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Health Rocks!: An 11-year evaluation

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Cover Page Footnote

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Health Rocks!: An 11-year evaluation

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Abstract. This study examined the program effectiveness of Health Rocks!, a youth substance use prevention program. Merging data from 128,544 youth participants in 21 states between 2009 and 2021, this study compared self-reported levels of knowledge, skills, and internal and external assets before and after the program. Youth reported significant increases in substance use knowledge, stress-coping skills, and assets to make healthy life decisions across eleven years. The magnitude of effects varied by individual characteristics, including gender, school grade level, race, ethnicity, and residence. We provide recommendations for the evaluation of substance use prevention program effectiveness.

INTRODUCTION

Youth substance use remains a serious public health concern in the United States (Centers for Disease Control and Prevention, 2022). Among young people, the most commonly used substances include tobacco, alcohol, and illicit drugs such as marijuana. In a recent national study, two-thirds of youth in grades eighth through 12th reported having tried alcohol, nearly one-third reported having used cigarettes, and almost one-half reported having used marijuana (Johnston et al., 2021). Youth substance use is a severe issue given its adverse impacts on brain development, heart and blood health, and mental health (Gray & Squeglia, 2017). Substance use also poses risks to youth's close and long-term relationships with others (Fairbairn et al., 2018). As such, substance use prevention endeavors are critical in supporting healthy youth outcomes (Tanner-Smith et al., 2018; Tremblay et al., 2020), and the delivery of such programs constitutes an important educational priority for extension across the country (Kumaran et al., 2015). This study reports on an 11-year evaluation of *Health Rocks!*, a substance use prevention program primarily delivered through Extension programs in several states.

HEALTH ROCKS!

Health Rocks! is a 4-H youth substance use prevention program delivered in many sites nationwide. The program is premised on the Positive Youth Development framework

(Lerner et al., 2015) and the 40 Development Assets (Search Institute, 2006), emphasizing strengths among youth and their surrounding environments. The program aims to reduce tobacco, alcohol, and drug use among youth aged 8 to 16 years old by helping them develop better decision-making skills, build upon their behavioral assets, and capitalize upon their social support systems. The curriculum is designed to prepare youth with knowledge, skills, and assets to establish healthy life habits and cultivate their competencies to resist substance use. This 11-year evaluation focuses on the intermediate level of *Health Rocks!*, targeted at youth from ages 10–14. This intermediate curriculum adopts an experiential learning model (Pfeiffer & Jones, 1983), an interactive process of experiencing, sharing, processing, generalizing, and applying. *Health Rocks!* is intended to be delivered for a minimum of 10 hours of participation, though there is substantial flexibility in delivery schedules (e.g., once a week for five weeks versus five hours for two days). *Health Rocks!* has been delivered in a broad range of settings, such as schools, 4-H clubs, homeschools, summer camps, after-school programs, and enrichment activities (National 4-H Council, 2022).

PROGRAM EFFECTIVENESS

Programs that receive funding from the National 4-H Council to deliver *Health Rocks!* have participated in the evaluation since the program's launch in 2010. Several studies have been published regarding the evaluation of *Health Rocks!*, mostly

at the state- or site- level and covering only a specific period of time. Generally, the findings of these studies have shown promising changes in participants' levels of knowledge about the adverse outcomes of substance use and improvements in youth skills to adopt positive stress-coping strategies (e.g., Kumaran et al., 2014; Kumaran et al., 2015; Park & Jang, 2018; Reeves et al., 2017; Self et al., 2013; Xia et al., 2016). Nonetheless, research combining data across all years and sites is lacking.

Although generally positive, several important variations have been found in studies exploring *Health Rocks!*. First, effect sizes have had a broad range, from medium to large in different states of program implementation. Such effect sizes have also varied across areas of change assessed (e.g., knowledge versus skills) and by sites. For instance, the program had a medium effect on youth knowledge of substance use and a small effect on youth skills in managing stress in a Georgia evaluation (Self et al., 2013). In contrast, the program had large effects on these two areas in a Florida evaluation (Kumaran et al., 2014). The lack of direct comparison or combined analysis makes it difficult to ascertain the root of such differences. For instance, the differences might be related to the variation in the measurement and the variation in effect by individual characteristics (e.g., differential effects across genders and settings).

Furthermore, substantial implementation of science research has revealed that participants' characteristics and delivery may affect program outcomes (Kelly & Perkins, 2012). For instance, Dir et al. (2017) reviewed gender differences in risk factors for adolescent binge drinking and concluded that girls tend to be more sensitive to peer pressure. In contrast, boys are more likely to be subject to gender stereotypes of binge drinking. Later empirical research also identified a similar pattern (e.g., Boyd et al., 2018). School grade levels also matter. A review (Gray & Squeglia, 2017) summarizes that a more significant proportion of high school students use substances than those in lower school grades, with over 20% of 12th graders reporting use of alcohol and marijuana each month, as opposed to approximately 5% for eighth graders. Race is also related to youth substance use. In one study, Yoon et al. (2022) showed that White youth were more likely to be affected by peer substance use than their Black peers. A national representative study also indicated a significant decline in participation in substance use prevention programs from 2002 to 2016 among Latinos, those from rural locales, and those whose families were identified as low-income (Salas-Wright et al., 2019). Attention to such individual and demographic differences in the impact of programs and substance use risk is critical in evaluation studies because they may provide helpful guidance to program planners and direct specific efforts towards specific populations. Yet it remains to be examined whether the effectiveness of *Health Rocks!* varies across youth demographic characteristics.

CURRENT STUDY

The current study aimed to examine the effectiveness of *Health Rocks!* since its launch. The study addressed the following research questions: (a) What is the long-term effectiveness of *Health Rocks!* in addressing youth outcomes regarding knowledge, skills, and assets; and (b) Does the *Health Rocks!* program's effectiveness vary by youth demographic characteristics?

METHOD

RESEARCH DESIGN

This study used a retrospective post-then-pre-design to evaluate the impact of *Health Rocks!* on youth substance use prevention outcomes. The retrospective approach is a simple method for practitioners to identify self-report behavior changes, as it is administered only once at the end of the program. This design has particular utility when there is a risk of response-shift bias or a change in how participants might respond to questionnaires as a result of the experience of being evaluated (Geldhof et al., 2018; Rockwell & Kohn, 1989). Furthermore, Little et al. (2020) gave credence to the validity of the retrospective post-then-pre design through statistical tests with two empirical studies of youth in educational settings. Youth participants voluntarily responded to a survey after completing the program, indicating their perspectives before and after the training. The original survey was designed to measure the three targeted outcomes, i.e., knowledge, skills and assets, and youth program satisfaction. Through factor analysis, the survey items were reduced from 80 to 13, which measured the intended program outcomes with acceptable reliability and feasibility (Pather & Uys, 2008).

PARTICIPANTS

Health Rocks! has a broad youth reach and participation (see Table 1). From 2009 to 2020, the program reached over 700,000 youth across 21 states in the United States. Of that total, most states participated in the program for multiple years: five states (23.8%) participated in the program each year, and seven states (33.3%) participated for five to 10 years. In addition, five states (23.8%) participated in the program for one year because they had just joined it by this overview in 2021. At least eight states have delivered the program each year for the past 11 years. The program implements the training at different locations, schools, and grades each year and collects data from youth participants. Youth could participate in the program more than once and indicate their previous participation in the first years of the evaluation. The results showed no significant difference in youth outcomes between single and multiple participations, so the item

Health Rocks! Evaluation

was removed from the survey in later years of evaluation. Therefore, this study did not identify and exclude responses from youth participating in the program multiple times in order to ensure the scores are comparable across years.

Of those participating in the program, 128,544 completed the evaluation survey, accounting for nearly one-fifth (17.2%) of the total youth reach. Respondent demographics are summarized in Table 2. About an equal proportion of girls (50.7%) and boys (49.0%) responded to the survey. Youth participants on average were 11.7 years old. These youth participants varied in grade levels (from third grade to 10th grade), with over half (51.8%) in middle schools, followed by over a third (37.3%) in elementary schools, and the rest (10.9%) in high schools. More than half of the youth were White (50.8%), followed by Black (33.5%), multiracial (7.8%), Native American (2.7%), and Asian American (1.7%). About one out of 10 (11.5%) youth were Hispanic or Latino. Youth residence included rural (39.7%), suburban (32.5%), and urban (27.8%) locales.

MEASURES

Youth outcomes throughout the years were measured with 13 items. *Knowledge* was measured with four items about smoking, drinking, and other drug use. The items were: (a) Once you start smoking, it is hard to stop; (b) Using drugs can ruin my relationship with family and friends; (c) People who use drugs sometimes see and hear things that are not really there; and (d) People who smoke can die from lung cancer. *Skills* were assessed with four items about youth managing stress, dealing with peer pressure, and making positive decisions. The items were: (a) If a friend wanted to try drugs, I can talk them out of it; (b) When I feel stressed, I am able to talk about it with people I trust; (c) I am able to say “no” if others offered me cigarettes; and (d) I don’t have to drink or smoke even if some other young people do it. *Assets* were measured with five items related to building social competency, volunteerism, self-confidence, and strong values. The items were: (a) It is important for me to stay focused on learning at school; (b) I need to think about how my choices will affect my future; (c) I have goals for myself;

Table 1. Health Rocks! Program Participation, Youth Reach, and Sample Size from 2009 to 2021

State/Grant Year	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	Total
1. Alabama	x	x	x	x	x	x	x	x	x	x	x	x	12
2. Arkansas										x			1
3. Colorado												x	1
4. Delaware		x	x	x	x	x	x	x					7
5. Florida	x	x	x	x									4
6. Georgia	x	x	x	x	x	x	x	x	x	x			10
7. Illinois					x	x	x	x	x		x	x	7
8. Kentucky	x	x	x	x	x	x						x	7
9. Louisiana												x	1
10. Maryland		x	x	x	x	x	x	x					7
11. Mississippi												x	1
12. Nevada												x	1
13. North Carolina	x	x	x	x	x	x	x	x	x	x	x	x	12
14. Ohio	x				x							x	3
15. Oklahoma												x	1
16. Pennsylvania					x	x	x	x	x	x	x	x	8
17. South Carolina				x	x	x	x	x					5
18. Tennessee	x	x	x	x	x	x	x	x	x	x	x	x	12
19. Virginia	x	x	x	x	x	x	x	x	x	x	x	x	12
20. Washington	x				x	x	x	x	x	x	x	x	9
21. West Virginia	x	x	x	x	x	x	x	x	x	x	x	x	12
No. of States	10	10	10	11	14	13	12	12	9	9	8	15	21
Youth Reach	19,743	45,781	47,839	76,868	103,774	89,331	87,213	77,560	58,500	50,046	38,580	53,281	748,516
Sample Size	5,271	6,090	10,128	13,888	27,883a	6,806	7,426	14,927	13,247	11,842	5,027	6009	128,544

Table 2. Demographic Information of Youth Participants

	n	Percent
Gender		
Boy	48,061	49.1
Girl	49,724	50.9
Age		
10 and younger	26,245	27.1
11	20,984	21.7
12	20,662	21.4
13	13,995	14.5
14	7,867	8.1
15	4,002	4.1
16 and older	2,947	3.0
M (SD)	11.79 (1.61)	
School grade level		
Elementary school	36,327	37.3
Middle school	50,368	51.8
High school	10,613	10.9
Race		
Caucasian American	28576	54.4
African American	17589	33.5
Native American	1398	2.7
Asian/Asian American	881	1.7
Multi-racial	4073	7.8
Ethnicity^a		
Hispanic/Latino	5,435	11.5
Non-Hispanic/Non-Latino	41,658	88.5
Residence		
Urban (population above 50,000)	27,235	27.8
Suburban (population between 10,000 and 50,000)	31,905	32.5
Rural (population less than 10,000)	38,943	39.7
Hours of completion		
Fewer than 10 hours	10,245	11.9
10 hours	67,216	77.9
More than 10 hours	8,818	10.2

Note. ^aEthnicity was not asked in 2021 survey.

(d) I feel good about myself; and (e) I would help other kids like me to stay away from alcohol or other drugs. Response options were based on a four-point scale ranging from 0 (*strongly disagree*) to 3 (*strongly agree*). Notably, these asset measures in *Health Rocks!* correspond with several categories of the four internal and four external assets identified in the 40 Developmental Assets (DA) (Search Institute, 2006). The reasons are the positive youth development frameworks guiding the *Health Rocks!* program, partially derived from the DA findings, and both frameworks emphasize strengths within the youth. For instance, the social competency of

Health Rocks! (e.g., staying focused on learning and making choices) corresponds with 40 DA's social competencies (e.g., planning and decision-making) of the internal assets; its volunteerism (e.g., helping other kids to stay away from substances) corresponds with DA's empowerment (e.g., service to others) of the external assets; its self-confidence (e.g., feeling good about oneself) corresponds with DA's positive identity (e.g., personal power) of the internal assets; its strong values (e.g., having goals) correspond with DA's positive values of the internal assets. A composite score for each outcome was calculated by averaging the scores for related items. Higher scores indicated stronger agreement. Cronbach's alphas before and after the program were .91 and .86 for the entire scale, .77 and .69 for the *Knowledge* subscale, .76 and .67 for the *Skills* subscale, and .86 and .79 for the *Assets* subscale.

ANALYSIS

Data collected from 2009 to 2021 were merged for analysis. Descriptive analysis and paired sample t-tests were conducted to compare youths' responses for their states before and after the training. Only survey data from youth who had completed at least 10 hours of training were included in the analysis. Analysis of Variance (ANOVA) with post hoc tests using least significant difference (LSD) was conducted to compare youth outcome changes by gender, race, grade level, residence, and hours of training participation.

RESULTS

Youth reported statistically significant positive changes in knowledge, skills, and assets across all years (see Table 3). On average, youth participants reported a .31 increase in total mean scores after the program compared to before ($t = 139.84, p < .001$). Their mean scores on knowledge increased by .37 ($t = 138.72, p < .001$). Their mean scores on skills increased by .31 ($t = 122.90, p < .001$). Their mean scores on assets increased by .28 ($t = 116.29, p < .001$). The average effect sizes were .51 for both the total and knowledge, .45 for skills, and .43 for assets. Based on the categorization of Cohen's d , with .2 being small, .5 being medium, and .8 being large, the program had a medium effect on the total and knowledge and a small effect on the skills and assets (Cohen, 1969; Goulet-Pelletier & Cousineau, 2018) (see Table 3 for effect sizes broken down by type of assessment and year of program).

Figure 1 illustrates the magnitude of pre- and post-differences, which suggest an overall decrease trend over the years. It is worth noting that youth knowledge, skills, and assets scores before the training show an overall increasing trend, while youth outcome scores after the training fluctuated at a smaller range (see Figure 2). Overall, *Health*

Health Rocks! Evaluation

Table 3. Program Effectiveness Among Youth Who Have Completed at Least 10 Hours of Training

Year	Total					Knowledge					Skills					Assets				
	Before	After	ES ^a	T	<i>p</i>	Before	After	ES ^a	T	<i>p</i>	Before	After	ES ^a	T	<i>p</i>	Before	After	ES ^a	T	<i>p</i>
2009-2010	2.06	2.47	.61	33.85	***	2.12	2.51	.52	28.62	***	1.96	2.40	.56	30.58	***	2.09	2.51	.55	30.02	***
2010-2011	2.22	2.63	.53	30.67	***	2.17	2.62	.52	29.58	***	2.20	2.59	.48	27.65	***	2.27	2.68	.50	28.74	***
2011-2012	2.26	2.63	.66	49.97	***	2.20	2.64	.67	50.10	***	2.21	2.57	.56	41.74	***	2.36	2.69	.55	41.20	***
2012-2013	2.34	2.66	.55	53.68	***	2.26	2.65	.56	54.62	***	2.29	2.61	.47	45.83	***	2.45	2.72	.44	42.77	***
2014-2015	2.37	2.66	.56	40.74	***	2.30	2.65	.53	38.68	***	2.32	2.61	.48	35.04	***	2.48	2.72	.44	34.43	***
2015-2016	2.40	2.69	.50	38.75	***	2.36	2.69	.49	38.37	***	2.36	2.64	.45	35.41	***	2.47	2.73	.42	32.90	***
2016-2017	2.36	2.70	.57	61.35	***	2.31	2.70	.56	60.43	***	2.32	2.64	.50	53.34	***	2.43	2.74	.49	52.67	***
2017-2018	2.36	2.65	.47	49.46	***	2.28	2.63	.48	50.44	***	2.33	2.61	.41	43.59	***	2.46	2.70	.38	40.32	***
2018-2019	2.30	2.64	.51	48.95	***	2.23	2.62	.51	48.97	***	2.28	2.62	.46	48.29	***	2.37	2.68	.43	41.21	***
2019-2020	2.42	2.59	.35	22.20	***	2.37	2.58	.33	20.94	***	2.41	2.57	.31	19.13	***	2.45	2.62	.29	17.82	***
2020-2021 ^b	2.25	2.49	.36	25.43	***	2.17	2.46	.39	26.98	***	2.26	2.51	.32	22.37	***	2.30	2.50	.27	18.68	***
Total	2.33	2.64	.51	139.84	***	2.26	2.63	.51	138.72	***	2.29	2.60	.45	122.90	***	2.40	2.68	.43	116.29	***

Note. Scores range from 0 to 3 for each scale and subscale. *** $p < .001$. ^aES = Effect size. The effect size was calculated by using the formula Cohen's d for paired samples t -test, $d = (\text{mean} / \text{S.D.})$. ^bIn 2020-2021, several sites may have experienced shifts in regular schedules and disruptions in practices and other challenges due to the COVID-19 pandemic.

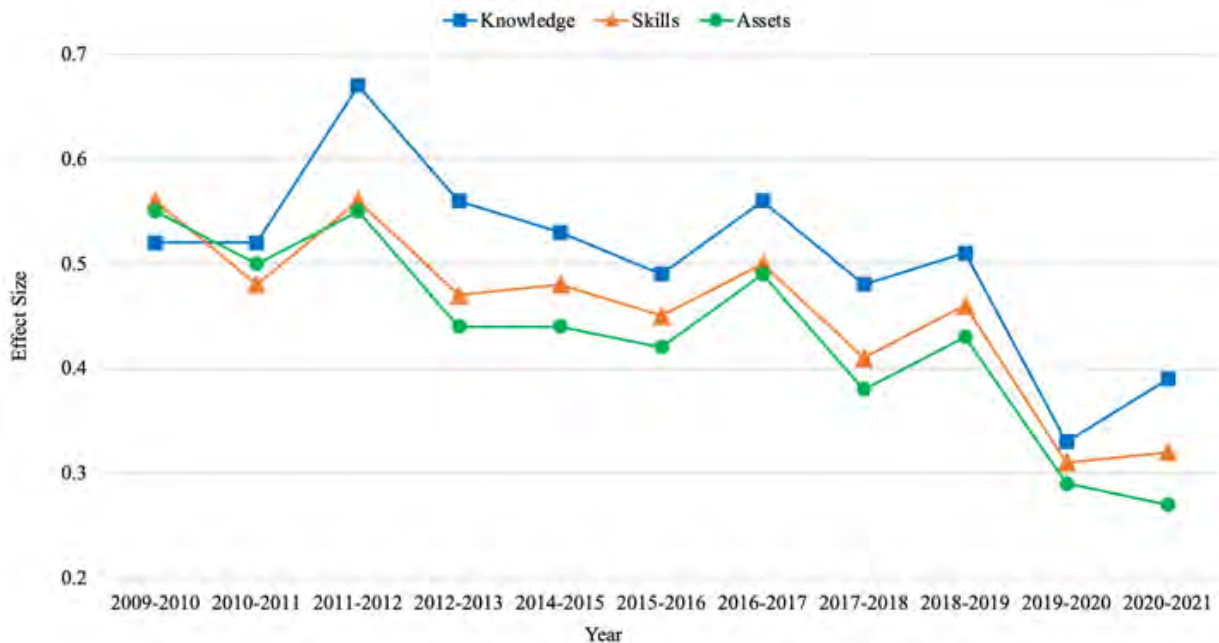


Figure 1. Program effect sizes on the Knowledge, Skills, and Assets subscales over time.

Rocks! showed a small to medium positive effect in increasing youth's knowledge of substance use consequences, skills to manage substance-related stress, and assets to make healthy decisions.

Program effectiveness differed by gender, school grade level, race, ethnicity, residence, and hours of training completion (see Table 4). ANOVA tests revealed a minor but significant gender difference in program effectiveness. Girls gained slightly more knowledge ($F = 5.93, p < .05$) than boys. Youth of both genders reported a similar increase in skills and more assets after the training. ANOVA tests and post hoc comparisons using LSD showed that elementary and high school youth reported more changes than middle school youth ($F = 71.68, p < .001$). Among youth of different races, Asian American youth reported the highest increase, and Whites reported the lowest increase ($F = 36.55, p < .001$). Hispanic/Latino youth also reported more increase than their non-Hispanic peers ($F = 11.30, p = .001$). Youth in urban areas reported the most changes, followed by rural and suburban areas ($F = 216.60, p < .001$). Youth who reported more hours of training completion also reported more increases in scores ($F = 28.93, p < .001$).

DISCUSSION

Using the quantitative data merged from youth survey responses collected in 21 states during the last 11 years, we examined the effectiveness of *Health Rocks!* in impacting youth outcomes in knowledge, skills, and assets. We also examined whether program effectiveness differed by youth characteristics. Several insights can be gleaned from the findings. First, there is evidence of consistent program impact throughout the years. Youth generally reported increases in each of the target areas of the program—namely, knowledge, skills, and assets necessary for resisting substance use.

Second, findings suggest that the magnitude of effects differed by gender, school grade level, race, ethnicity, residence, and hours of training completion. For instance, girls (compared to boys) and racially/ethnically minoritized youth (compared to White peers) reported greater changes after the training. Youth residing in urban areas reported the lowest knowledge, skills, and assets before the training but the highest level of change across the three areas. Such findings point to potentially higher sensitivity to training for some demographic groups more than others—helpful information for implementers as they design and deliver programs targeting specific youth groups.

Finally, examining the program across the years, results suggest a consistent but somewhat declining impact over the years. Program effectiveness (defined here as the difference between pre- and post-test scores) increased to its highest in 2011–2012 and then plateaued for several years, until its slight decline in the 2017–2018 implementation year,



Figure 2. Youth knowledge, skills, and assets before and after the training over time.

with the lowest impact in 2020–2021. Several factors might explain the decline. Youth skills and assets at baselines have increased in the last decade, which may be related to youth's increased access to substance use prevention programs and multiple sources of educational information. For instance, a review shows that multiple universal substance use prevention programs for youth also positively affect youth in making healthy life decisions (Tanner-Smith et al., 2018). Smartphone applications also prevent youth substance use (Schwinn et al., 2021). The program effectiveness for the 2020–2021

Health Rocks! Evaluation

Table 4. Program Effectiveness by Gender, School Grade Level, Race, Ethnicity, Residence, and Hours of Completion

	Total			Knowledge					Skills					Assets						
	Be-fore	Af-ter	Change	F	<i>p</i>	Be-fore	Af-ter	Change	F	<i>p</i>	Be-fore	Af-ter	Change	F	<i>p</i>	Be-fore	Af-ter	Change	F	<i>p</i>
Gender				.03					5.93	*				3.50					1.00	
Boy	2.21	2.61	.31			2.25	2.60	.36			2.26	2.57	.32			3.38	2.66	.28		
Girl	2.25	2.66	.31			2.28	2.65	.37			2.32	2.62	.31			3.43	2.70	.28		
School grade level				71.68	***				113.82	***				43.20	***				53.17	***
Elementary school	2.31	2.65	.34			2.21	2.62	.41			2.30	2.62	.33			2.41	2.71	.31		
Middle school	2.36	2.64	.29			2.32	2.64	.33			2.31	2.59	.29			2.43	2.68	.26		
High school	2.24	2.55	.32			2.25	2.57	.33			2.16	2.49	.34			2.29	2.59	.30		
Race				36.55	***				30.43	***				31.85	***				28.38	***
Caucasian	2.36	2.65	.29			2.32	2.65	.34			2.32	2.61	.29			2.43	2.68	.26		
African American	2.25	2.59	.35			2.17	2.57	.41			2.19	2.54	.36			2.35	2.66	.31		
Native American	2.26	2.60	.35			2.20	2.58	.38			2.23	2.57	.35			2.33	2.66	.33		
Asian American	2.13	2.64	.52			2.05	2.63	.58			2.12	2.63	.51			2.19	2.66	.47		
Multi-racial	2.30	2.61	.32			2.25	2.60	.36			2.26	2.57	.31			2.37	2.66	.29		
Ethnicity				11.30	**				14.89	***				4.34	*				10.18	**
Hispanic/Latino	2.23	2.59	.37			2.15	2.57	.43			2.19	2.54	.35			2.32	2.65	.33		
Non-Hispanic/Latino	2.33	2.65	.33			2.28	2.65	.37			2.28	2.60	.33			2.41	2.70	.29		
Residence				216.60	***				128.45	***				212.81	***				195.61	***
Urban	2.28	2.64	.37			2.21	2.62	.42			2.23	2.59	.37			2.37	2.70	.33		
Suburban	2.38	2.63	.25			2.30	2.60	.31			2.36	2.59	.24			2.47	2.68	.21		
Rural	2.32	2.64	.32			2.29	2.65	.37			2.28	2.60	.32			2.39	2.68	.30		
Hours of completion				28.93	***				12.26	**				22.67	***				39.50	***
10 hours	2.33	2.64	.31			2.27	2.63	.36			2.30	2.59	.30			2.41	2.68	.27		
More than 10 hours	2.30	2.63	.35			2.23	2.61	.39			2.26	2.59	.34			2.37	2.68	.32		

Note. Scores range from 0 to 3 for each scale and subscale. Change = After – Before. * $p < .05$, ** $p < .01$, *** $p < .001$.

grant cycle was among the lowest in the last 11 years, which might be related to the disruptions caused by the COVID-19 pandemic. During the pandemic, *Health Rocks!* programming shifted from in-person to online delivery, through which the program provided youth in isolation with much needed emotional support and connectedness. Presumably, both the change of delivery mode and added emotional support may mean less time and emphasis on *Health Rocks!* curriculum contents. However, the *Health Rocks!* evaluation did not include measures of emotional support and connectedness. In addition, program delivery systems may be related to variations of individual characteristics (e.g., demographics) and, finally, to the program outcomes. For example, 4-H in Georgia is primarily school-based delivery, whereas in other states *Health Rocks!* program delivery may have occurred in after-school and community-based club settings. These findings call for the constant examination of curricula to ensure that they continue to be relevant in an ever-changing context and highlight the need for contextual data to better understand potential shifts across time. It should be highlighted that since its original launch, *Health Rocks!* has been updated periodically and is undergoing major revision to address this issue.

Findings should be interpreted considering several study limitations. First, the current study relied on self-report data and a retrospective pre- and post-design without control groups. Feasibility and the need to address response-shift bias were some of the benefits of such an approach. Nonetheless, this design makes it difficult to rule out numerous potential influences—notably whether youth were making gains as a result of the program or other influences (e.g., peers, school). Second, the current study only examined the immediate effects of the program, but it remains unclear whether such positive effects extend beyond the testing period. Future research using a longitudinal design may help answer this question. Third, a few evaluative studies on *Health Rocks!* have shown that high youth engagement and positive youth perspectives of experiential learning delivery are also related to better program effectiveness (Taylor et al., 2019; Xia et al., 2016). Future studies focusing on qualitative responses can provide a more comprehensive understanding of the relation between these implementation processes and youth outcomes than the current study. Finally, program effect may vary by state due to program implementation and evaluation factors, including program delivery settings (e.g., camp vs. school), youth participation (e.g., voluntary vs. required), survey response rate (e.g., high vs. low), and youth access to other substance prevention programs.

Notwithstanding the aforementioned limitations, this study provides important insights regarding the program effectiveness of *Health Rocks!*, which is a widely used curriculum to address substance use. Moreover, current analyses illustrate the utility of long-term evaluation to examine trends over time,

the importance of attention to demographic characteristics of participants, and the contextualization of findings to better understand emergent patterns.

CONCLUSION

This study examined the program effectiveness of *Health Rocks!*, a youth substance use prevention program. Merging data from 128,544 youth participants in 21 states between 2009 and 2021, this study compared self-reported levels of knowledge, skills, and decision-making skills before and after the program. Youth reported significant increases in substance use knowledge, stress-coping skills, and assets to make healthy life decisions across 11 years. Youth outcomes vary by program completion and individual characteristics, including gender, school grade level, race, ethnicity, and residence. Overall, the study supports the utility of youth substance use prevention programs, such as *Health Rocks!*, in informal and formal educational settings. It also highlights that youth pre-program baseline knowledge, skills, and assets to resist substances have increased in the last decade. The findings suggest that future *Health Rocks!* and other youth substance use prevention programs' evaluations need to account for demographic differences in program effectiveness. In addition, the reduced program effect during the COVID-19 pandemic implies substance use prevention programs must plan for unexpected changes and update the curriculum to address the post-pandemic stress.

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Health Rocks! Evaluation

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