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**Original Research**

# The relationship of multiple, simultaneously occurring health risk behaviors to academic performance of high school students

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**Key words:** Academic performance; adolescents; cigarette smoking; depressed mood; marijuana use; perceived overweight; sexual behavior; survey; teen dating violence; physical activity; video game playing.

**Abstract**

Objective: This study aimed to identify health risk behaviors contributing to academic performance while controlling for other factors and investigated the relationship between academic performance and multiple simultaneously occurring predictors among public high school students in Rhode Island.

Methods: The Youth Risk Behavior Survey (YRBS) is conducted in a representative sample of public school students in grades 9-12 using a two-stage cluster sample design. In the springs of 2007, 2009, and 2011 a total of 9,384 adolescents participated in Rhode Island's statewide YRBS. The data were analyzed with multinomial logistic regression.

Results: Students who had been in a physical fight (past 12 months), were ever hit/slapped by a boyfriend/girlfriend, felt sad/hopeless for 2+ weeks (past 12 months), were current smokers (past 30 days), were current marijuana users (past 30 days), ever had sexual intercourse, perceived themselves as overweight, had insufficient physical activity (less than 60 minutes per day, 5 days per week), or played video games 3+ hours per school day were more likely to self-report obtaining low grades than students without these risk behaviors. Poor academic achievers are more prevalent among students of both sexes who participate in high-risk behaviors even after adjusting for other confounding effects.

Conclusions: Poor academic achievement in school may be a good indicator of students who are at risk of engaging in unhealthy or dangerous behaviors and in need of support or intervention. Conversely, prevention strategies aimed at risk behaviors may enhance student academic achievement.



## INTRODUCTION

Teachers, parents, and students have become increasingly concerned with improving academic achievement [1, 2]. There are many factors that are associated with academic performance. Previous investigations have demonstrated that poor student academic performance is related to: gender, minority status, and low socioeconomic status (SES)[3]; depression, cigarette smoking, alcohol drinking, and marijuana use[2, 4, 5]; insufficient sleep, poor sleep quality, and late bed and rise times[6, 7]; quality of diet[8]; and overweight[9]. However, much of prior research has been limited, focusing on the association of certain risk factors with academic performance [10-13]. The Youth Risk Behavior Survey (YRBS) provided the opportunity to evaluate numerous demographic characteristics and health risk behaviors [14] and outcome simultaneously. This study focused on a broader range of demographic/health risk behaviors associated with academic achievement. In addition to those risk behaviors already mentioned above, this study also included physical fighting, dating violence, sexual intercourse, and playing video games. In addition, because the Rhode Island YRBS is the

state-wide population-based survey, this study is not limited to specific populations, as are some prior studies [12, 13, 15, 16].

Many demographic characteristics or risk factors are highly correlated and cannot be understood independently from other demographics or risk factors. When focusing on one factor related with academic performance, the authors have controlled for all other factors to see the relationship. In addition, prior studies tend to dichotomize academic performance, categorizing students as high performing and low performing. In this study, four categories for academic performance are used. Studies suggest that self-reported grades are highly reliable and adequate enough for research use [1, 17]. This enabled the authors to examine the relationship between performance levels and frequency of engaging in one or more health risk behaviors among Rhode Island public high school students. When splitting into four categories, trends can be seen across ordered groups of academic performance, and the trend is more persuasive.

The goal here is to identify health risk behaviors contributing to academic performance while controlling for other factors and to investigate the relationship between academic performance and multiple simultaneously occurring predictors among public high school students in Rhode Island.

## METHODS

### Subjects

The Centers for Disease Control and Prevention (CDC) developed the YRBS to monitor adolescent behaviors that contribute to morbidity, injury, social problems, and premature mortality among the nation's youth and adults [14]. The YRBS is a standardized, biennial survey that collects self-reported information covering six categories of priority health risk behaviors among youth [14]. In Rhode Island, the survey also includes a question about grades. The YRBS is an anonymous and voluntary survey among random samples of students in over 60 states and municipalities [18]. Studies have shown YRBS data are reliable for analyzing high school students' health risk behaviors [1, 19, 20]. Rhode Island has participated in the high school YRBS since 1995.

The Rhode Island YRBS uses a two-stage cluster sample design, in which a sample of schools is selected first with probability proportional to enrollment size and then second with a sample of classes randomly selected within those schools. All students in selected classes are eligible to participate in the survey. These weighted, self-reported results are representative of 9$^{th}$ to 12$^{th}$ grade public high school students statewide and can be used to make important inferences concerning health-risk behaviors [18-20]. A detailed description of the YRBS is available elsewhere [21, 22].

The 2007, 2009, and 2011 Rhode Island high school YRBS data were combined to increase the sample size to 9,384 (2,210 for 2007, 3,213 for 2009, 3,961 for 2011). These three surveys were found to be compatible, when comparing the populations by academic performance, age, sex, grade, race, disability, and gay/lesbian/bisexual/not sure. The overall response rates for the 2007, 2009, and 2011 surveys were 66%, 67%, and 69%, respectively, which was above the threshold of 60% required for CDC to weight estimates. The weighted data were used to make inferences concerning academic performance and health risk behaviors for all Rhode Island public high school students in grades 9-12. The YRBS was reviewed and approved by an institutional review board at the Centers for Disease Control and Prevention, Atlanta, GA. No protocol approval was needed for this study.

### Measures

Students estimated their academic performance by responding to the following question: "During the past 12 months, how would you describe your grades in school?" Respondent choices were "Mostly As", "Mostly Bs", "Mostly Cs", "Mostly Ds", "Mostly Fs", "None of these grades", or "Not sure". The authors grouped responses into four categories: 'Mostly As', 'Mostly Bs", "Mostly Cs", and "Mostly Ds & Fs". We combined Ds and Fs due to low numbers of Fs. "None of these grades" and "Not sure" were treated as missing. This was a state-added question that is not one of the CDC's "core questions".

To identify risk factors to add in the logistic regression model, the first step was based on the significance of crude odd ratios; then the authors used the stepwise logistic regression model to decide which variable to keep and which to be excluded. Ten risk factors were identified as important to retain while the remainder were eliminated. Each variable was determined by the student's response to a single item on the survey.

The following are the definitions of the demographic and risk factors. Because there are very similar percentages across demographics and risk factors between freshmen and sophomores, and between juniors and seniors, grade was regrouped into a dichotomous variable of 9th/10th grade or 11th/12th grade. 'Physical fight' is defined as having been in a physical fight one or more times during the past 12 months. 'Dating violence' is defined as having ever been hit, slapped, or physically hurt on purpose by their boyfriend or girlfriend during the past 12 months. 'Sad

or hopeless feelings' is defined as feeling so sad or hopeless almost every day for two weeks or more in a row that they stopped doing some usual activities during the past 12 months. 'Smoking' is defined as smoking cigarettes on one or more of the past 30 days. 'Marijuana use' is defined as using marijuana one or more times during the past 30 days. 'Sexual intercourse' is defined as ever having had sexual intercourse. 'Perceived overweight' is defined as describing oneself as slightly or very overweight. 'Insufficient physical activity' is defined as not being physically active for a total of at least 60 minutes per day on five or more of the past seven days [22]. 'Playing video games' is defined as playing video or computer games three or more hours per day on an average school day. Detailed YRBS questions are available on the CDC website: (http://www.cdc.gov/HealthyYouth/yrbs/index.htm). These are the risk groups, and the reverses are the low risk groups used as referents.

**Data analysis**

One study showed that female students are the higher academic achievers than male students [1]. Therefore, the authors stratified their analyses by sex (male and female). The final analyses were restricted to students with complete data on the ten predictors, sex, and academic performance. Academic grades (A-F) are ordinal outcomes. The authors chose to use the multinomial logistic regression model.

SAS 9.1[23] was used for all analyses, because the software can account for the YRBS complex sampling design including each individual respondent weight, school cluster, and strata. Using the SAS SURVEYFREQ procedure, the authors calculated percentage estimates and Chi-square statistics to identify significant associations between academic performance and each of the predictors. Using multinomial logistic regression (SAS PROC SURVEYLOGISTIC), which simultaneously controls for confounding effects in the model, the authors calculated adjusted odds ratios (AORs) and 95% confidence intervals (CIs) to assess the strength of relationship between the level of academic performance and each of the other predictors. P values <0.05 were considered statistically significant. Lower risk groups (for instance, not current smoker, and sufficient physical activity) were used as the reference in the multinomial logistic regression model.

## RESULTS

Table 1 presents characteristics of the study population and the proportions of the 4 academic performance categories within each of the demographic and risk categories. Of RI public high school respondents 24% reported "Mostly As", 44% "Mostly Bs", 23% "Mostly Cs", and 8% "Mostly Ds & Fs"; half of respondents were male (50%); 55% were $9^{th}/10^{th}$ graders; 25% had been in a physical fight; 11% had been physically hurt by a girlfriend or boyfriend; 24% reported sad/hopeless feelings; 13% were current cigarette smokers; 25% were current marijuana users; 44% had ever had sex; 28% perceived themselves as overweight; 56% engaged in insufficient physical activity; and 28% played video games.

Table 1 shows that between 10.2% and 18.1% of health risk takers received "Mostly Ds & Fs" compared to between 4.0% and 7.2% of health risk non-takers. Grades of "Mostly As" were less prevalent for males than females, and less prevalent for 9th/10th graders than 11th/12th graders. There is a statistically significant difference when comparing academic performance distribution of four categories in demographics (gender and grade) or risk groups vs. their reference groups. For instance, academic performance of females is significantly better than that of males, with a higher percentage of "Mostly As" (29.4% vs. 18.9%, respectively) and a lower percentage of "Mostly Ds and Fs" (5.9% vs. 10.3%, respectively). Likewise, the academic performance distribution is significantly better for non-smokers than for current smokers (27.0% vs. 8.5% "Mostly As" and 6.3% vs. 18.1% "Mostly Ds and Fs," respectively).

Table 2 presents the relationship between demographic characteristics/risk factors and academic performance. Table 2 displays the adjusted odds ratios (AORs) using "Mostly As" as the reference group. Table 2 clearly indicates a direct correlation between decreasing academic performance and increasing odds of risky behaviors by sex. There are increasing trend relationships between risk factors and increasing academic performance among the male and female students.

For male students, the adjusted odds of younger (9th/10th grade) students reporting "Mostly Ds & Fs" was 3.7 compared with older (11th/12th grade) students. For all high school male students, students having a physical fight were 3.4 times more likely to report Ds & Fs than students without a physical fight. Victims of dating violence were much more likely to have grades of "Mostly Ds & Fs" (AOR=2.4) than students who had not experienced dating violence. Students reporting "sad or hopeless feelings" had significantly increased odds of having C (1.6), or D & F (1.9) grades. The odds of having Ds & Fs were 2.4 for current cigarette smokers and 2.2 for current marijuana users compared to other students. Students who ever had sexual intercourse were also significantly more likely to have Ds & Fs (AOR=5.0) than those who had not. Students with insufficient physical

activity and students who play video games for long periods had significantly increased odds (AOR=2.9 and 1.9 respectively) of having D & F grades compared with students without these risks behaviors. The AORs reported above are all statistically significant.

For female students, similar patterns persisted, except for two risk factors. Unlike males, females did not have statistically significant different grades, based on whether or not they had experienced dating violence. Conversely, only female students who perceived themselves as overweight were significantly more likely to have Ds & Fs (AOR=1.7) than those who had not.

**Table 1**. Percentage of academic performance for selected demographic characteristics and risk factors, Rhode Island public high school students, 2007, 2009, and 2011

| Demographic characteristics & risk factors | n ( weighted %) | Weighted percentage | | | |
|---|---|---|---|---|---|
| | | Mostly As | Mostly Bs | Mostly Cs | Mostly Ds & Fs |
| n(weighted percentage) | 9,384 | 2149(24.08%) | 3809(44.40%) | 2013(23.34%) | 744(8.18%) |
| **Gender** | | **P<0.0001** | | | |
| Male | 4534(50.44%) | 18.89 | 42.91 | 27.87 | 10.34 |
| Female | 4815(49.56%) | 29.40 | 45.93 | 18.80 | 5.87 |
| **Grade** | | **P<0.0001** | | | |
| 9th/10th grade | 5423(54.50%) | 23.00 | 42.27 | 24.29 | 10.45 |
| 11th/12th grade | 3859(45.50%) | 25.47 | 46.91 | 22.23 | 5.39 |
| **Physical fight** | | **P<0.0001** | | | |
| No physical fight past 12 months | 6850(74.98%) | 28.06 | 46.43 | 20.19 | 5.32 |
| Physical fight past 12 months | 2307(25.02%) | 12.17 | 38.70 | 32.76 | 16.37 |
| **Dating violence** | | **P<0.0001** | | | |
| No boyfriend/girlfriend hit on purpose | 8265(88.91%) | 25.17 | 44.81 | 22.78 | 7.24 |
| Boyfriend/girlfriend hit on purpose | 988(11.09%) | 15.48 | 41.87 | 27.00 | 15.65 |
| **Sad or hopeless feelings** | | **P<0.0001** | | | |
| Not feel sad/hopeless past 12 months | 6936(75.59%) | 26.33 | 45.57 | 21.67 | 6.44 |
| Feel sad/hopeless 2 weeks past 12 mos | 2376(24.41%) | 16.90 | 41.30 | 28.49 | 13.31 |
| **Smoking** | | **P<0.0001** | | | |
| Not current cigarette smoker | 7724(86.66%) | 26.96 | 46.10 | 20.66 | 6.28 |
| Current cigarette smoker | 1074(13.34%) | 8.53 | 36.77 | 36.61 | 18.09 |
| **Marijuana use** | | **P<0.0001** | | | |
| Not current marijuana user | 6922(74.73%) | 28.10 | 46.14 | 20.29 | 5.47 |
| Current marijuana user | 2194(25.27%) | 12.67 | 40.41 | 31.32 | 15.60 |
| **Sexual intercourse** | | **P<0.0001** | | | |
| No sexual intercourse | 4792(56.07%) | 31.81 | 46.99 | 17.17 | 4.02 |
| Ever had sexual intercourse | 3541(43.93%) | 15.83 | 42.10 | 29.65 | 12.42 |
| **Perceived weight** | | **P=0.0008** | | | |
| Normal or underweight | 6489(71.59%) | 24.61 | 44.83 | 23.36 | 7.21 |
| Overweight | 2711(28.41%) | 23.13 | 43.85 | 22.85 | 10.17 |
| **Physical activity** | | **P<0.0001** | | | |
| Sufficient physical activity | 3969(44.12%) | 28.57 | 45.54 | 20.45 | 5.43 |
| Insufficient physical activity | 5220(55.88%) | 20.68 | 43.69 | 25.32 | 10.31 |
| **Playing video games** | | **P<0.0001** | | | |
| Not play video 3+ hours school day | 6573(72.46%) | 25.61 | 45.63 | 21.90 | 6.86 |
| Play video 3+ hours per school day | 2637(27.54%) | 20.21 | 41.73 | 26.71 | 11.36 |

[a]: There is statistically significant difference in distribution of academic performance by demographic characteristics and risk factors.

**Table 2**. Adjusted odd ratios of academic performance for demographic characteristics and risk factors, Rhode Island public high school students, 2007, 2009, and 2011[a]

| Demographic characteristics & risk factors | n1/n2[b] | Adjusted Odds Ratio (95% CI) | | | |
|---|---|---|---|---|---|
| | | Mostly As | Mostly Bs | Mostly Cs | Mostly Ds&Fs |
| **Male students** | | 828(18.89%) | 1776(42.91%) | 1150(27.87%) | 447(10.34%) |
| 9th/10th grade vs. 11th/12th grade | 2605/1879 | 1.00(Ref) | 1.05(0.80-1.37) | 1.51(1.14-2.01)** | 3.68(2.47-5.49)*** |
| Physical fight past 12 months vs. No physical fight past 12 months | 1388/3007 | 1.00(Ref) | 1.51(1.12-2.01)** | 2.09(1.53-2.86)*** | 3.44(2.36-5.02)*** |
| Boyfriend/girlfriend hit on purpose vs. No boyfriend/girlfriend hit on purpose | 493/3966 | 1.00(Ref) | 1.36(0.9-2.04) | 1.13(0.72-1.76) | 2.43(1.44-4.08)*** |
| Feel sad/hopeless 2 weeks past 12 mos vs. Not feel sad/hopeless past 12 months | 877/3618 | 1.00(Ref) | 1.22(0.84-1.76) | 1.55(1.03-2.33)* | 1.91(1.29-2.81)** |
| Current cigarette smoker vs. Not current smoker | 560/3621 | 1.00(Ref) | 1.22(0.84-1.77) | 2.28(1.55-3.35)*** | 2.40(1.57-3.68)*** |
| Current marijuana user vs. Not current marijuana user | 1211/3144 | 1.00(Ref) | 1.45(1.06-1.99)* | 1.80(1.34-2.41)*** | 2.24(1.55-3.24)*** |
| Ever had sexual intercourse vs. No sexual intercourse | 1814/2088 | 1.00(Ref) | 1.54(1.21-1.97)*** | 2.98(2.24-3.97)*** | 5.01(3.19-7.86)*** |
| Overweight vs. Normal or underweight | 1065/3361 | 1.00(Ref) | 1.06(0.80-1.42) | 1.07(0.80-1.45) | 1.36(0.92-2.00) |
| Insufficient physical activity vs. Sufficient physical activity | 2117/2303 | 1.00(Ref) | 1.30(1.03-1.64)* | 1.86(1.34-2.59)*** | 2.89(1.88-4.45)*** |
| Play video 3+ hours per school day vs. Not play video 3+ hours school day | 1364/3067 | 1.00(Ref) | 1.10(0.87-1.40) | 1.38(1.03-1.86)* | 1.88(1.30-2.73)*** |
| **Female students** | | 1317(29.40%) | 2022(45.93%) | 858(18.80%) | 290(5.87%) |
| 9th/10th grade vs. 11th/12th grade | 2805/1975 | 1.00(Ref) | 1.19(1.00-1.42) | 1.62(1.28-2.05)*** | 2.75(2.06-3.66)*** |
| Physical fight past 12 months vs. No physical fight past 12 months | 902/3830 | 1.00(Ref) | 1.58(1.25-1.98)*** | 2.28(1.66-3.13)*** | 2.65(1.79-3.90)*** |
| Boyfriend/girlfriend hit on purpose vs. No boyfriend/girlfriend hit on purpose | 486/4280 | 1.00(Ref) | 1.00(0.61-1.63) | 1.12(0.68-1.84) | 1.20(0.63-2.28) |
| Feel sad/hopeless 2 weeks past 12 mos vs. Not feel sad/hopeless past 12 months | 1484/3305 | 1.00(Ref) | 1.33(1.06-1.66)* | 1.86(1.43-2.43)*** | 2.20(1.61-3.02)*** |
| Current cigarette smoker vs. Not current smoker | 509/4084 | 1.00(Ref) | 1.95(1.27-2.98)** | 2.56(1.57-4.19)*** | 2.65(1.20-5.85)* |
| Current marijuana user vs. Not current marijuana user | 976/3758 | 1.00(Ref) | 1.41(1.09-1.82)** | 1.48(1.08-2.03)* | 2.42(1.49-3.95)*** |
| Ever had sexual intercourse vs. No sexual intercourse | 1720/2693 | 1.00(Ref) | 1.49(1.24-1.79)*** | 2.31(1.75-3.05)*** | 3.47(2.11-5.71)*** |
| Overweight vs. Normal or underweight | 1641/3103 | 1.00(Ref) | 1.13(0.95-1.34) | 1.13(0.86-1.49) | 1.73(1.15-2.62)** |
| Insufficient physical activity vs. Sufficient physical activity | 3081/1656 | 1.00(Ref) | 1.51(1.28-1.79)*** | 2.34(1.79-3.07)*** | 3.29(2.22-4.88)*** |
| Play video 3+ hours per school day vs. Not play video 3+ hours school day | 1261/3486 | 1.00(Ref) | 1.06(0.83-1.36) | 1.47(1.11-1.95)** | 1.95(1.31-2.92)** |

[a]: Analyses were adjusted for all other variables in the table, even though the analysis was sex-stratified. Data are reported as adjusted odd ratios (AORs), 95% confidence intervals (CIs) are reported in parentheses.

[b]: n1 denotes the number of risk group, and n2 denotes the number of low risk group.

*: Statistically significant, ***p<0.001; **p<0.01; *p<0.05.

## DISCUSSION

This study assesses the relationship between demographics and health risk behaviors and academic performance among Rhode Island public high school students. In order to focus on one demographic characteristic or risk behavior associated with academic performance, all the other correlated factors need to be adjusted. This study found 10 factors related to self-reported academic performance. Using the stepwise logistic regression model, the authors found 9th/10th grade, physical fighting, date violence victimization, sad/hopeless feelings, smoking, marijuana use, ever had sexual intercourse, perceived overweight, insufficient physical activity, and excessive playing of

video games were associated with self-reported lowered academic performance.

Academic performance is associated with sex[1, 24, 25]. National studies indicate that females have had higher grade point averages than males since the early 1990s [1]. Female students may have different beliefs about the importance of grades, academic motivations, study habits, course-taking patterns, class behavior patterns, future job-related orientation, and extracurricular activities from male students [1, 24, 25]. Therefore the analysis in this study was stratified by sex.

There are many valuable studies that have focused on health risk behaviors related to academic performance. The findings in this study are generally consistent with these studies, although it is unique in that it addresses multiple factors simultaneously. In Orpinas et al[10], the Texas YRBS found that low academic performance was associated with physical fighting. Frojd et al[9, 26-29] showed that adolescent depressed mood has a significant negative impact on school performance. Previous studies [1, 2, 4, 5, 16] found that students who were regular smokers or under the influence of marijuana performed significantly lower on standardized tests relative to their peers. Others studies have found that overweight youth are more likely to have low self-esteem and poor academic performance [9, 30].

In addition, this study found generally similar results to several other studies, which used differently defined risk behaviors than those of the YRBS or different populations. For example, while Loveland et al[11] showed that physical aggression was associated lower academic performance, they used a personality inventory to measure physical aggression. Rivera-Rivera et al[12] found that poor academic performance was highly related to the experience of dating violence in a sample of female students from the state of Morelos in Mexico. This study found this among males but did not among females at a statistically significant level. Aras et al [13] did a survey among Turkish high school students and found that lower academic performance was related to having had sexual intercourse. Lewin [31] in a study of students in grades 3-12 found that heavy media use (at least 16 hours a day) was associated with lower grades.

In Rhode Island public schools, the 11th/12th graders reported being better academic achievers than 9th/10th grades. It is likely that some low performers drop out before or during 11th grade, accounting for some of the improved academic performance in the 11th/12th grades. At the time of these surveys, Rhode Island law required students to attend school until they are 16 years old, and 9th/10th grade students were not yet old enough to drop out.

It is not known whether the correlation between lower reported academic achievement and risk behaviors is causal, and, if so, what the direction the causality is. Many of the risk factors would be expected to have a negative impact on academic performance. For example, students who play video games for 3 or more hours a day would likely spend less time on homework than their peers. Moreover, while not all students who report currently using marijuana are frequent users, there may be some among them using marijuana frequently enough to impact their cognition and learning. Also, experiencing teen dating violence (among males) and extended periods of sadness or hopelessness could likely negatively impact concentration and therefore learning.

It is also possible that lower academic performance results in feelings of stress or lower self-esteem. These students may then engaging in risk behaviors may be a way for these adolescents to try to relieve these feelings. It is also possible that both lower academic performance and higher rates of health risk behaviors are the result of other risk factors. Further study is needed to understand the interrelationships between multiple factors.

This study is subject to several limitations. (1) 2007, 2009, and 2011 Rhode Island YRBS included only public high school students. In general, public school students report higher prevalence rates than private school students for most of the selected health risk behaviors [32]. Thus, the findings may not be comparable to behaviors of students at private schools. (2) Academic performance could be related to many other factors, including intellect, academic motivation, school and classroom environment, socioeconomic status, parent education level, parental support, past achievement, sleep, stress, hostility, personality factors, and interest in school [1, 16, 29]. The YRBS did not include questions to assess the items above. (3) The YRBS survey questions demonstrate good test-retest reliability, but YRBS data are all self-reported by students, and students may purposely under-report stigmatized behaviors or over-report some health behaviors to improve their social status[33]. Under-report behaviors usually are socially undesirable or illegal, e.g., alcohol or drug use, sexual questions, weight, and seat belt non-usage, and over-report behaviors are socially desirable, e.g., amount of exercise or height[33, 34]. (4) Student academic grades can be influenced by a number of factors including potential differences in grading practices between different schools and the choice and availability of more advanced/difficult classes. Those issues will affect the measure of academic performance. (5) The response rates of the three combined Rhode Island

YRBS are about 67%. The authors hope to investigate how the non-responders may have differed from the responders on variables of interest in the future. (6) The combination of YRBS data from 2007, 2009, and 2011 will cause some duplicates. Students who were 9th and 10th grade students in 2007 could be duplicate subjects in the 2009 Rhode Island sample as 11th and 12 grade students. The YRBS is anonymous and therefore eliminating duplicate subjects is not possible. CDC encourages states to improve precision by combining multiple years of YRBS data when analyzing subgroups[35]. Because YRBS is a complex sampling design survey, 2007, 2009, and 2011 were treated as different surveys. This situation is different from asking respondents twice, and therefore this should not be considered a duplication problem.

Despite these limitations, YRBS questions and the state-added self-reported grade question demonstrated highly reliability and validity[1, 17, 19, 20] for evaluating health-related programs, and our findings provide some insight into the association of risk behaviors with lower academic performance in the Rhode Island public high school students. The findings support the conclusions of others that schools, families, and communities need to work together to promote safe and healthy behaviors, prevent initiation of, and provide interventions for, high-risk behaviors among adolescents. We also suggest that students who may participate in risky behaviors be provided additional academic support, along with interventions for those risk behaviors. A double-pronged approach may have more impact on improving student academic performance than approaches that focus only on one or the other in school and community settings.

Social workers or school psychologists can provide tips for parents and teachers to identify early warning signs among adolescents. School counselors or school psychologists can design individual or small-group counseling or other interventions for high-risk students. The school-based behavior education programs can teach adolescents problem-solving and decision-making skills, which will deter their engagement in risk behaviors. Regardless of the prevention or intervention strategies implemented, student progress should be monitored over time to determine if the identified risk behaviors have decreased.

In conclusion, there is an association between poor academic performance and high-risk behaviors. Poor academic achievement in school may be a good indicator of students who are at risk of engaging in unhealthy or dangerous behaviors, and in need of support or intervention. Prevention and intervention strategies aimed at risk behaviors may enhance student academic achievement.

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