Risky Business:
The Effect of Family Income on Teen Risky Sexual Behavior

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Abstract

The inequality of income distribution within the United States has led to a differential in outcomes for teenagers from low-income and wealthy families. Previous research shows a positive relationship between family income and teen academic performance; however this study focuses on another aspect of teenage well-being. Risky sexual behavior can have profound consequences for a teen in terms of physical well-being, mental health, and future economic success. We explore this topic by examining the relationship between total household income and risky sexual behaviors including the use of birth control, number of sexual partners, age at first intercourse, and the contraction of STDs. Economic theories citing the household budget constraint and opportunity costs suggests a negative correlation between household income and risky sexual behavior. We find that for each dependent variable, race and religiosity are the most significant predictors of risky sexual behavior. For the use of birth control, however, our results show a significant negative correlation between income and unprotected intercourse that increases for teens with higher test scores. We conclude that household income is the most significant for risky behaviors that have expensive preventative costs.

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I. Introduction

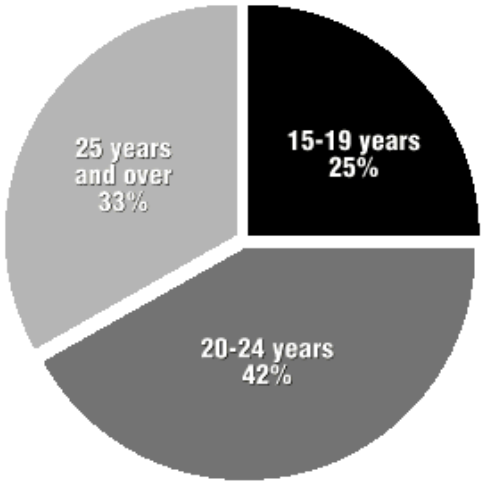
The inequality in income distribution present in the United States is the widest it has been in 25 years, and it continues to grow every year (Wutkowski, 2007). As the effects of this income gap between the richest and poorest members of society become visible throughout the country, now is a better time than ever to examine its effect on families and youth in particular. Wealthier families are often able to invest more time and money into raising their children, but how does this varying investment manifest itself in the outcome of teenage well-being? While many studies have shown that teens from higher income families achieve greater academic achievements than those from low-income families, fewer studies have focused on other aspects of teenage well-being, such as emotional, psychological, and sexual health. During adolescence, teens are exposed to drugs, alcohol, and sexual activity, and their family life can have a profound effect on their decisions of whether or not to partake in these activities (Brewster, 1994; Figlio and Ludwig, 2000; Upchurch, et. all, 2004). We are interested in determining to what extent a family's socioeconomic status influences the home environment and consequently teen involvement in risky behavior.

This paper specifically examines the effect of household income on teen risky sexual behavior. While there are many teen behaviors that are affected by family background and can act as indicators of a child's well-being, we feel that sexual activity is a particularly relevant element of teenage health because of its potentially devastating effects. Reckless sexual behavior, such as unprotected intercourse, having multiple partners, and premature intercourse, can have grave consequences for a teen's mental and physical health, as well as their future economic well-being. Approximately one quarter

of all cases of sexually transmitted infections, including HIV, occur among teenagers (*Figure 1*), and approximately one million teenage girls become pregnant every year (Women's Health Channel, 2007).

Figure 1: STDs among teenagers in the United States.

Distribution of New Cases of STDs by Age



Source: Eng, TR, and Butler, WT, eds, The Hidden Epidemic: Confronting Sexually Transmitted Diseases, Washington, D.C.: National Academy Press, 1997.

We take this analysis further than existing papers by examining some of the factors that influence *risky* sexual behavior instead of simply whether or not teens are sexually active. Through this analysis we hope to be able to thoroughly examine the consequences of income inequality on this one vital aspect of teen health and well-being.

We use the Carolina Population Center's National Longitudinal Study of Adolescent Health (Add Health) as our data set to test our hypothesis that wealthier teens will exhibit less-risky sexual behavior since their parents can invest more in their human capital. The Add Health study is a comprehensive, six-year study that surveyed more than 90,000 adolescents in three waves. It provides basic information about the respondent's parental income and education, as well as details about his or her sexual

activity and practices. We use the following six variables to determine risky sexual behavior: if the respondent used birth control during his or her most recent intercourse; if the respondent had been diagnosed with Chlamydia in the past twelve months; if the respondent had been diagnosed with HPV in the last twelve months; if the respondent had been diagnosed with HIV in the past twelve months; the respondent's age at first intercourse; and finally, the respondent's number of sexual partners. We focus on Chlamydia, HPV, and HIV as the three sexually transmitted diseases to study since they are common STD's among teenagers and have varying degrees of both severity and treatment options. By choosing these specific dependent variables we are able to differentiate between safe sexual behavior and inherently risky sexual behavior among teenagers.

The remainder of the paper is divided into five sections. Section II reviews previous literature that has examined the effects of family income on teen behaviors. It also discusses other variables that have been demonstrated to be determinants of risky sexual behavior. The third section discusses the National Longitudinal Study of Adolescent Health and why we it will be used as our data set. The fourth section explains our methodology and describes our econometric model. Section V presents our findings and an analysis of our results. The final section concludes the paper and discusses possibilities for further research in the area.

II. Teen Sexual Risk in Different Socioeconomic Backgrounds

The effect of socioeconomic background on general child well-being has been widely examined by researchers from multiple fields. Case and Lubotsky (2002) found a

positive correlation between family income and child health that became stronger as the child grew older. They suggested that a large portion of the relationship can be explained through chronic childhood conditions to which low-income children are more susceptible (Case and Lubotsky, 2002). Janet Currie and Mark Stable (2001) studied cross-sectional data to determine why this correlation increases with age. They proffered two possible explanations. The first was that children from lower socioeconomic status (SES) families are less able to treat and respond to negative health shocks. The second explanation was that lower SES children experience a greater quantity of negative health shocks. The data suggested that children from all SES levels generally recover to the same degree from previous negative health shocks. Currie and Stable concluded that the relationship between household income and child health grows stronger over time primarily because low-SES children receive more negative health shocks (Currie and Stable, 2001). These studies suggest that low-income children are more likely to have poor health than higher SES children due to increased exposure to health risks and that this differential will increase over time.

Since teenagers are generally physically healthy and many negative health shocks are caused by the teens' own risky choices, it is useful to examine the relationship between income and teen behaviors. While several studies have found a correlation between income and teen health, few have focused on the risky behavior that can determine teen health. Since behaviors related to sexual practices can have serious implications for a teen's health, it is relevant to understand the determinants of such behaviors. Jonathan Gruber examined the determinants of youth risky behavior in general and found that economic incentives and macroeconomic conditions were

predictors of risky behavior (Gruber, 2000). Luster and Small attempted to explain some of these risky behaviors by examining teens in the western United States. They compared 'sexually risky teens' - teens who have had multiple sexual partners and do not use contraception – with teens who are sexually active but less risky – those who have one partner and use contraception – and finally, with teens who practice sexual abstinence. They showed that high-risk teenagers were monitored less closely by their family and received less support than the less-risky groups (Luster and Small, 1994). These results encourage further research into the correlation between household income and teen risky sex, since higher-income families have more resources, including time, to invest in the development of their children.

Certain studies have examined additional variables other than income that may be correlated to teen involvement in risky sexual behavior. Multiple studies have demonstrated a negative relationship between private schooling and certain risky teen behaviors. Specifically, teens who attend private Catholic schools are less likely to be sexually active (Figlio and Ludwig, 2000, Mocan and Tekin, 2002). Since household income is one determinant of whether a child attends private school, it may be a contributing explanatory variable of this risky sexual behavior.

Other factors that researchers have considered as explanatory variables of teen risky sexual behavior include parents' religiosity, race, and substance abuse. Research has shown that the level of religiosity of a teen's family can have significant influence over their decisions to have sex and to use contraception. Manlove, et. all (2006) showed that having religious parents may delay the age at which a teen first has sex. They also demonstrated, however, that parent religiosity is negatively correlated to whether the teen

uses contraception at first intercourse (Manlove, et. all, 2006). Race has also been demonstrated to have a strong correlation with age at first intercourse. In 1994, Karin Brewster used the Add Health data set to explain this relationship as a reflection of race differences in both access to economic resources and exposure to positive adult role models (Brewster, 1994). Finally, substance abuse has also been explored as a determinant of teenage sexual behavior. While there is copious evidence demonstrating a high correlation between substance abuse and risky sexual behavior, Grossman and Markowitz set out to determine if it was a causal relationship (2002). They found that alcohol did not increase the probability of having sex or having multiple partners, but it did increase the likelihood that sexually active teens would not use condoms or birth control (Grossman and Markowitz, 2002). In a follow-up study, this conclusion was reinforced by results that suggested no causal relationship between alcohol and a teen's decision to have sex but provided evidence that alcohol lowers contraceptive use (Markowitz, Kaestner, and Grossman, 2005).

Previous research has suggested a possible correlation between household income and teen behavior that will be further explored in this paper. While many earlier studies demonstrated a positive relationship between income and teen health, they did not consider the risky behaviors that often determine health. Studies that did examine the causes of teen risky sexual behavior considered causal factors such as religion, race, and alcohol. We focus specifically on the relationship between family income and teen risky sex to provide a thorough analysis of one possible consequence of the growing income gap in the United States.

III. The National Longitudinal Study of Adolescent Youth

The National Longitudinal Study of Adolescent Youth (Add Health) was conducted by the University of North Carolina's Carolina Population Center throughout the 1990s. It focuses on the health of adolescent respondents in grades 7 through 12 and relevant behaviors that may put them at risk. It also contains information about the respondents' social background in terms of family history, education, and relationships that may explain these teen behaviors. The Add Health survey provides a contextual and comprehensive approach to understanding teen behavior by combining data from the respondents, their families, and their schools.

The study was conducted in three separate waves, beginning with Wave I which commenced in 1994. Wave II data was collected from the same respondents one year following the initial questioning. Wave III was collected approximately six years later, between 2000 and 2001, when the respondents were between the ages of 18 and 26 years old. The Add Health survey contains data from over 90,000 adolescents and includes subjects ranging from diet to violence to sexual behavior that was obtained through 'in-school surveys' and 'at-home questionnaires.' For all of our explanatory and dependent variables we use data from Wave III. For the variables related to risky sexual behavior, Wave III is particularly applicable since it contains the richest and most relevant data file for our topic. The age of respondents during Wave III (18 – 24) also implies that a significant portion is sexually active and can provide responses about risky practices.

Our explanatory variables consist of responses to the following questions: 1) What is your household's total income before taxes?[1] 2) How often did you attend

[1] If the respondent was unsure of the exact household income before taxes, we include their response for best guess of total household income.

religious services in the past 12 months? 3) What is the respondent's observed race?[2] 4) What is the respondent's cross-sectional standardized PVT score? Biological sex is also used as an explanatory variable for the regressions analyzing the pooled data from both sexes. In addition, we run each regression separately for male and female respondents to isolate coefficients for each gender. *(For a description of coded responses and summary statistics for each explanatory variable, see Tables 1 and 2)*

Our six dependent variables and indicators of risky sexual behaviors are based on the answers to the following six questions: 1) Have you been diagnosed with HPV in the past 12 months? 2) Have you been diagnosed with Chlamydia in the past 12 months? 3) Have you been diagnosed with HIV/AIDS in the past 12 months? 4) Did you use any form of birth control at your most recent vaginal intercourse? 5) What was your age at your first time of vaginal intercourse? 6) What is the number of vaginal intercourse partners that you have had? For both the age at first intercourse variable and the number of partners variable, we determine a cut-off number for risky behavior. For age at first intercourse, we classify 16 and below as risky behavior, since the average age in our data set and in the general population is approximately 16 years old (Weiss, 2007). For number of partners, we code respondents who answered 7 or above as risky, since the mean number of partners is 6.5. *(See Tables 1 and 2)*

[2] This question was answered by the interviewer instead of the respondent and provided much richer and more complete data than an alternative question regarding race that was asked directly of the respondent.

Table 1: Definitions of Explanatory, Dummy, and Dependent Variables

Variable	*Coding*
Income	=Total household income before taxes (best guess of total household income if the respondent is unsure of exact amount)
Sex	=1 if male, =0 if female
PVT Score	=the cross-sectional standardized PVT score of the respondent
Race	
Caucasian	=1 if observed race is Caucasian/white, =0 if otherwise
African American	=1 if observed race is African American/black, =0 if otherwise
Native American	=1 if observed race is Native American or American Indian, =0 if otherwise
Asian	=1 if observed race is Asian or Pacific Islander, =0 if otherwise
Religiosity	
Never	=1 if never attended religious services in past 12 months, =0 if otherwise
Few Times	=1 if attended services a few times in past 12 months, =0 if otherwise
Several Times	=1 if attended services several times in past 12 months, =0 if otherwise
Once a Month	=1 if attended services once a month in past 12 months, =0 if otherwise
2-3 Times a Month	=1 if attended services 2-3 a month in past 12 months, =0 if otherwise
Once a Week	=1 if attended once a week in past 12 months, =0 if otherwise
More Than Once a Week	=1 if attended more than once a week in past 12 months, =0 if otherwise
Chlamydia	=1 if diagnosed with Chlamydia in the past 12 months, =0 if otherwise
HPV	=1 if diagnosed with HPV in the past 12 months, =0 if otherwise
HIV/AIDS	=1 if diagnosed with HIV/AIDS in the past 12 months, =0 if otherwise
Birth Control	=1 if did not use birth control at most recent intercourse, =0 if otherwise
Age First Time	=1 if respondent was less than or equal to 16 at first vaginal intercourse, =0 if otherwise
Number of Partners	=1 if respondent has had 7 or more partners, =0 if otherwise

Table 2.1: Summary Statistics of Explanatory and Dependent Variables

Variable	*Obs.*	*Mean*	*Std. Dev.*	*Min.*	*Max.*
Income	1587	58580.86	49086.16	0	602500
Sex*	4882	.4614912	.4985659	0	1
PVT Score	4703	99.7795	15.42127	7	122
Race					
Caucasian	4882	.6943875	.4607135	0	1
African American	4882	.2455961	.4304841	0	1
Native American	4882	.0167964	.128521	0	1
Asian	4882	.041991	.2005891	0	1
Religiosity					
Never	4839	.2614176	.4394524	0	1
Few Times	4839	.2510849	.4336821	0	1
Several Times	4839	.1237859	.3293712	0	1
Once a month	4839	.0743966	.2624406	0	1
2-3 times a month	4839	.1049804	.3065598	0	1
Once a week	4839	.1281256	.3342642	0	1
More than once a week	4839	.0560033	.2299519	0	1
Chlamydia**	817	.1505508	.3578295	0	1
HPV **	455	.1032967	.304681	0	1
HIV/AIDS**	871	.0080367	.0893382	0	1
Birth Control	3768	.3213907	.4670724	0	1
Age First Time	4158	.53848	.498577	0	1
Number of Partners	4112	.3117704	.4632729	0	1

Table 2.2: Summary Statistics of Explanatory and Dependent Variables for Male Respondents

Variable	*Obs.*	*Mean*	*Std. Dev.*	*Min.*	*Max.*
Income	812	60206.06	41226.86	0	370000
PVT Score	2156	100.4782	14.8385	7	122
Race					
Caucasian	2253	.7043941	.4564159	0	1
African American	2253	.2316911	.4220064	0	1
Native American	2253	.0173103	.1304537	0	1
Asian	2253	.0461607	.2098795	0	1
Religiosity					
Never	2239	.3171059	.465453	0	1
Few times	2239	.2724431	.4453161	0	1
Several times	2239	.1058508	.3077153	0	1
Once a month	2239	.0723537	.2591306	0	1
2-3 times a month	2239	.0937919	.2916041	0	1
Once a week	2239	.0969183	.2959125	0	1
More than once a week	2239	.0415364	.1995718	0	1
Chlamydia**	198	.1969697.	.3987174	0	1
HPV **	98	.0510204	.2211707.	0	1
HIV/AIDS**	325	.0153846	.1232667	0	1
Birth Control	1712	.328271	.4697212	0	1
Age First Time	1919	.5398645	.4985382	0	1
Number of Partners	1890	.3592593	.4799103	0	1

Table 2.3: Summary Statistics of Explanatory and Dependent Variables for Female Respondents

Variable	*Obs.*	*Mean*	*Std. Dev.*	*Min.*	*Max.*
Income	775	56878.08	56130.37	0	602500
PVT Score	2547	99.18806	15.87677	7	122
Race					
Caucasian	2629	.6858121	.4642799	0	1
African American	2629	.2575124	.4373471	0	1
Native American	2629	.016356	.1268646	0	1
Asian	2629	.0384176	.1922389	0	1
Religiosity					
Never	2600	.2134615	.4098296	0	1
Few Times	2600	.2326923	.422629	0	1
Several times	2600	.1392308	.3462538	0	1
Once a month	2600	.0761538	.2652951	0	1
2-3 times a month	2600	.1146154	.3186185	0	1
Once a week	2600	.155	.3619743	0	1
More than once a week	2600	.0684615	.2525848	0	1
Chlamydia**	619	.1357027	.3427496	0	1
HPV **	357	.1176471	.3226419	0	1
HIV/AIDS**	546	.003663	.0604672	0	1
Birth Control	2056	.3156615	.4648918	0	1
Age First Time	2239	.5372934	.4987186	0	1
Number of Partners	2222	.2713771	.4447703	0	1

** Sex is used as an explanatory variable only for regressions using the pooled sample of males and females. For this, we created a dummy variable for males, using females as the reference group. All other regressions are run separately for males and females. Tables 2.2 and 2.3 contain gender-specific summary statistics.*

***For our dependent variables regarding STDs, we used a subset of our data sample that only included respondents who had been tested for the specific STD in the past 12 months.*

Because Add Health contains such thorough information about both risky teen behavior and potential causal variables, it is an ideal data set for our study. It was created with the intention of explaining risk factors in teenage health: something our study attempts to determine (Add Health). Physical health is only one component of overall teenage health, as many dangers to teenage health are self-created through risky behaviors. We attempt to explain one such risky behavior by determining the effect of family income on risky sexual practices.

IV. Economic Theory and Empirical Strategy

a. Optimization of the Household Budget Constraint

Households can be treated like economic units with both a budget constraint and a set of utility curves. Total household income serves as the budget constraint, and the household unit must make decisions between multiple investment options in order to maximize its utility. One of these possible investments is the human capital of children in the household. This includes time and money, but could also include things such as teaching safe sex or prudent behavior in general. Households with a higher income by definition have a larger budget constraint than low-income households. Therefore, if two households have identical sets of indifference curves and both value the human capital of their children to the same positive extent, the household with the higher income will invest more into its children.

Additionally, depending on the extent to which families discount the future well-being of their children, households will tend to make human capital investments in the present. This means that households that can afford to do so will make current

investments in their children, such as education, that have long-term benefits in the offspring's future. This theory suggests a hypothesis that income will have a negative correlation with risky sexual behaviors and a positive correlation with safe practices. It also suggests that income squared will have a positive correlation with risky behaviors since the trend is most likely increasing at a decreasing rate.

b. Greater Opportunity Cost

A second theory that could explain the effect of income on teenage risky sexual behavior is the idea that teens from higher-income households have better future outlooks than their peers, so they behave in ways that will protect their future. Teenagers from wealthy families have been shown to have both better health and greater academic success than their counterparts, predicting better futures for them in terms of longevity, health, economic well-being, and overall quality of life. Because they have more optimistic futures, high-income teens are less likely to partake in risky behaviors since becoming pregnant or contracting an STD could result in large opportunity costs. This theory reiterates the above hypothesis and also suggests that children with higher academic performance will be more affected by income since they have more to lose. Because of this we also hypothesize that the coefficient describing the effects of PVT score will be negative, and the coefficient of the interaction between PVT score and income will be positive.

c. Econometric model

We use probit regressions for each of our six dependent variables, wherein for each variable, 1 indicates a risky behavior and 0 indicates a non-risky behavior. Each equation is run first for the complete data set and then separately for male and female respondents in order to stratify our results by gender. To determine the effect of income on these risky behaviors, we begin with the following probit equation:

$$(1) \qquad Y = \alpha_0 + \alpha_1 I + \alpha_2 I^2 + \varepsilon$$

where Y is the dependent variable as a function of total household income (I), total household income squared (I^2), and an unknown error term (ε). We include household income squared as an explanatory variable in order to examine if the effect of income increases or decreases as the respondent becomes wealthier.

We then include additional right-hand variables describing the respondent's background. The new equation includes an explanatory variable for the respondent's cross-sectional standardized PVT score (ϕ). The PVT test used during the Add Health study tests the respondent's verbal and reasoning skills and is highly correlated with IQ (Urdy, 2003). In addition, we include dummy variables for the respondent's race, using Caucasian respondents as the reference group since this is the biggest portion of our data. The resulting equation is as follows:

$$(2) \qquad Y = \alpha_0 + \alpha_1 I + \alpha_2 I^2 + \alpha_3 \phi + [\alpha_4 AA + \alpha_5 NA + \alpha_6 ASIAN] + \varepsilon$$

where AA, NA, and ASIAN are dummy variables for African American/Black, Native American/American Indian, and Asian/Pacific Islander respondents, respectively.

Next our regression includes religiosity as an explanatory variable. Previous research strongly suggests religiosity as a predictor of teen sexual behavior that is independent of income (Manlove, et. all, 2006). We use the number of religious services attended by the respondent in the past year as a measure of religiosity and assign dummy variables for the various levels. Those who never attended services are used as the reference group, and dummy variables REL1 through REL6 are assigned for the other groups, with REL1 being those who attended services a few times in the past year and REL6 those who went more than once a week. For regressions run on the pooled data from both sexes, we also include a dummy variable for boys, using girls as the reference group. The dependent variable is explained by:

$$(3)\ Y = \alpha_0 + \alpha_1 I + \alpha_2 I^2 + \alpha_3 \phi + [\alpha_4 AA + \alpha_5 NA + \alpha_6 ASIAN] + \{\alpha_7 REL1 + \alpha_8 REL2 + \alpha_9 REL3 + \alpha_{10} REL4 + \alpha_{11} REL5 + \alpha_{12} REL6\} + \alpha_{13} BOY + \varepsilon$$

Finally, the regression includes the interaction between income and PVT score as an explanatory variable, as previous research and economic theory has suggested that children with higher income and better academic performance have more to lose. The resulting equation is as follows:

$$(4)\ Y = \alpha_0 + \alpha_1 I + \alpha_2 I^2 + \alpha_3 \phi + [\alpha_4 AA + \alpha_5 NA + \alpha_6 ASIAN] + \{\alpha_7 REL1 + \alpha_8 REL2 + \alpha_9 REL3 + \alpha_{10} REL4 + \alpha_{11} REL5 + \alpha_{12} REL6\} + \alpha_{13} BOY + \alpha_{14} I^* \phi + \varepsilon$$

where we include a final coefficient (α_{14}) to explain the relationship between risky sexual behavior and the interaction of income and PVT score. In summary, our probit regressions testing the effect of household income on HPV, HIV, Chlamydia, birth control use, number of partners, and age at first intercourse are described by Equation (4) and will be specified as follows: the dependent variable is a function of income (I) and income squared, as well as other personal characteristics such as PVT score (ϕ), sex (when the data includes both male and female respondents), dummy variables for both race and religiosity, the interaction of income and PVT score, and an error term (ε). The vector of coefficients on income will show whether family income influences STD rates and risky sexual practices. Given the evidence that increased income increases health and education outcomes in adolescents, we hypothesize that higher income will decrease teen risky sexual behavior. We also predict that this effect of income will decrease with higher household income and increase with higher PVT scores. Our regressions will jointly test the null hypothesis that $\alpha 1=0$, $\alpha_2= 0$, and $\alpha_{14}=0$ as well as the hypothesis that $\alpha_3= 0$ and $\alpha_{14}=0$.

For the regressions describing the dependent variables related to the diagnosis of an STD, we use a subset of the data that only includes respondents who had been tested for the STD in question within the past twelve months. For example, the regression analyzing HPV only includes data of respondents who answered yes to the following question: Have you been tested for HPV in the past twelve months? By excluding respondents who answered no to this question, we eliminate responses to the diagnosis question that are guaranteed to be negative but are not necessarily accurate.

In addition, after running each regression on our complete data set, we also run each regression separately for male and female respondents in order to isolate the coefficients for the explanatory variables by gender. This allows use to compare discrepancies between the effect of each variable on male versus female behavior. Clearly for these regressions we do not use include a dummy variable for sex.

V. Analysis and Results

As expected, our results vary greatly among the different dependent variables and between the gender-specific regressions. For HIV/AIDS, the small number of observations greatly limits our analysis. Even though the sample size is over 4,800, only a handful of respondents had been diagnosed with HIV/AIDS in the last 12 months. This is partly due to a weakness in the Add Health survey, since many respondents could have been diagnosed with the disease earlier than 12 months prior to the date they were questioned. It can also be attributed to the relatively rare occurrence of HIV/AIDS in the United States. For the gender-specific regressions, the number of observations is even smaller, since the data has the two constraints set by the respondent's gender as well as whether or not they had been tested for HIV/AIDS in the past year. Because there are so few positive observations, there is not enough variance to do any analysis. Six of the explanatory variables perfectly predict the outcome of the dependent variable. In order to show any significant correlation between our explanatory variables and a diagnosis of HIV/AIDS, we would need a much larger data set or access to more thorough information about the respondents' medical history.

While the regressions for HPV are slightly more successful, they still do not have enough positive observations to draw any conclusions or to show any significant coefficients. The variables that show absolutely no variance are the dummy variables for the two highest levels of religiosity and the dummy variables for Asian and Native American races. The coefficients for the rest of the explanatory variables are insignificant for the male, female, and the pooled data sets.

Unlike the other variables for STD diagnoses, the results for Chlamydia do show variance and some significance for the explanatory variables (*See Table 3*). The only right-hand variable with no variance is the dummy for Native Americans. For both the pooled data and girls-only data, there is a significant, positive correlation between the dummy variable for African Americans and the dependent variable. This suggests that female African Americans are more likely to have been diagnosed with Chlamydia in the past 12 months than the reference group of Caucasian females. For the pooled data, the coefficient for PVT score also shows a slight significance, however when the gender-specific results are examined, it becomes evident that this can be attributed to the male data. For the boys-only sample, the coefficients for income, income squared, and the interaction variable are significant on the 10% level, while the coefficient for PVT score is significant at the 5% level. Though the income, income squared, and interaction coefficients are very small, PVT score shows a correlation of -.178, suggesting that male respondents with higher PVT scores are less likely to have been diagnosed with Chlamydia. For the girls-only data, the only explanatory variable with a significant effect is the African American dummy variable, which has an extremely high level of significance at 1%.

Table 3. The Effect of Household Income on Diagnosis of Chlamydia

	Pooled Data	Girls	Boys
	(1)	(2)	(3)
Estimated constant	1.449	.619	14.599**
	(1.330)	(1.405)	(7.013)
Income	-.00003	-.00002	-.0002*
	(.00002)	(.00003)	(.0001)
Income squared	$-1.00e^{-10}$	$-7.23e^{-11}$	$-7.28e^{-10}$*
	$(9.16e^{-11})$	$(1.07e^{-10})$	$(4.09e^{-10})$
PVT score	-.028*	-.018	-.178**
	(.015)	(.015)	(.080)
Interaction of income*PVT score	$3.58e^{-7}$	$2.22e^{-7}$	$2.81e^{-6}$*
	$(2.76e^{-7})$	$(2.95e^{-7})$	$(1.46e^{-6})$
Male	.139	– – –	– – –
	(.231)		
Race			
African American	.854***	.964***	.181
	(.228)	(.285)	(.494)
Native American	– – –	– – –	– – –
Asian	.125	.282	– – –
	(.585)	(.622)	
Religiosity			
Few times	.139	-.128	.416
	(.231)	(.364)	(.505)
Several times	-.615	-.840	.331
	(.417)	(.494)	(1.078)
Once a month	.212	.033	1.110
	(.414)	(.559)	(.811)
2-3 times a month	-.238	-.172	-.789
	(.375)	(.437)	(.857)
Once a week	-.244	-.224	– – –
	(.358)	(.415)	
More than once a week	-.509	-.336	– – –
	(.613)	(.699)	
R^2	0.131	0.153	0.210
Number of Observations	259	193	57
χ^2 (I, I^2, interaction = 0)	1.70 (42.7%)	0.59 (74.6%)	3.84 (14.7%)
χ^2 (PVT score, interaction = 0)	4.01 (13.5%)	1.54 (46.4%)	5.36 (6.9%)*

*For all results tables, significance is denoted as *=10%, **=5%, and ***=1%; ( )=standard error.*

The regressions for number of partners show more significant results. Income, income squared, and the interaction variable show no significant correlation, however many of the dummy variables for race and religiosity do (*See Table 4*). For both the pooled data and the boys-only data, there is a highly significant, positive relationship between being African American and having a risky number of sexual partners. The dummy variable for Asian respondents, on the other hand, shows a significant, negative correlation, suggesting that male respondents classified as Asian are less likely than the

reference group to have sexual relationships with a risky number of partners. The dummy variables for race show no significance in the girls-only data, however higher levels of religiosity do. Girls who attended religious services once a month, 2-3 times a month, once a week, and more than once a week, are significantly less likely to have a risky number of sexual partners. The same negative correlation exists for both the pooled data and the boys-only data, but it is at a lower level of significance.

Table 4. The Effect of Income on Number of Sexual Partners

	Pooled Data	Girls	Boys
	(1)	(2)	(3)
Estimated constant	-1.073**	-1.059*	-.907
	(.441)	(.621)	(.656)
Income	$7.47e^{-6}$	$2.96e^{-6}$	.00001
	($6.65e^{-6}$)	($8.82e^{-6}$)	(.00001)
Income squared	$-5.06e^{-12}$	$-7.88e^{-12}$	$7.72e^{-12}$
	($4.33e^{-12}$)	($5.27e^{-12}$)	($1.33e^{-11}$)
PVT score	.005	.007	.005
	(.004)	(.006)	(.007)
Interaction of income*PVT score	$-4.99e^{-8}$	$4.73e^{-9}$	$-1.12e^{-7}$
	($6.43e^{-8}$)	($8.49e^{-8}$)	($1.04e^{-7}$)
Male	.132	– – –	– – –
	(.077)		
Race			
African American	.268***	.143	.433***
	(.091)	(.129)	(.132)
Native American	-.086	-.942	.476
	(.256)	(.532)	(.335)
Asian	-.506**	-.246	-.812**
	(.209)	(.291)	(.319)
Religiosity			
Few times	-.125	-.157	-.136
	(.102)	(.164)	(.133)
Several times	-.207	-.329	-.247
	(.127)	(.183)	(.186)
Once a month	-.385*	-.716***	-.129
	(.169)	(.266)	(.226)
2-3 times a month	-.168	-.532**	.214
	(.138)	(.207)	(.195)
Once a week	-.526**	-.640***	-.425*
	(.136)	(.192)	(.203)
More than once a week	-.417*	-.741**	-.160
	(.221)	(.331)	(.307)
R^2	0.027	0.044	0.040
Number of Observations	1245	608	637
χ^2 (I, I^2, interaction = 0)	3.23 (19.9%)	2.67 (26.3%)	1.15 (56.3%)
χ^2 (PVT score, interaction = 0)	1.66 (43.6%)	2.55 (28.0%)	1.16 (55.9%)

The dummy variables for race and religiosity also demonstrate significant correlation with the respondent's age at first intercourse (*See Table 5 below*). For all three subsets of data, the coefficients for African Americans are positive and significant, while the coefficients for Asians are negative and significant. Both race dummy variables are more significant for the boys-only data than the girls-only data, showing significance at the 1% level for male respondents.

Table 5. The Effect of Income on Age at First Intercourse

	Pooled Data	Girls	Boys
	(1)	(2)	(3)
Estimated constant	.879**	1.236**	.448
	(.422)	(.557)	.673
Income	$2.07e^{-6}$	$-3.01e^{-6}$	$6.54e^{-6}$
	($6.42e^{-6}$)	($8.00e^{-6}$)	(.00001)
Income squared	$1.31e^{-12}$	$8.25e^{-13}$	$2.34e^{-11}$
	($3.91e^{-12}$)	($4.60e^{-12}$)	($1.58e^{-11}$)
PVT score	-.006	-.010*	-.002
	(.004)	(.005)	(.007)
Interaction of income*PVT score	$-2.26e^{-8}$	$2.55e^{-8}$	$-1.02e^{-7}$
	($6.25e^{-8}$)	($7.76e^{-8}$)	($1.09e^{-7}$)
Male	-.058	– – –	– – –
	(.074)		
Race			
African American	.257***	.103	.459***
	(.088)	(.121)	(.131)
Native American	-.091	-.665*	.518
	(.235)	(.351)	(.349)
Asian	-.308*	.206	-.782***
	(.174)	(.260)	(.260)
Religiosity			
Few times	-.137	.015	-.242*
	(.100)	(.161)	(.130)
Several times	.285**	-.227	-.431**
	(.123)	(.177)	(.179)
Once a month	-.261	-.335	-.129
	(.157)	(.233)	(.219)
2-3 times a month	-.174	-.252	-.019
	(.135)	(.193)	(.197)
Once a week	-.493***	-.467***	-.468**
	(.125)	(.178)	(.188)
More than once a week	-.619***	-.606**	-.691**
	(.201)	(.284)	(.299)
R^2	0.025	0.026	0.055
Number of Observations	1258	610	648
χ^2 (I, I^2, interaction = 0)	0.15 (92.8%)	0.16 (92.1%)	2.00 (36.8%)
χ^2 (PVT score, interaction = 0)	7.59 (2.3%)**	4.87 (8.7%)*	4.36 (11.3%)

Religiosity again shows a negative correlation with risky behavior; however this time it shows significance across all three test groups. The dummy variables for attending religious services once a week and more than once a week show significance levels of 5% or greater for the pooled, girls-only, and boys-only data. The negative coefficient increases in absolute value from approximately -.475 to -.630 between the dummy variables REL5 and REL6, suggesting that the more frequently a respondent attended religious services in the past 12 months, the less likely he or she is to have intercourse at a risky age.

The results of the regression testing the effect of income on birth control usage are perhaps the most interesting (*See Table 6*). This time, both race and religiosity play a very small role in explaining the dependent variable. The only significant coefficients are that of the dummy variable for the highest level of religiosity for the girls-only data and the dummy variables for Native Americans and Asians. Each of these coefficients is only significant at the 10% level.

For the pooled data, the interaction variable shows significant explanation of the variable, and the significance becomes much more pronounced in the regressions that are isolated by gender. Though no other explanatory variables show significance for the boys-only data, the girls-only regression results are highly significant for both income and the interaction variable. The negative coefficient for income suggests that the wealthier the respondent, the less likely she is to partake in risky practices. In other words, higher-income teens are more likely to have used birth control at their most recent intercourse. The positive coefficient for the interaction variable explains that this effect increases even more as the respondent's PVT score increases.

Table 6. The Effect of Household Income on Birth Control Usage

	Pooled Data	Girls	Boys
	(1)	(2)	(3)
Estimated constant	-.063	-.253	.091
	(.478)	(.666)	(.749)
Income	-.00001	-.00003**	$-2.93e^{-6}$
	($7.76e^{-6}$)	(.00001)	(.00001)
Income squared	$-3.43e^{-12}$	$1.44e^{-12}$	$-2.07e^{-11}$
	($6.88e^{-12}$)	($8.16e^{-12}$)	($1.79e^{-11}$)
PVT score	-.005	-.002	-.008
	(.005)	(.007)	(.008)
Interaction of income*PVT score	$1.34e^{-7}$*	$2.91e^{-7}$**	$4.13e^{-9}$
	($7.56e^{-8}$)	($1.18e^{-7}$)	($1.20e^{-7}$)
Male	.055	– – –	– – –
	(.081)		
Race			
African American	.144	.107	.207
	(.094)	(.133)	(.135)
Native American	.292	.598*	-.128
	(.245)	(.354)	(.369)
Asian	.330*	.305	.443*
	(.183)	(.276)	(.250)
Religiosity			
Few times	.076	.075	.105
	(.112)	(.180)	(.143)
Several times	.119	.070	.257
	(.133)	(.197)	(.188)
Once a month	.170	.395	-.062
	(.171)	(.255)	(.240)
2-3 times a month	.017	-.055	.093
	(.147)	(.217)	(.206)
Once a week	.086	.075	.097
	(.136)	(.195)	(.203)
More than once a week	.316	.586*	.066
	(.223)	(.333)	(.313)
R^2	0.030	0.062	0.022
Number of Observations	1133	553	580
χ^2 (I, I^2, interaction = 0)	3.40 (18.3%)	8.10 (1.7%)**	0.91 (63.4%)
χ^2 (PVT score, interaction = 0)	18.96 (.01%)***	18.01 (.01%)***	3.43 (18.0%)

For the girls-only regressions, significance tests reject the joint null hypothesis for household income, income squared, and the interaction variable as well as for the joint null hypothesis for PVT score and interaction. The latter is also rejected for the pooled data set at a high level of significance.

VII. Conclusion and Further Research

Our results show that two of the most significant predictors of risky sexual behavior are race and religiosity. African Americans respondents are significantly more likely to have been diagnosed with Chlamydia, have a risky number of partners, and have their first intercourse at an early age. Asian and Pacific Islanders instead are less likely to participate in these behaviors. Religiosity is also a main determinant of the number of partners and age at first intercourse of the respondents. Those who frequently attended religious services have fewer sexual partners and intercourse at an older age. This correlation is particularly significant for girls in determining their number of sexual partners. For each of these dependent variables, there is no significant correlation between household income and risky behavior as we had predicted.

One of our most interesting results is the effect of income on birth control usage among females. We find a significant, negative correlation between income and unprotected intercourse. In addition, the positive relationship between the interaction variable and birth control use suggests that this effect increases if the respond has higher test scores. Our findings seem very logical, since birth control is the dependent variable that is most closely tied to expenditures and would be directly affected by income. We also speculate that the differential between the sexes can be explained by the fact that most contraceptives used and purchased by females are more expensive than those purchased by males.

These results have particularly relevant policy implications, as a current concern of women's organizations is the recent increase in the price of contraceptive pills. This price increase is an unintended effect of a 2005 deficit-reduction bill, and could have

especially consequential effects for lower-income women and students (Associated Press, 2007). Drug companies now have to pay more in order to provide discounts for contraceptives to colleges and Medicaid recipients, something they are expectedly hesitant to do (Davey, 2007). Oral contraceptives are well-known to have a high success rate in terms of pregnancy prevention, and they are also one of the most common forms of contraceptives used by women. If their increased cost is financially prohibitive for lower-income women, then a higher number of unintended pregnancies could prevent these women from gaining education and entering the labor market in order to improve their financial situation, thus exacerbating the income gap in the United States. It is in the government's and the country's best interest to ensure that contraceptive pills are readily available to women of all incomes, including teenagers, who are generally in a vital stage of education when they become sexually active.

Future research could further explore this correlation between income and contraceptive use. We advise adding the respondent's number of siblings as an explanatory variable for risky behaviors. Multiple studies have posited that investment in a child is negatively related to the number of siblings they have (Delgado, 2006). In other words there is generally a trade-off between quantity and quality of offspring since families have a limited amount of resources. We feel it would be useful and illuminating to use sibship size as another measure of child investment in addition to household income.

We also would potentially like to extend our study to explore the effects of Catholic schooling on risky sexual behavior. Private Catholic schooling not only insinuates certain levels of both income and religiosity, but it has a unique social dynamic

that could potentially affect its students' behavior. While past research has been done on the effect of Catholic schooling on risky teen behavior in general, none have delved as deep into risky teen sexual behavior as we would like to.

For our specific research question, we would also like to expand our set of explanatory variables. Due to time constraints we were limited to using the public-use version of the Add Health data set and were confined to abbreviated data. One such example is the question of the respondent's race being limited to four possible responses that did not include racial identities such as Hispanic.

Our conclusions support our hypothesis that household income has an effect on some risky sexual behaviors, specifically the nonuse of birth control. Further research examining specific types of birth control and additional explanatory variables could specify the full extent and nature of this correlation. Access to birth control is necessary for a teen's sexual health, and subsequent well-being, but our results suggest that this access is unevenly distributed among teens from different levels of socioeconomic status.

VII. Appendix

Table 7. Previous Research and Investigations into the Effect of Income on Teen Outcomes and Determinants of Risky Teen Behavior

Author	*Year*	*Description of Data and Methods*	*Findings and Conclusions*
Brewster	1994	• Used individual-level data from Cycle III of the National Survey of Family Growth (NSFG-III) as well as census tracts of neighborhoods in which respondents live derived from an aggregate-level database designed to be merged with the individual-level records. • Employed multilevel data to examine the association between the race difference in the risk of experiencing nonmarital first intercourse during adolescence and several theoretically relevant aspects of the neighborhood environment.	• Neighborhood SES and the labor market experiences of neighborhood women are particularly important determinants of the market race difference in coital risk. • Risk of first intercourse also increases with a lower socioeconomic background, living in a nonintact family, and having no formal religious affiliation. • Each $1,000 increase in median family income reduces the risk of experiencing first intercourse during adolescence by about 1.2 percent.
Figlio and Ludwig	2000	• Used the National Education Longitudinal Study of 1988 (NELS), which surveyed a nationally representative sample of eight-grade students in 1988, 1990 and 1992. • Employed an instrumental-variables strategy exploiting variation across metropolitan areas in costs that parents face in transporting their children to private schools, to examine the effect of private schooling on adolescent non-market behaviors.	• Found that religious private schooling seems to produce substantial reductions in teen sexual activity, arrests, and the use of hard drugs (specifically cocaine). • No consistent evidence that private school affects teen drinking, marijuana use, gang involvement, or smoking. • Findings suggest "negative selection," in which the parents of high-risk teens are more likely to send their children to religious private schools.
Upchurch, Mason, Kusunoki, and Kriechbaum	2004	• Used data from Wave 1 (1995) of the National Longitudinal Study of Adolescent Health (ADD Health) to estimate school, neighborhood, family, and individual effects on acquiring an STD. • Used data from Waves 1 and 2 (1996) of Add Health to estimate effects of prior STD acquisition and other factors on STD occurrence between waves.	• Seven percent of sexually experienced teenagers reported ever having had an STD as of Wave 1, affected by respondents' age, gender, race or ethnicity, and their family background, neighborhood and school characteristics. • Nearly 7% reported an STD between Waves 1 and 2; females, blacks, those with low levels of mother's education and those with a prior STD at higher risk.
Case and Lubotsky	2002	• Used data from the National Health Interview Surveys, the Panel Study of Income Dynamics, and the National Health and Nutrition Examination Survey. • Studied whether the well-known positive association between health and income in adulthood has antecedents in childhood.	• Found that children's health is positively related to household income, and the relationship becomes more pronounced as children grow older. • A large component of the relationship between income and children's health can be explained by the arrival and impact of chronic health conditions in childhood.
Currie and Stable	2001	• Used data from the National Longitudinal Survey of Children and Youth (NLSCY), a Canadian national longitudinal data set surveying children ages 0-11 and their families beginning in 1994. • Studied whether the well-known relationship between SES	• Showed that the gradient estimated in the cross section is similar to that estimated previously using U.S. children. • Both high and low-SES children recover from past health shocks to about the same degree. • The relationship between SES and health grows stronger

		status and health that grows more pronounced with age is because (1) low-SES children are less able to respond to a given health shock or (2) low SES children experience more shocks.	over time mainly because low-SES children receive more negative health stocks. • Health shocks affect math and reading test scores and future health in very similar ways.
Luster and Small	1994	• Used a sample of 2,567 adolescents who attended schools in four counties in the upper Midwest, including only adolescents living with at least one parent. • Studied what characteristics of teens and their families distinguish sexual risk takers (i.e., those who have multiple partners and do not use contraception consistently) from teens who engage in more responsible sexual behavior.	• Factors associated with sexual risk taking among females included low GPA, frequent alcohol consumption, low levels of parental monitoring, and a lack of communication about birth control with mothers. • Factors among males included low GPA, frequent alcohol consumption, suicidal ideations, low levels of parental support, and a history of sexual abuse.
Mocan and Tekin	2002	• Used data from Wave I of the Add Health study, a nationally representative survey of adolescents in grades 7 through 12. • Studied the impact of Catholic school attendance on the likelihood that teenagers use or sell drugs, commit property crime, have sex, join gangs, attempt suicide, and run away from home.	• Employed propensity score matching methods to control for the endogeneity of school choice. • Found that Catholic school attendance reduces the female adolescent's tendency to use cocaine and have sex, but increases the propensity for the male adolescent to use and sell drugs.
Manlove, Terry-Humen, Ikramullah, Moore	2006	• Used the National Longitudinal Survey of Youth (NLSY97) to test the association between and family religiosity and the transition to first sexual experience and contraceptive use at first sex during the teen years. • Used multivariate event history models to assess the association between parent and family religiosity and the timing of adolescent sexual experience, and examine contraceptive use outcomes using logistic regressions.	• Frequent parental religious attendance is associated with delayed first sex among all sub-populations except black adolescents. • Engaging in family religious activities on a daily basis is associated with delayed sexual initiation among male, female, and white teens. • Only strong parental religious beliefs and more frequent participation in family religious activities are associated with *less* contraceptive use at first sex among males.
Grossman and Markowitz	2002	• Used data from the 1991, 1993, 1995, 1997, and 1999 National School-Based Youth Risk Behavior Surveys, which contain nationally representative samples of high school students in grades 9-12. • Used two-stage least squares and reduced form models to examine the relationship between substance use and sexual behaviors by gender.	• Alcohol use does not increase the likelihood of having sex or having multiple partners. • Alcohol does lower the probability of using birth control and condoms among sexually active teens.
Markowitz, Kaestner, and Grossman	2005	• Used individual-level data from the first three waves of the National Longitudinal Survey of Youth, 1997 cohort (NLSY97) and the biennial Youth Risk Behavior Surveys (YRBS). • Investigated the causal role of alcohol in determining sexual activity and risky sexual behavior among teenagers.	• Alcohol use appears to have no causal influence in determining whether or not a teenage has sex. • Alcohol use may lower contraception use among sexually active teens.

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