



Published in final edited form as:

Acad Pediatr. 2017 August ; 17(6): 649–655. doi:10.1016/j.acap.2017.02.002.

Chronic Physical Health Conditions and Emotional Problems from Early Adolescence through Mid-adolescence

LaRita C. Jones, PhD¹, Sylvie Mrug, PhD¹, Marc N. Elliott, PhD², Sara L. Toomey, MD,MPhil,MPH,MSc^{3,5}, Susan Tortolero, PhD⁴, and Mark A. Schuster, MD,PhD^{3,5}

¹Department of Psychology, University of Alabama at Birmingham, Birmingham, AL

²RAND Corporation, Santa Monica, CA

³Division of General Pediatrics, Boston Children's Hospital, Boston, MA

⁴University of Texas Health Science Center, Houston, TX

⁵Harvard Medical School, Boston, MA

Abstract

Background/Objectives—Chronic physical health conditions are highly prevalent in youth, frequently persisting into adulthood and contributing to the current and future healthcare burden in the United States. Our study evaluates associations of chronic physical health conditions with depressive and physiological anxiety symptoms in a community sample of youth, and examines how those associations change from early to mid-adolescence.

Methods—In this longitudinal study of 5,147 youth, students and their caregivers were interviewed when youth were in grades 5 (M age = 11), 7 (M age = 13), and 10 (M age = 16). Caregivers reported family sociodemographics, youth race/ethnicity, and youth chronic physical health history at baseline. Youth reported their depressive symptoms at each time point and their physiological anxiety symptoms at grades 7 and 10.

Corresponding Author Information: LaRita Jones, PhD, SOM-Orthopedic Surgery, University of Mississippi Medical Center, 2500 North State Street, Jackson, MS 39216; ljones9@umc.edu; (601) 815-1046.

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Conflicts of Interest: none

Contributors' Statement:

Dr. Jones conceptualized the study, conducted all data analyses, drafted the initial manuscript, revised the manuscript, and approved the final manuscript as submitted.

Dr. Mrug conceptualized the study, supervised data analysis and drafting of the manuscript, revised the manuscript, and approved the final manuscript as submitted.

Dr. Elliott designed the overall study, developed the sampling design and weights, critically reviewed the manuscript, and approved the final manuscript as submitted.

Dr. Tortolero designed and oversaw the overall study, critically reviewed and approved the final manuscript as submitted.

Dr. Toomey helped design the 10th grade survey, critically reviewed and revised the manuscript and approved the final manuscript as submitted.

Dr. Schuster designed and oversaw the overall study, critically reviewed and revised the manuscript, and approved the final manuscript as submitted.

Results—At age 11, 28.5% had experienced a chronic physical health condition. Having any chronic physical health condition was related to elevated depressive symptoms at age 11 (2.05 ± 0.05 vs. 1.89 ± 0.03 ; mean \pm standard error; $p < .01$) and anxiety symptoms at age 16 (2.72 ± 0.06 vs. 2.55 ± 0.04 ; $p < .05$). Experiencing multiple conditions was also related to experiencing more depressive symptoms ($b = 0.13$; $p < .01$) and physiological anxiety symptoms ($b = 0.13$; $p < .05$). After adjusting for previous mental health symptoms, having any condition still predicted anxiety at age 16.

Conclusions—Children with chronic physical health conditions have an increased risk of depressive symptoms and physiological anxiety symptoms, especially in early and mid-adolescence. Repeated screening for these symptoms may help identify children in need of interventions.

Keywords

chronic physical health conditions; depressive symptoms; physiological anxiety symptoms; adolescent development

INTRODUCTION

The prevalence of pediatric chronic physical health conditions is increasing in the U.S.¹. Approximately 25% of American youth experience a chronic health issue, most commonly respiratory allergies and asthma, before reaching early adulthood.^{1–4} Experiencing chronic physical health conditions increases risk for mental health problems,⁵ with depression and anxiety disorders being two-three times more prevalent compared to healthy youth^{6,7} due to multiple factors.⁸ Mental health symptoms may be further exacerbated in those who experience multiple health conditions – an estimated 1 in 15 youth.⁹

A common limitation of studies examining mental health in youth with chronic illness is the use of small clinical samples, rendering results less generalizable to youth with less severe conditions or limited healthcare access.¹⁰ Using a community-based sample would provide information about the general population of youth. Another limitation of extant literature is the lack of attention to developmental differences in mental health. Both depressive and anxiety symptoms typically emerge or escalate in early adolescence, around age 13, particularly among girls.¹⁰ However, many studies on mental health in youth with chronic physical health conditions group together children and adolescents, without addressing possible developmental differences. Additionally, few studies have employed longitudinal designs that would examine depression and anxiety symptoms among youth with chronic conditions over time. Fewer still have examined these issues in youth with multiple conditions.

The present study uses a prospective longitudinal design to examine depression and physiological anxiety symptoms in a community sample of children with versus without chronic physical health conditions as they transition from early to mid-adolescence. We evaluate the associations of chronic physical health conditions and the number of conditions experienced in early adolescence with developing mental health symptoms, and we examine how those associations change over time. Because the prevalence rates of chronic physical

health conditions, depression, and anxiety vary across race,¹¹ gender,¹² and socioeconomic status (SES),¹² we adjust for these potential demographic confounders.

METHODS

Study Design and Participants

This study utilized data from Waves 1 to 3 (average ages 11, 13, and 16) of Healthy Passages, a longitudinal study of health-risk behaviors in adolescence¹³ conducted by University of Alabama at Birmingham; University of California, Los Angeles/RAND; and University of Texas, Houston. Institutional human subjects review boards at each location approved the study. At Wave 1, the study sampled fifth-graders in regular classrooms in public schools with fifth-grade enrollments of 25 students within the Birmingham, Houston, and Los Angeles metropolitan areas. Schools and students were selected using a two-stage probability sampling procedure. Inclusion criteria included ability to understand the interview questions and provide answers. Stratified sampling was used to achieve similar numbers of non-Hispanic Black, Hispanic, and non-Hispanic White participants. Design and nonresponse weights were constructed so that weighted results represent the population of fifth-graders in the public schools in each area.

Of the 11,532 eligible fifth-graders, 58% of primary caregivers gave permission to be contacted. Of those, 77% of parent-child dyads completed baseline (Wave 1) interviews (N=5,147; 2,607 females). At the 2-year follow-up (Wave 2), 4,773 dyads completed interviews (93% retention); and at the 5-year follow-up (Wave 3), 4,521 completed interviews (88% retention from baseline). Written informed parental consent and youth assent were obtained at each wave. Racial/ethnic composition of the sample was 31% non-Hispanic Black, 41% Hispanic, and 25% non-Hispanic White. Due to their small numbers, youth who identified as Asian, Pacific Islander, Native American, or multiracial were grouped together ('Other'), and constituted 3% of the sample. Birmingham contributed 31% of participants, Houston 35%, and Los Angeles 34%. Median family income was \$30,000–\$34,999/year and median parental education was 'some college' or 'a two-year degree.' At each wave, parents and youth completed individual interviews in separate private rooms with trained interviewers using a computer-assisted personal interview (CAPI) and audio-computer assisted self-interviewing (A-CASI) for sensitive topics. Both English and Spanish versions were available, with 24% of caregivers and 8% of youth participants responding partially or entirely in Spanish. There were few missing data which were imputed using a single Markov Chain Monte Carlo imputation via SAS PROC MI.

Measures

Chronic physical health conditions—Although there is no uniform definition of pediatric chronic physical health conditions, most definitions focus on recurrence, duration, and/or physical consequences of the condition.¹⁴ Following recommendations to use a more inclusive definition when examining health issues occurring in the general population,² we defined pediatric chronic physical health conditions as physical health issues that were likely to last 3 months; had occurred 3 times; and/or were likely to have long-term physiological

consequences by early adolescence. These criteria were used to select conditions which were included in the assessment instrument.

Physical health assessment items came from the National Health Interview Survey.¹⁵ At Wave 1 caregivers were asked if a doctor or health professional had ever told them that their child had any of the following conditions: allergies including hay fever, respiratory allergy, and/or any kind of food or digestive allergy; arthritis; asthma, wheezing, or respiratory airway disease; congenital heart disease; diabetes; frequent or repeated diarrhea or colitis; frequent and severe headaches/migraines; muscular dystrophy; seizures or epilepsy; or sickle cell anemia. Caregivers were also able to specify any other serious health conditions that were not listed. Youth were then categorized as having ‘Any’ vs. ‘No’ condition, and the number of different chronic physical health conditions was also computed. Because very few youth (0.01%) had more than 3 different conditions this variable was coded as 0, 1, 2, or 3 conditions. Parent-proxy reports of youth physical health have shown good reliability and validity.¹⁶

Depressive symptoms—At each wave, depressive symptoms were assessed via youth self-report on 6 items from the 7-item Major Depressive Disorder (MDD) subscale from the DISC Predictive Scales (DPS). The DPS is a screening tool derived from the DISC that identifies youth with subclinical mental health problems. The MDD items assessed depressive symptoms, including decreased interest/pleasure in activities; decreased energy levels; feelings of worthlessness; suicidal ideation; fatigue; and trouble thinking clearly/concentrating. One MDD question assessing previous suicide attempts was not used due to concerns from the institutions’ boards for protection of human subjects. In this study, items on the scale were rated Yes (1) or No (0) and summed (α ’s ranged from .62 to .68). The full MDD subscale scores have good reliability and validity.¹⁷

Physiological Anxiety Symptoms—At Waves 2 and 3, youth reported their anxiety symptoms on the 10-item Physiological Anxiety subscale from the Revised Children’s Manifest Anxiety Scale, which assesses somatic manifestations of anxiety such as sleep difficulties, nausea, and fatigue in youth ages 6–19.¹⁸ This subscale was used because of its presumed relevance to physical health. The items were rated True (1) or False (0) and summed (α =.61 and .66).

Demographics—Child gender and race/ethnicity were assessed via caregiver-report at each wave. To assess household SES, caregivers were asked to indicate household income (ranging from <\$5,000 to >\$250,000 annually) and the highest level of education attained in the household (ranging from ‘8th grade or less’ to ‘more than a four-year college degree’). Due to high stability of SES indicators over time (r ’s > .80), SES from Wave 1 was used.

Statistical Analyses

All analyses were performed with SAS version 9.3. The prevalence of chronic physical health conditions in the sampled population was estimated, followed by examination of racial/ethnic and gender differences in the conditions and mental health symptoms using chi-square tests and general linear models. The associations between presence of conditions and

depressive or physiological anxiety symptoms were evaluated with general linear models adjusting for demographics. Additional general linear models evaluated the effects of multiple conditions as a continuous predictor ranging from 0 to 3. These main analyses were then repeated with additional adjustment for depressive or anxiety symptoms at the previous wave to evaluate associations with changes in symptoms over time. Standardized effect sizes were computed as Cohen's *d* (standardized difference between adjusted means for those with any vs. no condition). All analyses accounted for the complex sampling design (clustering, stratification, and weight adjusting for sampling, nonresponse, and differential attrition over time) using SAS survey procedures.¹⁹

The most commonly reported condition was allergies (27.0%), but due to unknown and often low severity, this condition was excluded from primary analyses; all models were then rerun with allergies included.

RESULTS

The prevalence of ever having 'any' chronic physical health condition (excluding allergies) was 28.5%, with asthma being the most common (18.2%). Almost 4% of youth experienced multiple conditions, with 0.7% experiencing 3 conditions. Using the cutoff of 5 depressive symptoms,²⁰ between 6.5% and 8.2% screened positive for possible major depression across all waves. Although no clinical cutoff has been developed for the measure of anxiety, 8.7% and 7.4% of the adolescents endorsed 6 of the 10 items at ages 13 and 16. Racial/ethnic and gender differences emerged in the prevalence of both chronic physical health conditions and depressive and physiological anxiety symptoms (Table 1). Specifically, experiencing any condition was most common in non-Hispanic Black youth (32.8%) and least common in Hispanic youth (24.7%). Additionally, non-Hispanic White youth had lower levels of depressive symptoms at ages 11 and 13, and anxiety symptoms at age 13 than racial/ethnic minorities. 'Other' racial/ethnic minority youth had the highest level of depressive symptoms at age 13. Males experienced more health conditions (34.0% vs. 25.6%; $p<.001$) and more depressive symptoms than females at age 11 ($p=.02$), but females had more depressive symptoms and more anxiety symptoms than males at ages 13 and 16 ($p<.001$) (Table 1).

Table 2 depicts associations between presence of a chronic physical health condition and depressive and physiological anxiety symptoms, without and with adjustment for mental health at the previous wave (when available). All models also adjusted for demographic covariates. When not adjusting for previous symptoms, youth with any condition experienced elevated depressive symptoms at age 11 (2.05 ± 0.05 , $p<.01$ vs. 1.89 ± 0.03 ; $d = .06$; mean \pm standard error) and elevated anxiety at age 16 (2.74 ± 0.07 , $p<.05$ vs. 2.55 ± 0.04 ; $d = .08$). The association of experiencing any condition with anxiety at age 16 remained significant when adjusting for anxiety at age 13 (2.72 ± 0.06 , $p<.05$ vs. 2.55 ± 0.04), suggesting higher levels of physiological anxiety among youth with chronic physical health conditions. Experiencing multiple conditions was associated with more depressive symptoms at age 11 (0.13 ± 0.04 ; slope \pm standard error) and more anxiety symptoms at ages 13 (0.14 ± 0.06) and 16 (0.13 ± 0.05), but not with an increase in symptoms from one wave to the next (all reported differences $p<.05$) (Table 3).

When youth with allergies were included among those with chronic physical health conditions, all results remained identical, with the exception of number of conditions predicting greater increase in physiological anxiety symptoms at age 16 after adjusting for anxiety at age 13 ($p < .05$).

DISCUSSION

This multi-site, community-based study examined the associations of pediatric chronic physical health conditions with depressive and physiological anxiety symptoms from early to mid-adolescence (when these symptoms typically increase), and how those associations change over time. Having a chronic physical health condition was related to elevated depressive symptoms in early adolescence and elevated physiological anxiety symptoms in mid-adolescence.

Hispanic youth were least likely to experience any condition, which contrasts with previous reports of poorer health and more clinic visits/hospitalizations (particularly for asthma and allergies)²¹ in Hispanic vs. non-Hispanic White youth. This suggests that Hispanic youth may be less at-risk of experiencing chronic physical illness, but may experience more severe or less well-managed conditions. The higher prevalence of mental health symptoms for racial/ethnic minorities in pre- and early adolescence is in line with prior findings¹¹ and may reflect earlier pubertal timing in minority youth²² or place-based racial/ethnic differences.²³ Additionally, findings of higher prevalence of depressive symptoms in males in early adolescence and greater escalation of symptoms from early to mid-adolescence in females are consistent with prior research.¹⁰

The overall effect sizes of the associations of depressive and physiological anxiety symptoms with presence of any health condition were small, ranging from $d = .03$ to $.08$, consistent with other studies.²⁴ However, significantly elevated symptoms in youth with chronic physical health conditions were specific to early adolescence for depression and mid-adolescence for anxiety. These developmental changes in links between health conditions and mental health symptoms indicate that youth with physical health conditions may benefit from regular screenings for depressive and anxiety symptoms as they transition through adolescence. This may be especially true for those who experience multiple chronic physical health conditions, as these youth experienced more mental health symptoms at multiple time points. The fewest differences were observed in early adolescence, perhaps due to substantial variability in pubertal development occurring at this time and its effects on depressive and anxiety symptoms.²⁵

Although most effect sizes in this study were small, even subclinical symptoms of depression and anxiety in adolescence are associated with negative long-term outcomes, including mood disorders, substance abuse/dependence, psychosocial difficulties, and suicidal behaviors.²⁶ Healthcare providers and policymakers should be aware of the increase in mental health symptoms in many youth as they transition through adolescence, particularly those with chronic physical health conditions.

When considering interventions and preventive measures, it is important to consider factors that may underlie the associations between chronic physical illness and mental health.⁸ Evidence-based interventions for depressive and anxiety symptoms include cognitive-behavioral strategies, such as cognitive restructuring and problem-solving.²⁷ These interventions have had long-lasting effects whether delivered in-person, via the internet, or by combination of the two, offering more options to families.²⁸ Some studies suggest that youth with comorbid health conditions and mental health problems may benefit from general cognitive behavioral interventions, while others suggest that interventions should be tailored to the child's specific characteristics such as age and health condition.²⁹ Most studies on the efficacy of cognitive-behavioral therapy for depression and anxiety employed physically healthy samples, leaving questions about its efficacy for youth with chronic physical illness.³⁰ Future research should examine the effects of general cognitive-behavioral therapy in youth with chronic physical health conditions.

It is important to note that the definition of a 'pediatric chronic physical health condition' varies across studies, limiting comparability of results.² In this study, health conditions were measured via caregiver-report, and we assessed whether the youth had ever had a physical health condition, rather than current condition status or its severity. Additionally, although we assessed the number of chronic physical health conditions experienced (an important factor in burden of disease), the current study did not directly assess burden of disease. Utilization of medical records may give a more accurate depiction of condition prevalence, duration, severity, and burden of disease; however, their use may also be confounded by access to healthcare. Although mental health problems may also contribute to chronic physical illness,³¹ reciprocal relationships between chronic physical health conditions and mental health could not be evaluated in this study because health conditions were only assessed at Wave 1. Assessing physical health only at Wave 1 also limited the ability to study the roles of onset or remission of conditions. Although many of the conditions assessed in this study persist into adulthood, their severity often varies over time,³²⁻³⁵ further underscoring the importance of assessing severity in future studies. Despite these limitations, the findings still revealed important associations over time. Future research should assess both physical health and mental health at multiple time points. Results from the current study may not generalize to other geographic locations. Measures of depressive and anxiety symptoms had relatively low internal consistency. Future studies should utilize instruments with stronger psychometric properties, and should employ shorter intervals between assessments to avoid recall bias. The current associations were only examined into mid-adolescence; future examinations should follow individuals into late-adolescence or adulthood. Finally, the correlational design does not permit causal inferences.

CONCLUSIONS

Current findings show that children with any chronic physical health condition experience more depressive symptoms in early adolescence and physiological anxiety symptoms in mid-adolescence compared to healthy youth; and experiencing multiple conditions further increases these risks at multiple time points.

These results indicate the importance of screening youth with chronic physical health conditions for depressive and anxiety symptoms across development, particularly in early and mid-adolescence, as even subclinical levels of depressive symptoms are associated with long-term impairment and may warrant treatment.²⁶ Current recommendations from the U.S. Preventive Services Task Force already include screening for MDD in adolescents ages 12–18, which includes youth with chronic health conditions. These tools should also be sensitive to the unique circumstances of youth with special healthcare needs, who according to the Health Resources & Services Administration, comprise an estimated 15% of American youth. However, there are currently no recommendations to screen youth for anxiety symptoms. Results from the current study suggest that screening for and addressing anxiety in chronically physically ill youth may be beneficial. Healthcare providers and researchers working with youth with chronic physical health conditions should be aware of elevated depressive and physiological anxiety symptoms in this population and their implications for long-term outcomes.²⁶ Early and repeated screenings for these types of mental health problems may lead to more timely diagnoses and treatments of depression and anxiety in chronically physically ill youth, e.g. with in-person, internet-based, or combined cognitive-behavioral interventions.²⁸ Future work should examine whether mental health problems interfere with disease self-management in youth and address the effectiveness of cognitive-behavioral therapy in this population, as well as the need for tailored interventions to specific health conditions. Future studies should also assess both physical and mental health at multiple time points to clarify the nature of their associations. Finally, findings from this study support the need for integrative healthcare models that include mental healthcare providers and address both physical and behavioral health of youth, and continued research on such integrative models of care.

Acknowledgments

This work was funded by administrative supplement to grant MH098348 from the National Institutes of Mental Health; and by cooperative agreements (CCU409679, CCU609653, CCU915773, U48DP000046, U48DP000057, U48DP000056, U19DP002663, U19DP002664, and U19DP002665) with the Centers for Disease Control and Prevention.

Financial Disclosure Statement: The authors have indicated that they have no financial relationships relevant to this article to disclose.

Funding Source: Completed under administrative supplement as a component of the Healthy Passages project, grant MH098348 from the National Institutes of Mental Health; additional support by cooperative agreements (CCU409679, CCU609653, CCU915773, U48DP000046, U48DP000057, U48DP000056, U19DP002663, U19DP002664, and U19DP002665) with the Centers for Disease Control and Prevention.

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What's New

Youth who experience chronic physical health conditions are at increased risk of developing depressive symptoms and physiological anxiety symptoms. Specifically, these individuals are at-risk of elevated depressive symptoms in early adolescence and elevated physiological anxiety symptoms in mid-adolescence.

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Table 1

Racial/Ethnic and Gender Differences in Chronic Health Conditions at Baseline and Mental Health over Time

	Race/Ethnicity						Gender			
	Non-Hispanic White (1,256)	Hispanic (1,813)	Non-Hispanic Black (1,755)	Other (323)	Male (2,536)	Female (2,610)	Specific Differences	p value	Specific Differences	
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)				
Any Chronic Health Condition	349 (27.8%)	448 (24.7%)	575 (32.8%)	97 (30.0%)	801 (34.0%)	668 (25.6%)	NHB>NHW >HIS OTH>HIS	p < 0.0001	p < 0.0001	M>F
Number of Conditions	M, SD	M, SD	M, SD	M, SD	M, SD	M, SD				
	0.37, 0.01	0.28, 0.01	0.38, 0.02	0.44, 0.05	0.38, 0.02	0.29, 0.01	NHW, NHB, OTH>HIS	p < 0.0001	p < 0.0001	M>F
Mental Health Symptoms	M, SD	M, SD	M, SD	M, SD	M, SD	M, SD				
Depression, Age 11	1.81, 0.05	1.98, 0.04	2.01, 0.05	1.99, 0.13	2.01, 0.03	1.89, 0.04	HIS, NHB > NHW	p = 0.01	p = 0.02	M>F
Depression, Age 13	1.54, 0.08	1.70, 0.04	1.71, 0.05	2.01, 0.11	1.59, 0.03	1.77, 0.04	OTH>HIS, NHB>NHW	p = 0.001	p < 0.001	F>M
Depression, Age 16	2.10, 0.06	2.07, 0.05	2.04, 0.05	2.34, 0.13	1.84, 0.04	2.33, 0.04		p = 0.13	p < 0.0001	F>M
Anxiety, Age 13	1.97, 0.06	2.56, 0.06	2.5, 0.06	2.42, 0.15	2.23, 0.05	2.58, 0.05	HIS, NHB, OTH>NHW	p < 0.0001	p < 0.0001	F>M
Anxiety, Age 16	2.64, 0.07	2.61, 0.06	2.54, 0.05	2.54, 0.14	2.19, 0.04	3.02, 0.05		p = 0.65	p < 0.0001	F>M

Table 2
Associations between Physical Health at Baseline and Mental Health Symptoms over Time

	Depression Age 11	Depression Age 13	Depression Age 16	Anxiety Age 13	Anxiety Age 16
	M (SE)	M (SE)	M (SE)	M (SE)	M (SE)
Without adjustment for previous mental health symptoms					
No Condition (Reference group)	1.89 (0.03)	1.67 (0.04)	2.08 (0.04)	2.37 (0.05)	2.55 (0.04)
Any Condition	2.05 (0.05)**	1.74 (0.06)	2.14 (0.05)	2.49 (0.07)	2.74 (0.07)*
With adjustment for mental health symptoms at previous wave					
No Condition (Reference group)	–	1.67 (0.04)	2.08 (0.04)	–	2.55 (0.04)
Any Condition	–	1.70 (0.05)	2.13 (0.05)	–	2.72 (0.06)*

Note: All models were adjusted for youth race/ethnicity, youth gender, household income, household education, stratification by site, clustering by school, and design and nonresponse weights.

* p<.05,

** p<.01,

*** p<.001

Associations between Number of Physical Health Conditions at Baseline and Mental Health Symptoms over Time

Table 3

	Depression Age 11	Depression Age 13	Depression Age 16	Anxiety Age 13	Anxiety Age 16
	b (SE)	b (SE)	b (SE)	b (SE)	b (SE)
Without adjustment for previous mental health symptoms					
Number of Conditions	0.13 (0.04)**	0.09 (0.05)	0.08 (0.05)	0.14 (0.06)*	0.13 (0.05)*
With adjustment for mental health symptoms at previous wave					
Number of Conditions	-	0.05 (0.04)	0.06 (0.04)	-	0.09 (0.05)

Note: All models were adjusted for youth race/ethnicity, youth gender, household income, household education, stratification by site, clustering by school, and design and nonresponse weights.

* p<.05,

**

p<.01,

p<.001