hispanic origin (0 = no, 1 = yes). Race was a dichotomous variable that indicated whether the respondent was Black or White (0 = no, 1 = yes). Age of the respondent was used as a control variable. These variables were chosen because they typically are associated with initiation of sexual activity. For example, African American and Hispanic youth, on average, have higher rates of teen pregnancy and earlier age of onset of sexual activity (http://www.guttmacher.org/pubs/USTPtrends.pdf).

School Policies. The policy variable used in the analysis was whether sexual education was taught in the school of the adolescent participant.

This variable was dichotomous and indicated whether a state provides a program or not, no = 0 and yes = 1. These data were gathered from state policy archives during the first wave of Add Health. While policies may have changed over the course of the study, they were relevant at the first year of the study.

Socioeconomic disadvantage and community risk. Parents reported on income, parent and financial strain. For parent report of financial strain, parents reported whether they could pay their bills on a monthly basis by indicated no = 0 or yes = 1. Community risk was a composite variable drawn from census data comprised of percentage of people within the adolescent's community within census tract area living below the federal poverty level, percentage of people within the community living on federal or state financial assistance, crime rate in area, and unemployment rate in area.

Analytic Plan

The goal of this paper was to test whether community risk predicted the differences in association between presence of sexual education at the school-level and reproductive behavior outcomes in youth. In order to test these influences, we chose to use multi-level modeling techniques. This approach allowed us to test the influence of school policies within the context of poverty and community risk on individual outcomes. Youth were clustered within schools and the SAS PROC MIXED procedure was used to assess between school and within school differences of reproductive outcomes in youth, and what adolescent characteristics, such as gender and race, contributed to those differences.

For a standard multi-level analysis, cases with missing data are dropped due to multi-level modeling. SAS PROC Mixed procedure only analyzes available data, and it is robust to missing data and estimates parameters based on what is available. The total final sample included participants who completed the in home questionnaire, were available to answer questions at the final time point, and whose parents participated in the parent survey (N = 846). 119 schools were included in the final analysis. Because multi-level analyses were used, only participants who had data for all variables in the analyses were included. Data were substantially missing for some census tract variables; however, due to the nature of the analyses in multi-level modeling, missing data were not imputed. Missing data are reported in Table 1.

Results

Descriptive statistics for all relevant variables are presented in Table 1. Correlations among key variables are presented in Table 2. Boys had significantly higher incidence of sexual risk taking, $r(846) = -.154$, $p < .001$. Unexpectedly, youth whose parents reported having enough money to pay bills (less financial constraint), had higher incidence of sexual risk-taking, $r(675) = .134$, $p < .001$. Individuals who reported being of Hispanic origin also reported having more trouble paying their bills, $r(675) = -.142$, $p < .001$.

The estimate of correlation of sexual risk-taking likelihood between students within schools is 2%. Essentially, 98% of model variance was by differences among individuals within schools and 2% of the variance was explained by differences between schools. The intraclass correlation is used to determine between and within group variation. This estimate shows that there is very little variability between schools that is associated with sexual risk-taking, but much higher variability between individuals within schools. Specifically, individual characteristics are more highly related to sexual risk-taking than school characteristics; however, characteristics about schools may have greater impact for some individuals than others.

The hypotheses tested in this paper specifically test the association of school characteristics in conjunction with individual characteristics and their relationships to sexual risk-taking. Results of all models are presented in Table 3.

Hypothesis one was that youth who attended schools that offered sexual education would have lower rates of sexual risk-taking. This hypothesis was supported. The presence of sexual education being offered in schools was associated with a decrease in sexual risk-taking ($N = 454$, $\beta = -1.96$, $SE = .92$, $p < .05$). Approximately 50% of the schools in this sample offered sexual education.

Hypothesis two was that the presence of sexual education in schools would benefit youth who lived in high-risk situations (as indicated by community level poverty, crime, and unemployment rates). Hypothesis two was not supported. There was no significant association between the interaction of community risk and sexual education on the outcome of sexual risk-taking in youth (N = 446, β = -.11, SE = 1.92, p = .96).

Hypothesis three was that proximal factors such as parent report of financial strain and child report of parent support will have a stronger association with sexual risk-taking for youth than contextual variables such as community risk. Hypothesis three was partially supported. Child report of parent support was not significantly associated with youth sexual risk-taking (N = 436, β = .001, SE = .05, p = .98). However, parent report of financial strain was significantly associated with sexual risk-taking ((N = 446, β = 1.53, SE = .36, p < .0001), but not in the direction expected. Parents who reported being able to pay their bills had youth who reported higher levels of sexual risk-taking. While adding these proximal variables to the model, community risk was still significantly associated with higher levels of sexual risk-taking (N = 446, β = -.72, SE = 37, p = .05).

Hypothesis four was that the effects of sexual education on sexual risk-taking outcomes will vary as a function of gender. Hypothesis four was not supported (N = 446, β =3.14, SE = 2.52, p = .22).

Discussion

In an attempt to better understand the impact of teaching sexual education on sexual risk-taking in youth, this paper tested the role of school level policies on the sexual risk-taking behaviors of youth, while including the role of parental perception of financial hardship, and community-level risk factors such as poverty, crime rates, and unemployment. Because poverty is substantially correlated with sexual risk-taking, we chose to test the combination of school policies, gender, and familial functioning in conjunction with poverty levels for youth. Add a sentence to preview structure of the discussion.

Hypothesis one tested the effects of teaching sexual education on sexual risk-taking in youth. Hypothesis one was supported. Youth who attended schools that offered sexual education had significantly lower rates of reported sexual risk-taking. Hypotheses three and four tested the role of gender and poverty and sexual education. The most important predictors of sexual risk-taking for youth were parent report of financial strain, but not in the direction expected. This finding is surprising when considered in light of the psychosocial acceleration model (Belsky, Steinberg, and Draper,1991), which falls under the umbrella of life history theory to account for the interaction of the developing individual within the familial environment. This theory also fits nicely into the ecological systems theory model. According to the theory developed by Belsky and colleagues, parents are the conduit between environmental characteristics and the developing child. If parents encounter an environment that is rich in resources with relatively low levels of uncertainty, this message will be transmitted to the child because parents will encounter less stress and be able to devote more time to their children. Conversely, if parents encounter an environment that has limited resource availability, high levels of resource unpredictability, or high mortality rates, this information will be transmitted to the child indirectly simply due to the stresses present in the immediate environment. The findings in this analysis suggest that, while it is important to consider the effects of poverty and community risk factors, we need to more fully understand how living in high risk communities affects familial functioning.

When considering the life history model, poverty may impact sexual risk taking because it is a proxy for access to resources, health, and mortality. However, as indicated in research using the Family Stress Model (Conger, et al., 2002; Duncan & Brooks-Gunn, 1997; McLoyd, 1998) and the work of Belsky, Steinberg, & Draper (1991), how parents respond to economic hardship may be even more important than objective income or poverty measures in determining the sexual risk-taking outcomes of youth. These results were not found in this analysis. Specifically, youth whose parents reported less financial strain had higher chances of engaging in sexual risk-taking. This finding needs to be explored further. Parents still may be a stronger conduit of expected environmental hardships than contextual influences, such as community level poverty for youth. This statement does not discount the documented adverse consequences associated with poverty (Evans, 2006; McLoyd, 1998); however, it suggests more fruitful avenues that prevention programs can target. Specifically, as McLoyd (1998) states, the link between poverty and poor child health outcomes is partially mediated by harsh parenting practices. While the work of Yang and Gaydos (2010) documented effects of state-level policies on sexual risk-taking outcomes in youth, the empirical findings in this paper suggest that schools may be one avenue where we can successfully target sexual risk-taking; however, incorporating the effects of community-level risk will be an important area for sexual risk-taking prevention programs. Millions of dollars are spent on prevention programs that isolate individuals from context, but the message from these findings suggests it may be better to broaden the scope and include the neighborhood context.

Study Strengths and Limitations

A major strength of the Add Health dataset is the inclusion of multiple levels of variables such as census tract level data, school-level data, state-level data, family-level data, and individual data. Several limitations of this study need to be mentioned.. First, the measurement of sexual education at the school level lacked specificity. The variable indicated whether the school offered sexual education or not. It did not indicate how it was taught, the curriculum, the length of the program, who attended, or any other details about the program; however, there were effects associated with this variable. While there were no interaction effects, the provision of sexual education had a main effect on sexual risk-taking of youth, in the direction that would be expected. Essentially, schools that taught sexual education had youth who engaged in less sexual risk-taking behavior, but the details of why this variable had effects are unknown. For example, there could be correlates to sexual education being taught such as willingness to engage in open discussion with youth about sexual behavior that lead to less sexual risk-taking. This finding speaks to the benefits of providing sexual education, but further details of how this works need to be explored. Future studies would benefit by including more detailed measurement of school-level policies and practices related to sexual education.

Implications for Prevention and Policy

The results in this paper suggest one very important prevention possibility. Providing sexual education through schools does have an impact on sexual risk-taking in youth. It is important to note that these sexual education data in Add Health were gathered prior to 1995, meaning that many of these courses were not Abstinence Only Curricula because these curricula were developed and mandated with the Personal Responsibility and Work Reconciliation Act of 1996 (Kantor & Bacon, 2002). While this does not provide information on the sexual education courses that were offered, it does tell us that many of them may not have been Abstinence Only. Further investigation on the programs offered before 1996 is warranted.

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Table 1.

Descriptive Statistics of Variables used in Analyses

Variable	Mean	SD	Range
Age Time 1	16.32	1.64	11 - 23
N	614		
Missing	232		
Reported Age of First Pregnancy	23.71	3.7	14 - 33
N	846		
Missing	0		
Percent Teen Pregnancy reported by Time 4	14.1%		
N	846		
Missing	0		
Biological Sex	1.52	.5	1 - 2
N	846		
Missing	0		
Parent Financial Stress	.82	.58	0 - 5
N	675		
Missing	171		
Reproductive Outcomes	2.84	.03	2.79 – 3.0
N	846		
Missing	0		
SEXED	.97	.55	0 - 6

N	836		
Missing	10		
STATESTI	.57	.5	0 – 1
N	334		
Missing	512		
STATEPREG	.36	.48	0-1
N	320		
Missing	526		
STATEFUND	.47	.47	0-1
N	414		
Missing	432		

Table 2:

Correlations among variables in analysis

		1.	2.	3.	4.	5.	6.	7.	8. 9.	10.	11.	12.
1. SEX	Pearson Correlation	1	-.154**	-.018	.055	-.053	.066	-.033	.016	-.029	.056	.072
	Sig.		.000	.754	.320	.128	.088	.336	.645	.416	.254	.075
	N	846	846	320	334	836	675	846	846	804	414	614
2.reproductive outcome	Pearson Correlation	-.154**	1	-.010	-.007	-.035	.134**	-.017	-.017	-.019	-.035	.064
	Sig.	.000		.856	.893	.319	.000	.621	.628	.586	.477	.111
	N	846	846	320	334	836	675	846	846	804	414	614
3. STATEPREG	Pearson Correlation	-.018	-.010	1	.669**	-.006	.023	-.005	-.064	-.179**	.057	.051
	Sig. (2-tailed)	.754	.856		.000	.916	.707	.926	.253	.002	.314	.432
	N	320	320	320	320	319	261	320	320	307	320	236
4. STATESTI	Pearson Correlation	.055	-.007	.669**	1	-.069	.050	-.067	-.076	-.100	-.028	.066
	Sig. (2-tailed)	.320	.893	.000		.208	.408	.225	.168	.075	.607	.299
	N	334	334	320	334	332	272	334	334	320	334	249
5. SEXED	Pearson Correlation	-.053	-.035	-.006	-.069	1	-.079*	-.003	-.014	.069	.012	-.004
	Sig. (2-tailed)	.128	.319	.916	.208		.041	.926	.686	.050	.811	.921

	N	836	836	319	332	836	665	836	836	794	412	607
6. Parent Report of Financial Strain	Pearson Correlation	.066	.134**	.023	.050	-.079*	1	-.142**	-.060	-.034	-.002	-.047
	Sig. (2-tailed)	.088	.000	.707	.408	.041		.000	.118	.387	.971	.292
	N	675	675	261	272	665	675	675	675	641	336	501
7. Ethnicity	Pearson Correlation	-.033	-.017	-.005	-.067	-.003	-.142**	1	.078*	.083*	-.020	-.012
	Sig. (2-tailed)	.336	.621	.926	.225	.926	.000		.024	.019	.687	.771
	N	846	846	320	334	836	675	846	846	804	414	614
8. Race	Pearson Correlation	.016	-.017	-.064	-.076	-.014	-.060	.078*	1	.234**	.025	-.084*
	Sig. (2-tailed)	.645	.628	.253	.168	.686	.118	.024		.000	.617	.038
	N	846	846	320	334	836	675	846	846	804	414	614
9. communityrisk	Pearson Correlation	-.029	-.019	-.179**	-.100	.069	-.034	.083*	.234**	1	-.063	-.095*
	Sig. (2-tailed)	.416	.586	.002	.075	.050	.387	.019	.000		.212	.022
	N	804	804	307	320	794	641	804	804	804	397	582
10. STATEFUND	Pearson Correlation	.056	-.035	.057	-.028	.012	-.002	-.020	.025	-.063	1	.067
	Sig. (2-tailed)	.254	.477	.314	.607	.811	.971	.687	.617	.212		.246
	N	414	414	320	334	412	336	414	414	397	414	306
11. AGE	Pearson Correlation	.072	.064	.051	.066	-.004	-.047	-.012	-.084*	-.095*	.067	1
	Sig. (2-tailed)	.075	.111	.432	.299	.921	.292	.771	.038	.022	.246	

N	614	614	236	249	607	501	614	614	582	306	614

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 3:

Hypotheses tested in multi-level models

Independent Variables	Model 1	Model 2	Model 3	Model 4
Intercept	13.7*** (1.8)	14.53*** (1.83)	12.9*** (2.46)	19.5** (5.0)
Respondent Age	.23* (.01)	.19* (.1	.22* (.11)	.23* (.1)
Race: White 0 = no, 1 = yes	-.38 (.27)	-.36 (.28)	-.43 (.41)	-.37 (.27)
Ethnicity: Hispanic or Non Hispanic 0 = no, 1 = yes	-.25 (.25)	-.33 (.26)	-.10 (.37)	-.26 (.26)
Gender	-1.42*** (.30)	-1.48*** (.31)	-1.58*** (.35)	-4.5 (2.51)
SEXED	-1.96* (.92)	-1.9* (.93)	-1.86(1.02)	-7.75 (4.75)
PARENT STRAIN			1.53*** (.002)	
Community Risk		-.5	-.72*	

		(1.9)	(.35)	
Parent support			.001 (.05)	
SEXED*Community Risk		-.11 (1.9)		
SEXED X Gender				3.14 (2.53)

*** Significant at the 0.001 level (2-tailed).
** Significant at the 0.01 level (2-tailed).
* Significant at the 0.05 level (2-tailed).