
Behavioral risk reduction and health intervention for adolescents

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The study estimates the cost effectiveness of a school-based, health-education intervention to promote pregnancy prevention. Application of the PRECEDE-PROCEED model demonstrates a significance difference between the treatment and control groups in attitudes toward adolescent pregnancy avoidance and sexual abstinence. The results confirm the effectiveness of the school-based health intervention, even among adolescents who were already sexually active. Periodic monitoring of the program seems warranted, however, to monitor program effects and enhance operating efficiency.

Since the Federal government's first involvement in teenage pregnancy prevention, the United States has confronted many challenges in reducing risky adolescent sexual behaviors, including unintended pregnancies. For at least a generation, however, since the Ronald Reagan administration, abstinence education programs have been a centerpiece of national adolescent health policy in the U.S. With teenage pregnancy rates rising recently after a decade of decline, and adolescents continuing to show high rates for the most common Sexually Transmitted Diseases (STDs) (Gavin et al., 2009; Hamilton & Ventura, 2012), risky sexual behaviors among adolescents have emerged once again as a major public health concern --- one that is associated with social and economic disadvantages in both the short- and long-run (Burt, 1990; Hawkins, Catalano, Kosterman, Abbott, & Hill, 1999; Hoffman, 2006, Reynolds et al., 2007).

The literature documents that risky sexual behavior of adolescents often impose burdens of poor health outcomes (i.e., premature birth, intrauterine growth retardation, low-birth-weight babies, and prenatal complications), socio-economic costs (i.e., childbearing, single motherhood, impeded school

achievement, low education attainment, poor-earning potential, and future low-economic status), and medical costs, including the detection and treatment of sexually transmitted diseases (Ayoola, Brewer, & Nettleman, 2006; Centers for Disease Control and Prevention (CDC), 2012; Hoffman, 2006; Muender, Moore, Chen, & Sevick, 2000). Risky sexual behaviors among adolescents continue to be a public health priority (Chen, Yamada, & Walker, 2011; Kirby et al., 2004; Lieberman, Gray, Wier, Fiorentino, & Maloney, 2000; Philliber & Nolte 2008; Sabia, 2006; Sasaki & Kameoka, 2009). However, there remains a considerable reservoir of mixed evidence from empirical studies about the extent to which health intervention programs are effective, and which overall design (including whether abstinence only or abstinence plus) best affects adolescent risk behavior.

This study begins by focusing on a single, complex behavioral intervention and the evaluation of its effectiveness in adolescents. Second, this research sheds light on the program effectiveness within the theoretical foundation of the PRECEDE-PROCEED model (PP model) which is related to the behavioral effects in Phase 8 and outcomes in Phase 9 of Figure 1. In this way, this study serves to

guide the evaluation of risky sexual behaviors and the assessment of school-based health intervention, with the intention of providing empirical evidence to guide public policy.

Method

Study Design and Data Collection

The Family Life Abstinence Program (FLAP) is sponsored by the Adolescent and Family Comprehensive Services of New York. The project targets 800 students in 6th and 7th grades. The FLAP contains two primary components: one is a 2-year abstinence only education program based on the "Sex Can Wait Curriculum". This program offers 24 weekly classes, which last 45 to 60 minutes. Participating schools in the Bronx, New York were randomly assigned to the treatment and control groups.

The project employs a quasi-experimental treatment-control group evaluation design with random assignment of schools to treatment and control groups. Approximately 700 students are in the intervention and 500 students are in the control group. A common instrument is administered to students at the baseline, in addition to follow-ups at 6 months, 12 months and 24 months. A semi-structured instrument completed at the end of each

class period by health educators delivering the curriculum is used to capture classroom implementation of the curriculum. All data collection was completed by May 2010 and the follow-up data have been processed in the language which the adolescents selected (English or Spanish). The survey was administered only by trained research assistants, in order to ensure acceptable responses.

Empirical framework for model and measurement

The PP model is a widely used model that has guided the design of programs in various settings (for example, Gary et al., 2003; Wright, McGorry, Harris, Jorm, & Pennell, 2006). The model has also been incorporated into national policy documents for community health and applications in assisting school health curriculum planners, administrators, parents, teachers, and advocates for creating behavioral health interventions (Green & Kreuter, 2005). This study applies intra-personal and interpersonal determinants to the PP Model.

The classroom-based health-education curriculum designed to promote adolescent pregnancy prevention, risky sexual behavior avoidance, and sexual abstinence will be

examined with regard to the changes in predisposing factors, enabling factors, and reinforcing factors by controlling for socio-demographic factors before and after the health-education curriculum interventions, as shown in Phase 6 of Figure 1.

The conceptual model for a cost-effectiveness analysis is an application from the framework of the PP model. The model of this empirical study embodies adolescent pregnancy prevention, risky sexual behavior avoidance, and sexual abstinence among adolescents, and will be examined with predisposing, enabling and reinforcing factors. We show a conceptual framework of the health-education intervention program that is associated with adolescent health behavioral changes in Figure 1.

The basic structural model for this empirical analysis is:

$$AHB_i = \beta_0 + \beta_1APR_i + \beta_2AEN_i + \beta_3ARE_i + \beta_4ASD_i + e \dots \dots \dots (1)$$

Equation 1 represents the relationship between the health behavioral changes of adolescent “i,” and an adolescent with health-education intervention in Phases 3 and 4, as seen in Figure 1. Predisposing (APR), enabling (AEN), reinforcing (ARE), and sexual activity and socio-demographic (ASD) factors will influence an adolescent sexual risk behavior (AHB).

“e” is an unobserved error, generally assumed to satisfy $E(e | APR, AEN, ARE, ASD) = 0$. Similarly, risky sexual behaviors are incorporated in the PP model to observe decision-making health behavior and influential determinants.

Results

Descriptive statistics

Table 1 reports basic descriptive statistics on the outcome variables for the intervention and comparison groups at the baseline and first follow-up. The table suggests that in terms of risky sexual behavior, more than 50% of adolescent students responded negatively to sexual risk. About 50% of both intervention and comparison adolescents answered that they control pregnancy avoidance and sexual abstinence. However, there are no clear-cut differences between adolescents in the comparison and intervention groups regarding attitudinal change in the risky sexual behavior, pregnancy avoidance, and sexual abstinence.

Table 1 shows the distribution of the study participants at the baseline and follow-up. The difference in attrition rates in the intervention versus comparison group can be attributed in part to the enrollment at the schools. Some of the comparison schools had populations of students in K-6 only.

Therefore, as students moved to 7th grade and beyond, students either went to other public schools within the district, private schools within the district or left the district entirely. We were only able to track those students who remained in the public schools within the Bronx school district. The programs were conducted in 6th and 7th grades. Approximately 1200 baseline students for both intervention and control adolescents. The Bronx sample was 7% White, 58% Hispanic, 33% African American, and 2% were identified as “other.”

Pregnancy avoidance and sexual abstinence

Table 2 displays the Poisson regression results for the effect of school-based health education on pregnancy avoidance and sexual abstinence among 6th and 7th grade adolescents. The adolescent sexual behaviors before and after intervention are analyzed in the following categories: one measures pregnancy avoidance and another measures sexual abstinence. The results illustrate the different influences of the school-based health-education curriculum on behaviors of adolescents in Phase 8 of Figure 1.

For the behavioral outcome related to pregnancy avoidance (i.e., “How likely is it that you will use birth control or

pregnancy protection when you have sex?”) and sexual abstinence (i.e., “No sex is the only sure way to not get pregnant. It is the only way to avoid sexual disease.”), the school-based health education program has a significantly positive influence on behavioral changes. The positive coefficient (i.e., 0.435) of “How likely is it that you will use birth control or pregnancy protection when you have sex?” shows that, among the intervention group, there is a higher probability of birth control or pregnancy prevention behavior than among the control group. The incidence-rate ratio in the next column shows the different influences of the school-based health education curriculum on pregnancy avoidance (i.e., incidence rate 1.544) and sexual abstinence (i.e., incidence rate 1.073) among adolescents in Phase 8 of Figure 1. The effect of the health education intervention on the use of pregnancy protection by adolescent students is 1.544 times higher (or 54.4%) with each unit increase in the health-education intervention program. Moreover, as shown in Table 2, the incidence rate for those who are currently engaging in sexual activity (i.e., variable name: current sexual activity) and have received health education

intervention is 3.033 times higher than those who do not receive health education intervention. This indicates that the health education intervention would increase pregnancy avoidance by 203.3% (i.e., 3.033-1). Thus, the school-based health education programs are effective for who sexually active adolescents in the intervention group.

For the behavioral outcome related to sexual abstinence (i.e., “No sex is the only sure way to not get pregnant. It is also the only way to avoid sexual disease.”), the coefficient is positive (i.e., 0.071). This shows the effects of health education intervention on sexual abstinence among adolescents. The incidence rate in the next column of the Poisson regression result implies that the expected number of abstinent adolescents within the intervention group is 7.3% (i.e., 1.073-1) higher than within the control group, with each unit increase in the health-education intervention program. The behavioral change by the intervention group is larger than the control group. However, adolescents who are active sexually now or in the past in the intervention group are not statistically significant from sexually active adolescents in the comparison group.

The incidence-rate ratios of the

“importance of not having sex until marriage” item related to pregnancy avoidance and sexual abstinence in Table 2 are both positive and significant. The attitude is 9.7% (i.e., 1.097-1) higher among the health education intervention group for pregnancy avoidance than for the control group while sexual abstinence declined by 3.3% (i.e., 0.967-1) for the health education intervention group than for the control group. The effects of health education intervention on these two behavioral outcomes are different and depend on the perceptions regarding sex and marriage.

Conclusions and Implications

This research focuses on the cost-effectiveness of a behavioral health intervention to promote abstaining from sexual activities and pregnancy avoidance among 6th and 7th graders in an urban middle school. The results from using the PP model clearly show that there is a significant difference between the control group and the group provided with school-based health-education. For the school-based behavioral health intervention, the differences are a 54.4% increase in pregnancy avoidance. The results support the effectiveness of early behavioral interventions for adolescent pregnancy (Key, Gebregziabher, Marsh,

& O'Rourke, 2008) and abstinence (Aten, Siegel, Enanharo, & Auinger, 2002).

This study supports contributing to school-based behavioral interventions in order to prevent adolescents from engaging in sexual activities or becoming pregnant (Santelli, Lindberg, Finer, & Singh, 2007; Thomas & Dimitrov, 2007). An application of the PP model to analyze community and public health policy is important. School-based health intervention for abstaining from sexual activities and pregnancy prevention still needs to be carefully evaluated from a cost effective point of view. There are

two limitation of this study. First, there are always concerns about the validity of self-report data by adolescent 6th and 7th graders. Second, we could not ask sexual-related behavioral questions which are related to useful policy oriented variables (i.e. pregnancy, STD infection, abortion, etc.) due to school regulations. In spite of these limitations, this cost effective study of an early behavioral health intervention has important implications for school-based health intervention curriculums for reducing sexual activity and enhancing pregnancy prevention of adolescents.

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Table 1

Descriptive statistics for three dependent variables used in this study (i.e., pregnancy avoidance and sexual abstinence).

	Comparison Groups		Intervention Group	
	Baseline n=492 (%)	Follow-up n=21 (%)	Baseline n=626 (%)	Follow-up n=165 (%)
Pregnancy Avoidance				
How likely is it that you will use birth control or pregnancy protection when you have sex?				
Not at all likely	92 (18.9)	2 (10.0)	129 (20.6)	24 (17.4)
Not very likely	26 (5.3)	0 (.0)	30 (4.8)	7 (5.1)
Somewhat likely	66 (13.5)	3 (15.0)	64 (10.2)	23 (16.7)
Probably likely	76 (15.6)	5 (25.0)	91 (14.6)	17 (12.3)
Definitely likely	228 (46.7)	10 (50.0)	311 (49.8)	67 (48.6)
Sexual Abstinence				
No sex is the only sure way to not get pregnant. It is also the only sure way to avoid health problem like disease.				
Disagree a lot	115 (23.5)	1 (5.0)	109 (17.4)	24 (16.6)
Disagree a little	77 (15.7)	2 (10.0)	82 (13.1)	18 (12.4)
Agree a little	90 (18.4)	6 (30.0)	124 (19.8)	34 (23.4)
Agree a lot	207 (42.3)	11 (55.0)	311 (49.7)	69 (47.6)

Table 2

Poisson regression results for the effect of school-based health education on **pregnancy avoidance** and **sexual abstinence** among 6th and 7th grade adolescents.

Variables	Coefficient (p value) [95% C.I.]	Incidence rate (p value) [95% C.I.]
Dependent variable: Pregnancy avoidance and STD prevention (“How likely is it that you will use birth control or pregnancy protection when you have sex?”)		
Intervention group [effect: relative to the control group]	0.435 (0.001) [0.184; 0.684]	1.544 (0.001) [1.202; 1.983]
Sexual activity ever	-0.013 (0.938) [-0.354; 0.328]	0.986 (0.938) [0.701; 1.388]
Current sexual activity	1.110 (0.000) [0.797; 1.422]	3.033 (0.000) [2.219; 4.145]
Importance of not having sex until marriage	0.092; (0.038) [0.005; 0.180]	1.097 (0.038) [1.005; 1.197]

Samples: 98

LR χ^2 (27): 248.89

Probability χ^2 : 0.000

Pseudo R^2 :0.329

Log likelihood: -253.78

Dependent variable: Sexual abstinence (“No sex is the only sure way to not get pregnant. It is also the only way to avoid sexual disease.”)

Intervention group [effect: relative to the control group]	0.071 (0.041) [0.002; 0.139]	1.073 (0.041) [1.002; 1.149]
Sexual activity ever	0.094 (0.202) [-0.050; 0.238]	1.098 (0.202) [0.9503; 1.269]
Current sexual activity	0.073 (0.409) [-0.100; 0.247]	1.076 (0.409) [0.904; 1.280]
Importance of not having sex until marriage	0.033; (0.031) [-0.063; 0.003]	0.967 (0.031) [0.938; 0.996]

Samples: 1208

LR χ^2 (28): 92.18

Probability χ^2 : 0.000

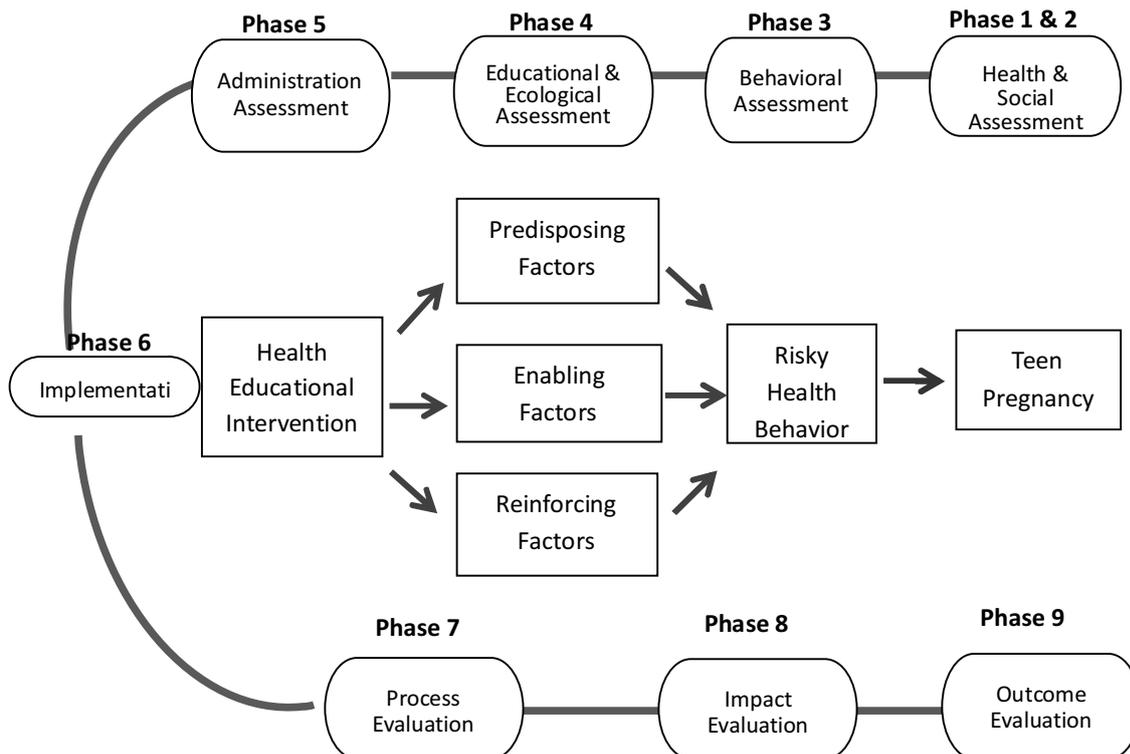
Pseudo R^2 :0.022

Log likelihood: -2018.18

Note:

Each Poisson regression is adjusted for predisposing, enabling, reinforcing factors, and socio-demographic factors. The full set of regression result is available from the authors.

Figure 1 Application of the Precede-Proceed Model to Abstinence and Refraining from Risky Sexual Behavior among Adolescents



Source:

Green, L.W., and M.W. Kreuter. 2005. *Health Program Planning: An Educational and Ecological Approach* (4th ed.). New York: McGraw-Hill.