



## Original article

## Building Competencies to Prevent Youth Substance Use in Kazakhstan: Mixed Methods Findings from a Pilot Family-Focused Multimedia Trial

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## A B S T R A C T

**Purpose:** The knowledge-based approach to substance use and HIV prevention, commonly used in Central Asia, does not equip at-risk adolescents with risk reduction skills. This pilot study aims to adapt and test the feasibility and estimate the effect size parameters of a skill-based and family-focused intervention for at-risk adolescents from communities affected by heroin trade and use in Kazakhstan, located on the major drug trafficking route from Afghanistan.

**Methods:** This National Institute on Drug Abuse-funded pilot trial used a mixed-methods approach and included 181 adolescents (ages 14–17) that reported at least one risk factor (e.g., substance-using family members or friends and parental criminal history). In addition to the school-based health education program, intervention-arm adolescent-caregiver dyads received three computerized pilot sessions focusing on risk reduction self-efficacy, resistance to peer pressure, and strengthening of family relationships. Adolescents completed baseline, 3- and 6-month Audio Computer-Assisted Self-Interview surveys in Russian and treatment group adolescents ( $n = 12$ ) also participated in postintervention focus groups.

**Results:** Small size effects were observed for youth-level theoretical mediators associated with lower substance use. Compared to the control group, intervention-arm adolescents showed improvement in personal and social competencies such as assertiveness (Cohen's  $d = .21$ ) and self-esteem ( $d = .22$ ) at 3 months and increased engagement in prosocial activities at 6 months ( $d = .41$ ). Adolescents from the intervention group also reported improved self-control skills helping alleviate emotional distress (an increase in anger and tension management  $d = .30$  at 3 months and a reduction in temper  $d = -.27$  at 6 months) along with a lower likelihood of binge drinking at 6 months (odds ratio = .18,  $p = .023$ ).

**Conclusions:** In middle-income countries like Kazakhstan, an intervention that utilizes interactive technologies and combines an empirically tested skills-based approach with family involvement may be an engaging, acceptable, and culturally appropriate tool for preventing substance use among at-risk youth.

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IMPLICATIONS AND  
CONTRIBUTION

This pilot trial demonstrates that multimedia family-based substance use prevention intervention is feasible and culturally acceptable for at-risk youth in Central Asia. Prevention efforts should engage most at-risk youth and go beyond providing preventive information to build their personal competencies and strengthen their positive relationships with peers, school, and families.

Preventing drug use is critical to changing the trajectory of the HIV epidemic in Central Asia, a region struggling with some of the

fastest growing rates of HIV in the world [1]. Kazakhstan is located on the heaviest opium and heroin trafficking route from Afghanistan, and host to the world's largest crop of wild uncultivated cannabis [2], making opiates, marijuana, and other drugs easily available at a low price [1]. The annual prevalence rate of opiate use is among the highest in the world (.96%) [3] and the United Nations estimates that 100,000–450,000 Kazakhstanis inject drugs

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[4]. Out of people officially registered with Narcological Centers in Kazakhstan with drug addiction, 70% are injecting drugs and about a third are under the age of 30 [5].

To be effective, preventive interventions should be introduced in adolescence, when youths begin to adopt HIV-related drug and sexual risk behaviors [6]. In Kazakhstan, one fifth of adolescents living in drug-risk areas had been exposed to heroin at home or in the community [7]. By the age of 16, 12% of adolescents reported ever using drugs [8] with the rates being twice higher among Russian-speaking youth and 10 times higher among at-risk youth [9,10].

Schools in Kazakhstan offer health information about HIV and drug use, but these national prevention initiatives are often limited to health education sessions. Although the majority of youth in Kazakhstan are aware of harmful effects of alcohol and drugs, 81% report trying substances out of curiosity or peer pressure [10]. Over half (52%) of sexually active adolescents in Kazakhstan report initiating sex due to inability to refuse partner or peer pressure, fear of losing a partner, or to spite their parents and a fifth of 15–17-year-old adolescents reported initiating sex under the influence of drugs or alcohol [10].

Systematic reviews of HIV and drug prevention programs for youth in the United States and sub-Saharan Africa show that skills-based approaches, especially with gender-sensitive and culturally tailored messages, are more efficacious than knowledge-based approaches in delaying onset and changing risk behaviors as they equip youth with skills to analyze social influences and to resist peer or partner pressure [6,11,12].

Initiation of injection drug use (IDU) is associated with drug use beginning at an early age; daily consumption of alcohol; history of hallucinogen, cocaine/crack, or heroin use; and level and length of addiction [13,14]. To reduce the risk of transitioning to IDU, interventions should attempt to prevent initiation, delay onset, reduce the frequency of drug use and prevent a transition from softer (cannabis) to harder drugs (e.g., cocaine and heroin) [15].

The aim of this pilot study was to adapt and test feasibility of a youth drug prevention intervention called Kazakhstani Family Together (KFT) that engages youths' caregivers and utilizes a multimedia approach [16]. Computerized interventions are known for high fidelity, scalability, and inexpensive dissemination [17,18], but their use has not been tested in a middle-income country like Kazakhstan.

This study targets at-risk youth from communities with high drug availability in Kazakhstan. Exposure to drug dealers, peers approving drug use, and (most significantly) proximate relationships with people injecting drugs are among the most common family- and community-level factors associated with IDU [13,14]. Family risk factors such as a parent's substance misuse and a parent's criminal history further increase youths' vulnerability for drug use [14,15].

### *Theoretical Framework*

The cognitive-behavioral component of the intervention was guided by the Integrated Behavioral Model suggesting that HIV-risk behaviors are related to intentions that are shaped by drug and sexual preventive knowledge and attitudes, subjective norms, and perceptions of personal control including self-efficacy [19]. In order to translate preventive knowledge into practice and control substance use and sexual risk activities, youth should develop skills to deal with peer and partner pressure, desire for social acceptance, and fear of rejection, and increase perceived self-

efficacy in making healthy choices [20]. The intervention's family involvement component was informed by Family Interaction Theory [21], which posits that substance use and sexual experimentation can be delayed by fostering parent–adolescent attachment, supervision, and support. The study's conceptual model (see online Supplementary Materials) integrates both theories and shows how the core intervention components may result in concomitant changes in youth risk behavior outcomes by targeting youth- and caregiver-level theoretical mediators (the pathways or mechanisms through which the intervention can affect change).

This pilot feasibility trial includes a small sample size and is not powered to test intervention effects. It was designed to test the feasibility and obtain preliminary estimates of the effect size parameters of the adapted intervention compared to the standard care on: (1) youth-level theoretically relevant mediating variables (youth's personal and social competences such as assertiveness, self-esteem, self-control, and coping skills; refusal skills and resistance to peer pressure; and risk reduction self-efficacy) and (2) substance use intentions and behaviors. The estimates of effect size parameters on caregiver–youth mediators are described elsewhere and incorporate youth's and caregivers' quantitative and qualitative responses [16].

### **Methods**

This National Institute for Drug Abuse-funded pilot study is registered with ClinicalTrials.gov (#NCT01969305) and has been approved by the Institutional Review Boards at the University of Chicago (IRB13-0841), Columbia University (IRB-AAAL1064), and by the ethics review board of the Kazakhstan School of Public Health (IRB-A043).

### *Sample and eligibility criteria*

Through consultations with experts and mapping of risk factors, four districts in Almaty (Auzovskiy, Alatauyskiy, Turksibskiy, and Zhetesuyyskiy districts) have been identified as a "drug-risk area" with a concentration of drug trafficking, supply, and use [7]. The study used convenience sampling. School police "inspectors" who are based at local public schools and work with at-risk adolescents (e.g., with poor academic performance and poor school discipline) invited these adolescents and their parents/guardians to attend a meeting with the research staff to learn about the study. Research assistants administered assent and parental consent and screened interested candidates for the eligibility criteria: (1) being between the ages of 14–17; (2) having at least one risk factor (substance-using friends, parental criminal history or problem substance use, adolescent's history of drug use, running away, and dropping out of school or history of sexual activity); and (3) being fluent in Russian, the country's second official language. Out of 375 screened adolescents, 181 adolescents met the eligibility criteria and agreed to participate (Figure 1). Each eligible adolescent involved a parent of his/her choice. Adolescents whose parents were unable to participate in the study (but provided consent) were asked to involve any other adult family member who provided them care (e.g., grandparent, uncle/aunt, and adult sibling).

### *Study design*

The study used a randomized control design with three waves of data. Immediately after baseline surveys, the project manager randomized participants into two study arms: (1) *Usual Care Alone*,

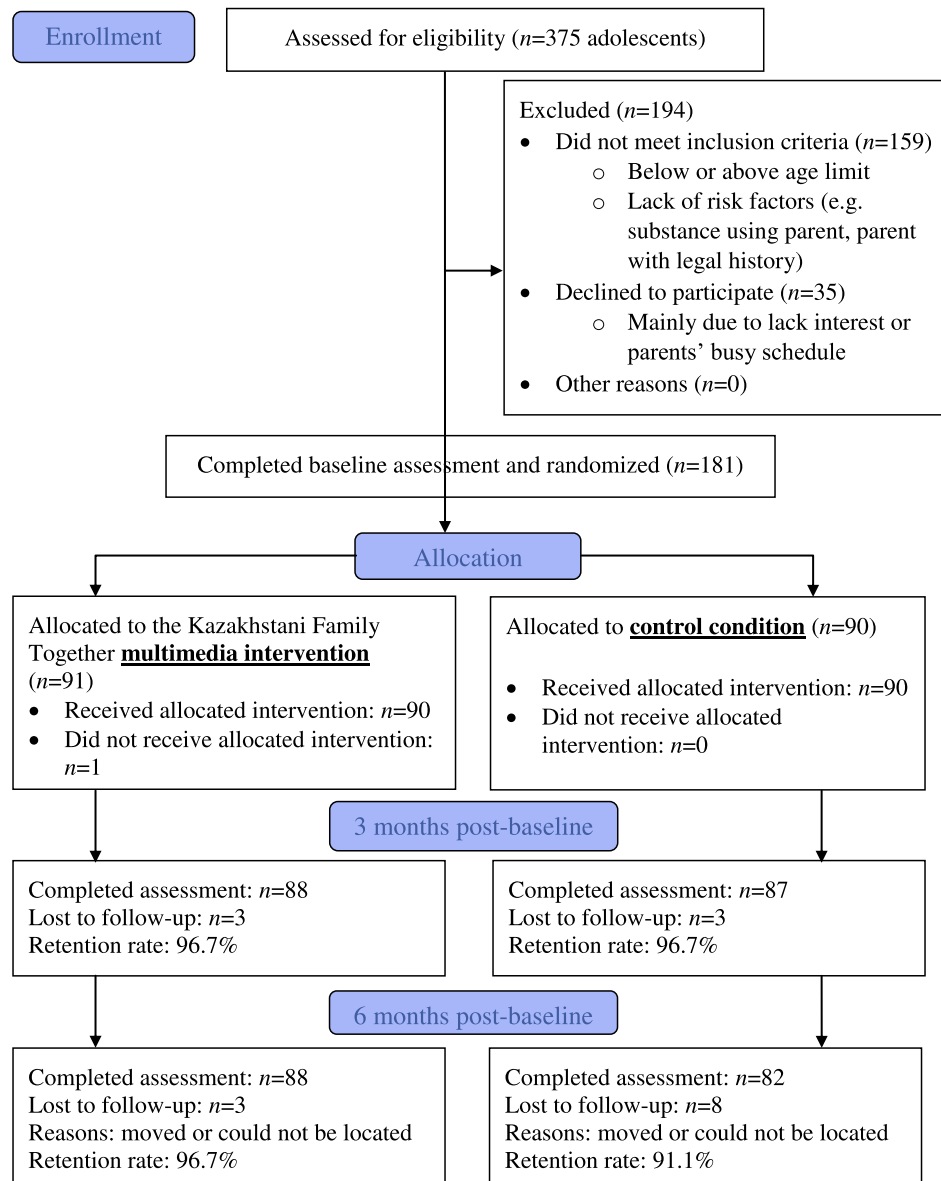


Figure 1. CONSORT flow diagram.

a school-based health education program on HIV and drugs (n = 90 child–caregiver dyads) or (2) *Usual Care+KFT intervention* (n = 91 child–caregiver dyads). One adolescent–caregiver dyad dropped out after the first session; 99% of dyads attended all three pilot sessions. Sessions lasted about 25–30 minutes each and were delivered weekly at participants' homes or in the field office.

**Multimedia family-based intervention:** The KFT included three pilot interactive multimedia sessions on sexual and drug risk reduction self-efficacy, resistance to peer pressure, and child–parent communication and support. Within the program's simulated human interaction platform, participants confronted a series of sexual risks and substance use related situations. Each situation let users communicate with a youth or caregiver avatar to practice their listening, empathy, assertiveness, refusal, and other relevant interpersonal skills. The platform employed artificial intelligence, skill demonstration by animated characters,

and a branched learning environment in which caregivers and youths can try out acquired skills. The program included original artwork, voice-over narration, and avatars customized for each user's gender and role (youth or parent). Sitting together in one cubicle at the same computer, each caregiver–youth pair worked jointly and engaged in discussions, exercises, and behavioral rehearsal as directed by the program. For details on the intervention adaptation process see online Supplementary Materials.

**The Usual Care:** Adolescents from both study arms received the standard health education program on prevention of drug use and HIV/sexually transmitted infections delivered at schools by trained health educators. The usual care approach is delivered at schools to adolescents only and does not include caregivers. After 6-month data collection, control-arm participants received CD-ROMs or USB flash drives to gain access to the KFT prevention program.

### Data collection

Both the adolescent and his/her participating caregiver completed baseline, 3-month, and 6-month assessments in Russian in separate private rooms or cubicles. Measures took 1–1.5 hours to complete and were collected on laptops at the field research office or participant's home using Audio Computer-Assisted Self-Interview software. This article examines changes in youth-level theoretical mediators and includes responses from adolescents only.

### Measures

Table 1 contains the details for instruments assessing *outcome variables* (e.g., alcohol and drug use) and associated *youth-level theoretical mediators* (e.g., youth's skills and competences such as assertiveness, self-esteem, and coping skills). Adolescents' sociodemographic characteristics included gender, age, ethnicity, education, and family characteristics.

### Data analysis

The statistical analysis was performed in Stata 15. To obtain preliminary estimates of the effects on theoretical mediators, we arranged data in the long format (one observation for each time point for each participant) and used mixed effect regressions with random effects modeled at the individual level to account for the repeated observations nested within individuals over time [22]. We will use linear (Gaussian) link function for continuous variables (e.g., assertiveness or coping skills scales), logistic function for binary outcomes (e.g., an episode of binge drinking), and zero-inflated Poisson link function for count outcomes with 70%–80% of zero values (e.g., maximum number of drinks). Models included Restricted Maximum Likelihood estimators and unstructured within-subject covariance.

The group assignment  $\times$  time interaction terms in each model were used to assess intervention effects for each wave. The mean difference between the treatment and control groups, pre/posttest standard deviations for both groups at each wave and autocorrelations between waves were used to calculate effect size estimates for continuous variables (e.g., self-esteem scale). Cohen's  $d$  of .2, .5, and .8 were considered to be small, medium, and large effect sizes [23]. Corresponding exponentiated coefficients (odds ratios or incident rate ratios) served as measures of effect size for noncontinuous variables.

**Postintervention qualitative interviews.** A random sample of adolescents ( $n = 24$ ) from the intervention group were invited to participate in focus group interviews (nine groups, eight adolescents per group) upon completion of all pilot intervention sessions and follow-up Audio Computer-Assisted Self-Interview assessments. The qualitative interviews were designed to explore adolescents' experiences with the program not captured by standardized quantitative measures. Interviews were conducted by the principal investigator and included some of the following questions: *What did you think of the computerized format of the intervention? What information seemed relevant to experiences you and other adolescents face? What topics or parts of the program will youth find particularly useful?* Audio-recorded interviews were transcribed verbatim and analyzed in Russian language. Three coders independently reviewed transcripts and met to discuss their findings. After developing a preliminary list of codes and reaching consensus on the themes, analysts independently coded transcripts applying the

Thematic Analysis approach [24] and utilizing a web-based qualitative software, Dedoose. To increase inter-rater reliability of coding, the themes and patterns that were validated by at two of the three coders were included in the results [24]. Qualitative results were meant to inform the future intervention revisions.

## Results

### Descriptive results

There were no significant baseline differences in sociodemographic and risk exposure characteristics between the study arms (Table 2).

Despite being from disadvantaged neighborhoods, an overwhelming majority reported having a mobile phone or a computer with Internet connection at home, showing the ubiquity of digital technologies in middle-income nation Kazakhstan.

About 17.5% of adolescents reported binge drinking and 8.4% disclosed drug use in the past 3 months. A correlation matrix (Table 3) shows that adolescents' substance use was inversely associated with assertiveness and self-esteem. Impulsiveness and temper, as indicators of low self-control, were associated with higher alcohol use, while the ability to manage anger and tension was associated with lower alcohol use.

### Preliminary estimates of intervention effects

Compared to the usual care participants, adolescents in the intervention arm demonstrated improvements with small size effects in assertiveness (Cohen's  $d = .21$ ) and self-esteem ( $d = .22$ ) at 3 months postbaseline and showed a greater involvement in prosocial activities at school or home ( $d = .41$ ) at 6 months (Table 4).

Small size effects were also detected for management of anger and tension ( $d = .30$  at 3 months) and reduction in temper outbursts ( $d = -.27$  at 6 months). Specifically, adolescents who received the family-focused multimedia sessions were less likely to report getting angry and yelling at people, swearing, and blaming others for problems. However, we also detected a reduction in coping skills such as positive cognitive restructuring and seeking help from friends.

Intervention-group adolescents reported a reduction in peer pressure for substance use at 3 and 6 months ( $d = -.26$  and  $d = -.28$ , respectively) and a significant reduction in binge drinking at 6 months (odds ratio = .18,  $p = .023$ ). However, we also observed a reduction in refusal skills at 6 months ( $d = -.25$ ). Irrespective of the group assignment, significant within-group reductions in attitudes approving of substance use were observed at 6 months for both study arms ( $b = -.31$ ,  $SE = .06$ ,  $p = .001$ ), which could be attributed to the schoolwide health education program. No detectable between-group differences were observed in beliefs approving substance use nor in substance use intentions at follow-up, which were already relatively low at baseline.

### Qualitative findings

#### 1. The intervention's computerized format

**(a) Engaging:** According to postintervention focus groups, the multimedia format was attractive and the instructional videos with animated characters and games made it easier to engage in and follow the information:

**Table 1**  
Measurement table

Construct	Measurement instrument	Sample item	Cronbach's $\alpha$
Outcomes			
Substance use	Substance use questions were adapted from <b>CDC's Youth Risk Behavior Surveillance Survey</b> [32] include the prevalence of use of a substance and the frequency and intensity of lifetime and current (past 3 months) use	"During the past 3 months, on the days you had a drink of alcohol other than a few sips, how many drinks did you have?" Substance use questions included specific probes, including street names for alcohol, marijuana, glue/solvents, stimulants, ecstasy, hallucinogens, cocaine, heroin, injecting drug use, and other drugs as appropriate to the context (e.g., local versions of opiates such as koknar, kuknar, and hanka). Problem or binge drinking was defined as having four or more drinks in a row (within a 2-hour period).	n/a
Substance use intentions	<b>Intentions to use alcohol or illicit drugs Substance Use Intentions Scale</b> [33]	On a four-point Likert-type scale from 1 ( <i>very unlikely</i> ) to 4 ( <i>very likely</i> ) adolescents will rate how likely they are to use various substances (e.g., tobacco, beer or wine, hard liquor such as vodka, sniff glue, take ecstasy pills, or inject drugs) within the next year.	.71
Youth-level mediators			
Personal and social competencies			
Assertiveness	<b>Adolescent Social Self-Efficacy Scale</b> [34]	Five statements (e.g., <i>express your opinion to a group of kids discussing a subject, stand up for yourself when another kid in your class makes fun of you</i> ) rated on a seven-point Likert scales from "impossible to do" (1) to "extremely easy to do" (7).	.70
Self-esteem	<b>Tennessee Self-Concept Scale</b> [35]	"I know as much as the other children in my class" "I have a happy family" Twenty items rated from "completely false" (0) to "completely true" (4). Negatively phrased items (e.g., <i>I hate myself, It is hard for me to do what is right</i> ) were reversed coded.	.87
Social connectedness	<b>Engagement in prosocial activities</b> included four questions and measured and involvement in social activities in the past 3 months	Have you participated in organized after-school activities such as debate or drama club, music lessons, sports, volunteer work, or helped around house with cleaning, grocery shopping, or caring for family members. Rated on a scale from 0 ( <i>never</i> ) to 5 ( <i>more than 20 times</i> )	n/a
Self-control	<b>Low Self-Control Scale</b> [36]	Four questions in each of three domains: - impulsiveness ( <i>I often act on the spur of the moment without stopping to think</i> ), - risk seeking ( <i>I sometimes find it exciting to do things for which I might get into trouble</i> ), and - temper ( <i>I lose my temper pretty easily</i> ). Rated from 1 ( <i>strongly disagree</i> ) to 4 ( <i>strongly agree</i> ).	.72 .82 .76
Coping skills	<b>Youth Coping Index</b> [37] was used to measure strategies and behaviors for managing stress in the past month.	The scale included 32 items with a five-point Likert scale (from "never" to "most of the time"). The factor analysis did not confirm the original subscale structure and items were organized around the following domains: - anger and tension management (e.g., <i>Swear; Say mean things to people; be sarcastic</i> ). Negatively phrased items for tension management subscales were recoded in the direction indicating better management of conflict and incendiary communication. - positive cognitive restructuring (e.g., <i>Try to think of the good things in your life; Try to see the good things in a difficult situation</i> ); - help seeking from friends (e.g., <i>Let off steam by complaining to your friends, Talk to a friend about how you feel, Try to keep up friendships or make new friends</i> ); - avoidance ( <i>Avoid the people who made you feel bad. Tell yourself the problem is not important; Try to ignore it; Daydream about how you would like things to be</i> ). This scale has moderate internal consistency.	.84 .72 .78 .65
Substance use-related mediators			
Peer pressure for substance use	Questions adapted from <b>Beliefs about Peer Norms Scale</b> [38]	Six questions rated from none (0) to a lot/almost all (4):  <i>How much peer pressure is there on people your age to drink alcohol?</i> <i>How many of your friends smoke marijuana? How many of your friends get drunk?</i> <i>How many of your friends tried other drugs (e.g., ecstasy, LSD, cocaine, and heroin)?</i>	.82
Substance use resistance and peer and partner refusal skills	Items adapted from a <b>Self-Efficacy for Limiting Substance Use Scale</b> [39] designed for measuring adolescents' ability to refuse alcohol or drugs.	On a four-point Likert scale (from "very easy" to "very hard"), adolescents were asked to assess how hard would it be to refuse the offer or say No in eight situations: "...to a drink, if someone made fun of you for not drinking?" "If your close friend offered you a beer at a party and you didn't want to drink?" "If your boyfriend/girlfriend, or a boy/girl you really like, offered you to try drugs and you didn't want it?"	.91
Normative beliefs	Beliefs and attitudes approving alcohol and other drugs were adapted from the <b>Individual Protective Factors Index</b> [40] and included 17 statements.	"Drinking alcohol makes parties more fun"; "If I don't drink, I will feel left out of a group"; "Using cocaine or other hard drugs makes you look like an adult"; "Smoking marihuana makes you look cool" Each statement could be rated as "YES!" (very true for you), "yes" (somewhat true), "no" (somewhat false) and "NO!" (very false).	.89

Names of the scales are in bold. CDC = Centers for Disease Control; LSD = Lysergic acid diethylamide; n/a = not applicable.



**Table 2**

Sociodemographic characteristics of adolescents at baseline (N = 181)

	Total sample (N = 181)	Control group (n = 90)	Intervention group (n = 91)	t test/ $\chi^2$
Child's characteristics	Frequency (Percentage, %) or Mean (SD)			
Gender				.73
Boys	111 (61.33)	58 (64.44)	53 (58.24)	
Girls	70 (38.67)	32 (35.56)	38 (41.76)	
Child's age in years, <i>mean</i> (min 14/max 17)	15.27 (1.01)	15.23 (.99)	15.31 (1.03)	-.49
Age groups				.17
14–15-year olds (middle adolescents)	116 (64.09)	59 (65.56)	57 (62.64)	
16–17-year olds (late adolescents)	65 (35.91)	31 (34.44)	34 (37.36)	
Ethnicity				1.37
Kazakh	50 (27.62)	22 (24.44)	28 (30.77)	
Russian	87 (48.07)	47 (52.22)	40 (43.96)	
Other (Tatar, Uighur, Korean, and Uzbek)	44 (24.31)	21 (23.33)	23 (25.27)	
Education				.29
Secondary school	167 (92.27)	84 (93.33)	83 (91.21)	
Vocational school ("kollege") <sup>a</sup>	14 (7.73)	6 (6.67)	8 (8.79)	
Grade (if in school)				2.76
Eighth grade	33 (19.88)	15 (17.86)	18 (21.95)	
Ninth grade	86 (51.81)	46 (54.76)	40 (48.78)	
Tenth grade	23 (13.86)	12 (14.29)	11 (13.41)	
Eleventh grade (last)	19 (11.45)	9 (10.71)	10 (12.20)	
Evening school or other	5 (3.01)	2 (2.38)	3 (3.66)	
Household characteristics				
Primary female caregiver				7.34
Mother	156 (86.19)	78 (86.67)	78 (85.71)	
Grandmother	14 (7.73)	5 (5.56)	9 (9.89)	
Older sister	5 (2.76)	3 (3.33)	2 (2.20)	
Aunt	1 (.55)	1 (1.11)	0	
Stepmother or father's girlfriend	1 (.55)	0	1 (1.10)	
No female	1 (.55)	0	1 (1.10)	
Primary male caregiver				4.20
Father	98 (54.75)	53 (58.89)	45 (50.56)	
Grandfather	9 (5.03)	3 (3.33)	6 (6.74)	
Older brother	26 (14.53)	14 (15.56)	12 (13.48)	
Uncle	7 (3.91)	4 (4.44)	3 (3.37)	
Stepfather or mother's boyfriend	9 (5.03)	4 (4.44)	5 (5.62)	
Other	3 (1.68)	2 (2.22)	1 (1.12)	
No male	27 (15.08)	10 (11.11)	17 (19.10)	
Household size ( <i>number of people living at home</i> ), <i>mean</i> (min 2/max 14)	4.49 (1.79)	4.63 (1.48)	4.35 (2.06)	1.06
Household poverty status ( <i>problems with having enough money for basics such as food, electricity, school supplies or books, medication</i> )				1.91
Never	59 (32.78)	33 (37.08)	26 (28.57)	
Sometimes	85 (47.22)	41 (46.07)	44 (48.35)	
Constantly	36 (20.00)	15 (16.85)	21 (23.08)	
Computer at home	151 (83.43)	76 (84.44)	75 (82.42)	.13
Personal mobile (cellular) phone	168 (92.82)	86 (95.56)	82 (90.11)	2.01
Access to the Internet at home				.45
Has slow Internet connection	46 (25.56)	21 (23.60)	25 (27.47)	
Had high-speed Internet	103 (57.22)	53 (59.55)	50 (54.95)	
Risk exposure	n (%)	n (%)	n (%)	
The child has...				
ever run away from home	32 (17.68)	12 (13.33)	20 (21.98)	2.72
been sent to the principal's office for doing something wrong	92 (50.83)	44 (48.89)	48 (52.75)	.27

(continued on next page)

Table 2 (Continued)

	Total sample (N = 181)	Control group (n = 90)	Intervention group (n = 91)	t test/ $\chi^2$
been in trouble with the police	22 (12.15)	9 (10.0)	13 (14.29)	1.48
been registered with the juvenile police	11 (6.08)	6 (6.67)	5 (5.49)	.11
experienced violence (a grown-up in your life ever hit, beat, kick, or physically hurt you in any way)	58 (32.22)	24 (26.67)	34 (37.78)	2.54
In the family				
A family history of alcohol problems (child lives with a family member who has problems with alcohol)	43 (23.76)	21 (23.33)	22 (24.18)	.89
A family history of drug use problems (child lives with a family member who uses drugs)	6 (3.33)	4 (4.49)	2 (2.20)	.39
A family legal history (parent or family member who lives with a child has ever been incarcerated, spent time in jail or prison)	17 (9.39)	5 (5.56)	12 (13.19)	.08
In the community				
Witnessed someone selling or using drugs in community	77 (42.54)	37 (41.11)	40 (43.96)	.70
Been offered to use drugs by someone in the community	55 (30.39)	26 (28.89)	29 (31.87)	.66
Been offered to sell drugs by someone in the community	17 (9.39)	7 (7.78)	10 (10.99)	.55

SD = standard deviation.

\* $p \leq .05$ , \*\* $p \leq .01$ , \*\*\* $p \leq .001$ .<sup>a</sup> A 2-year vocational school for students who left or dropped out of secondary school after ninth grade (2 years prior to completing full secondary education).

"Everything is so clear and so unusual... At school, they do not explain like this... [At school health education sessions] there are usually many children and everything is very confusing. Here, I managed to pay attention."

"Good that there were no teachers around. When adults are lecturing, it is not interesting and boring. Cartoons were funny and interesting."

Adolescents shared that they do not get this content at school not because there is a lack of focus on HIV and drug education but rather because of the lecture-based format of instruction. School administrators typically invite all students in a large auditorium to attend annual guest presentations by invited medical personnel on various health topics, including smoking, drugs, and HIV. When asked where most adolescents get information about drug and sexual protection, they responded:

"100% not from school. At school when they show, nobody listens. Students only go to skip a class. She [the health educator] was screaming and yelling, but everyone was watching their phone".

Other adolescents added: "Many read on the internet now," showing that using computer technologies for health information is natural to this generation of youth.

**(b) Self-paced and custom-made:** While some participants mentioned that they like to get information about drugs in a group because "other students can add stories," other adolescents stated they prefer the computerized version because of its self-pacing: "Always more interesting to read alone, think...and analyze by themselves."

**(c) Confidential:** Adolescents liked that the computerized format offers confidentiality. "It is good when a person works alone on the computer because there are questions...that are private."

## II. Building social competences and skills vs. providing information

**(a) Assertiveness and resistance to peer pressure:** While the information about risk behaviors per se was not new ("We already know it!"), adolescents appreciated the content on social relationships building and identified it as very useful, particularly (1) how to choose friends (referring to a Prince and Villain exercise that asked adolescents to identify behavior such as "gossiping," "making fun in front of others," "asking your opinion" as things a real friend would or would not do; (2) how to stand up to peers when pressured to do things they do not want to; and (3) how to solve conflicts, especially when saying no.

Adolescents thought that the risk situations in the program were real ("This often happens in life") and unanimously confirmed that peer pressure exists, whether it involves smoking, alcohol, or any other risk behaviors.

"Regarding alcohol, indeed many want to have a drink (выпить), there is a desire like this."

"Older kids will bet, challenge, or humiliate you that you are weak, not a real guy, if you don't drink with them (не понты берут, ты не пиздэн, ты лох). And if a kid is afraid to lose a friend, he will go and have a drink."

Adolescents also observed that teens who are less prepared and less informed about such risks and pressures are more likely to be

**Table 3**  
Correlation table among key youth–caregiver variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<b>Youth-level mediators</b>																	
<b>Personal and social competences</b>																	
1 Assertiveness	1																
2 Self-esteem	.13	1															
3 Prosocial activities	<b>.17*</b>	<b>.29***</b>	1														
<b>Low self-control</b>																	
4 Impulsiveness	.12	<b>-.27***</b>	-.14	1													
5 Risk seeking	<b>.26***</b>	<b>-.19*</b>	.07	<b>.56***</b>	1												
6 Temper	.06	<b>-.29***</b>	-.01	<b>.46***</b>	<b>.60***</b>	1											
<b>Coping skills</b>																	
7 Tension management	-.13	<b>.39***</b>	-.09	<b>-.25***</b>	<b>-.32***</b>	<b>-.43***</b>	1										
8 Positive cognitive restructuring	<b>.26***</b>	<b>.23**</b>	<b>.19**</b>	-.01	.11	.02	<b>-.31***</b>	1									
9 Help seeking (friends)	<b>.22**</b>	.02	<b>.23**</b>	<b>.17*</b>	<b>.16*</b>	.14	<b>-.46***</b>	<b>.68***</b>	1								
10 Avoidance	.13	<b>-.22**</b>	<b>.15*</b>	<b>.20**</b>	<b>.24**</b>	<b>.19**</b>	<b>-.58***</b>	<b>.43***</b>	<b>.60***</b>	1							
<b>Substance use (SU) mediators</b>																	
11 Beliefs approving SU	-.08	<b>-.48***</b>	<b>-.18*</b>	<b>.15*</b>	<b>.23**</b>	<b>.16*</b>	<b>-.25***</b>	-.14	.03	.12	1						
12 Peer pressure for SU	-.01	<b>-.33***</b>	-.04	<b>.30***</b>	<b>.31***</b>	<b>.25***</b>	<b>-.31***</b>	.06	<b>.23**</b>	<b>.24***</b>	<b>.59***</b>	1					
13 SU resistance skills	.11	<b>.22**</b>	.09	-.01	-.07	.00	<b>.22**</b>	.10	-.04	-.10	<b>-.40***</b>	<b>-.27***</b>	1				
<b>Substance use outcomes (past 3 months)</b>																	
14 Substance use intentions	-.07	<b>-.38***</b>	-.13	<b>.24**</b>	<b>.25***</b>	<b>.20**</b>	<b>-.32***</b>	-.07	.15	<b>.17*</b>	<b>.66***</b>	<b>.65***</b>	<b>-.27***</b>	1			
15 Any binge drinking	<b>-.15*</b>	<b>-.20**</b>	-.12	<b>.20**</b>	.09	<b>.20*</b>	<b>-.21**</b>	.02	.13	<b>.15*</b>	<b>.39***</b>	<b>.43***</b>	<b>-.17*</b>	<b>.56***</b>	1		
16 Any drug use	-.06	<b>-.29***</b>	-.15	.14	.03	.12	-.11	<b>-.23**</b>	-.14	-.06	<b>.40***</b>	<b>.25**</b>	-.10	<b>.32***</b>	<b>.29***</b>	1	
17 Any polydrug use	-.03	<b>-.21**</b>	-.12	.09	.02	.11	-.06	-.15	-.11	-.08	<b>.36***</b>	<b>.26***</b>	-.08	<b>.32***</b>	<b>.29***</b>	<b>.88***</b>	1
<b>Covariates</b>																	
18 Family history of alcohol problems	-.02	<b>-.18*</b>	-.04	.04	.05	.04	<b>-.17*</b>	.06	.11	<b>.16*</b>	<b>.16*</b>	<b>.20**</b>	-.10	.14	<b>.20**</b>	.11	<b>.17*</b>

Significant relationships are in bold. \*  $p \leq .05$ , \*\*  $p \leq .01$ , \*\*\*  $p \leq .001$ .



**Table 4**Estimates of the intervention effects (group  $\times$  time interaction) on key outcomes and theoretical mediators

Youth-level mediator variables	Treatment group			Control group			Group $\times$ Wave 2		Group $\times$ Wave 3	
	Wave 1 M (SD)	Wave 2 M (SD)	Wave 3 M (SD)	Wave 1 M (SD)	Wave 2 M (SD)	Wave 3 M (SD)	Cohen's <i>d</i>	<i>p</i>	Cohen's <i>d</i>	<i>p</i>
<b>Personal and social competences</b>										
Assertiveness ( <i>range 1–7</i> )	5.43 (1.39)	5.64 (1.34)	5.48 (1.49)	5.56 (1.18)	5.48 (1.36)	5.51 (1.46)	<b>.21</b>	.231	.07	.687
Self-esteem ( <i>range 20–100</i> )	73.43 (12.18)	75.48 (12.63)	75.33 (12.15)	76.56 (13.69)	75.48 (14.39)	76.09 (12.45)	<b>.22</b>	.096	.18	.200
Prosocial behaviors ( <i>range 0–20</i> ) <i>social connectedness</i>	9.68 (4.14)	9.76 (4.79)	9.09 (6.25)	11.0 (4.0)	11.25 (4.90)	8.38 (5.80)	–.02	.909	<b>.41</b>	.011
<b>Low self-control (<i>range 1–4</i>)</b>										
Impulsiveness	2.19 (.63)	–	2.09 (.69)	2.21 (.64)	–	2.01 (.55)			.14	.446
Risk seeking	2.26 (.64)	–	2.16 (.77)	2.34 (.74)	–	2.20 (.78)			.06	.735
Temper	2.26 (.60)	–	2.07 (.69)	2.12 (.66)	–	2.10 (.67)			–.27	.130
<b>Coping skills (<i>range 1–5</i>)</b>										
Anger and tension management ( <i>e.g., get angry and yell at people, swear, blame others</i> )	3.39 (.90)	3.51 (.84)	3.64 (.87)	3.69 (.99)	3.53 (1.03)	3.64 (.86)	<b>.30</b>	.082	<b>.27</b>	.138
Positive cognitive restructuring ( <i>e.g., try to see the good things in a difficult situation</i> )	3.55 (.87)	3.41 (.86)	3.15 (1.06)	3.34 (1.00)	3.27 (1.06)	3.18 (1.01)	–.10	.544	–.25	.192
Help seeking from friends ( <i>e.g., let off steam by complaining to your friends</i> )	3.20 (.85)	3.02 (.88)	2.92 (1.01)	3.02 (.89)	2.98 (1.01)	3.05 (.96)	–.15	.378	–.29	.107
Avoidance ( <i>e.g., avoid the people who made you feel bad</i> )	2.87 (.79)	2.82 (.74)	2.73 (.87)	2.77 (.93)	2.83 (.86)	2.73 (.82)	–.16	.344	–.06	.782 <i>p</i>
<b>Substance use-related mediators</b>										
Normative beliefs approving substance use ( <i>range 1–4</i> ), 16 items	1.53 .50	1.45 .50	1.45 .50	1.49 .52	1.47 .48	1.39 .46	–.15	.340	.03	.848
Peer pressure for substance use ( <i>range 1–4</i> )	1.62 (.57)	1.57 (.60)	1.53 (.59)	1.54 (.46)	1.64 (.54)	1.60 (.58)	–.26	.083	–.28	.067
Substance use resistance and refusal skills ( <i>range 1–4</i> )	3.54 (.66)	3.72 (.60)	3.57 (.78)	3.48 (.75)	3.55 (.75)	3.68 (.61)	.15	.411	–.25	.162
Substance use intentions ( <i>range 1–4</i> )	1.45 (.50)	1.41 (.55)	1.36 (.54)	1.45 (.46)	1.44 (.50)	1.39 (.47)	–.05	.757	–.02	.902
<b>Substance use outcomes (past 3 months)</b>										
<b>Alcohol use</b>	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	Ratio	<i>p</i>	Ratio	<i>p</i>
Had a binge drinking episode <sup>†</sup> ( <i>had <math>\geq 4</math> drinks within 2 hours</i> ), %	20 (21.98)	9 (11.39)	11 (12.79)	11 (12.79)	11 (13.75)	15 (19.23)	.25	.083	<b>.18</b>	.023
Number of days binge drinking, <i>mean</i> <sup>††</sup> (min 0/max 6)	.36 (.86)	.23 (.82)	.29 (.93)	.30 (.92)	.28 (.84)	.41 (1.06)	1.28	.630	1.36	.489
Maximum number of drinks, <i>mean</i> <sup>††</sup> (min 0/max 7)	.56 (1.39)	.33 (.95)	.34 (1.03)	.61 (1.34)	.60 (1.40)	.72 (1.54)	.90	.782	.79	.538
<b>Drug use<sup>†††</sup></b>										
Any drug use, %	6 (6.98)	10 (13.16)	4 (4.71)	8 (9.88)	8 (10.39)	2 (2.56)	–		–	
Any marijuana use, %	2 (2.35)	4 (5.33)	2 (2.35)	5 (6.17)	3 (3.90)	2 (2.56)	–		–	
Any polydrug use, %	1 (1.15)	3 (3.85)	1 (1.18)	2 (2.38)	3 (3.80)	1 (1.28)	–		–	

Notes: Data are the means with standard deviations, Cohen's *d* as the effect size estimate and *p* values for the intervention group  $\times$  time interaction for each wave. Groups of youth-level mediator and outcome variables are in bold. <sup>†</sup> For binary outcomes, the results are odds ratios. <sup>††</sup> For count outcomes, the results are incidence risk ratios from zero-inflated Poisson regressions. <sup>†††</sup> Due to small numbers, outcomes for drug use were not tested.

\*  $p \leq .05$ , \*\*  $p \leq .01$ , \*\*\*  $p \leq .001$ .

influenced by others. *"All depends on a person, especially if shy... they will make him drunk and that's it (его избухают)."*

While for boys, the opinion of peer groups and friends was very important, for girls the pressure from their boyfriends seemed to have a stronger influence: *"If a girl is in love, nothing is going to help her."*

**(b) Positive social networks and activities:** Due to such pressures, adolescents acknowledged that whom they choose as friends and dating partners affect their exposure to risk situations: *"All depends on your crowd (от компании зависит). With whom you spend time...."* A female adolescent shared that she understood that, *"If a person loves you, they never offer you anything [illicit]... especially at our age."*

Access to positive peer groups was connected with being engaged in prosocial and extracurriculum activities. Youth shared that being involved in social groups or activities, especially sports for boys, was a strong factor that could prevent them from getting engaged in risk behaviors. A male adolescent shared:

*"A friend of mine was smoking for 5 years. Later he even started using drugs (marijuana). He withdrew from friends...lost interest in everything, but he quit soon after joining a basketball team."*

**(c) Independent thinking, decision-making, and goal setting:** In addition to strengthening interpersonal skills, it was important for adolescents to learn how to think for themselves and make their own choices. By simulating country-specific risk situations and scenarios in animated videos, according to adolescents, *"the program shows consequences"* and teaches *"how to control your actions and make better choices."*

Adolescents shared that in families where children are under strict control and parents make all decisions, children might be more influenced by peer pressure because they are not accustomed to making their own decisions (*"When parents prohibit everything, children want to try it even more"*).

While youth acknowledged the importance of family in forming values and norms (*"A lot depends on parents... If nobody is smoking in the family, a kid would not either"*), for adolescents exposed to substance use in the family, it was important to learn to take personal responsibility for their actions not to repeat the cycle: *"It is 50/50....A lot depends on the child too. Parents do not owe you anything. They gave birth to you, gave you a life, and that's it. Teens have to have their own head."*

Finally, a Goal Ladder exercise gave youth an opportunity to think about their vision of the future and set goals for themselves, and do these together with their caregivers: *"I liked that we discussed plans for the future and that my parent does not have to decide everything for me."*

## Discussion

These pilot intervention sessions demonstrated that the intervention is feasible for at-risk adolescents in Kazakhstan. The multimedia approach made the information more engaging for adolescents compared to lecture formats, and provided privacy. The literature supports that computerized interactive interventions are engaging for youth, maintain confidentiality, provide nonjudgmental feedback, and stimulate active and independent problem solving [25,26]. In addition, interactivity permits the development of a self-directed tool that can include additional content tailored to their specific needs of the participant.

The original intervention includes 10–12 sessions, and this study shows that the three pilot sessions produced small size effects on key theoretically relevant mediating variables. The intervention-arm youth demonstrated improved interpersonal competences and skills such as assertiveness and self-esteem that, as illustrated by qualitative interviews, are indispensable in handling peer pressure toward substance use. The intervention-arm adolescents also demonstrated a greater involvement in prosocial activities at home and at school, an important achievement for at-risk youth who are often marginalized. Responses from caregivers, described in a separate manuscript, showed less frequent use of harsh discipline practices, improved supportive parenting, and reduced family conflicts [16]; thus, a more positive family environment could potentially explain promising improvements in youth's temper and anger management. All these potential changes are essential as youth with low self-esteem, history of violence, psychological distress, and low level of family support are more likely to engage in risk behaviors [27]. These findings are in line with the short-term effects of other self-instructional computer-based and family-focused substance use preventive interventions with high-risk adolescents [28,29], that could be further strengthened by including additional culturally relevant and gender-tailored content with subsequent refresher sessions to boost the effects over time as children face new risks [30].

The qualitative interviews showed that adolescents needed guidance in navigating social relationships beyond child–parent interactions. While the original intervention did not incorporate peers, older siblings, or other family members and was primarily built on child–mother relationships, future sessions adapted for the Kazakhstani content should incorporate a wider range of role model characters, which could be particularly essential for adolescents with substance using parents who can benefit from supportive relationships with other adult family members (e.g., grandparents).

Caregivers, who grew up primarily during the Soviet era without daily exposure to drug use or HIV risk situations like the generation of their children, are not accustomed to openly discuss HIV and drug prevention issues in the family. In a more culturally traditional environment of Central Asia, some parents tend to protect their children by overly controlling them and limiting their knowledge about such situations. Qualitative interviews with youth suggested that such overly protective approach might put some youth even at higher risk due to their limited awareness about potential risks and their unpreparedness to face risk exposure situations.

Transition to drug use typically occurs later in life, so changes in drug use were too early to detect, while declines in drinking patterns were imperative. Kazakhstan has one of the highest alcohol consumption rates and binge drinking rates worldwide [31]. Since the drinking age is not enforced [31], Kazakhstani adolescents begin drinking early (33% of 15–17-year olds reported ever drinking alcohol) and are exposed to strong drinks like vodka (25%) [10].

Unexpectedly, adolescents in the intervention group showed a lower score in peer resistance skills. Since baseline scores in both the control and intervention groups were very high, this reduction could be associated with more realistic assessment of the tensions and complexities of risk situations and relationships, as well as personal capabilities and the difficulties of resistance.

**Limitations.** The study was not powered to detect behavioral changes, and included only a sample of pilot sessions,

precluding us from assessing the full potential of the intervention. While the intervention dropout rates were minimal during the pilot phase, the future trial should take into account that the percentage of families that complete all intervention sessions could potentially decrease once more sessions are included. Given that it was a feasibility study, biological testing of outcomes (e.g., drug testing) was not used to verify youth's self-report data. Finally, the original intervention did not account for a large number of participants who witnessed or experienced violence. Future interventions could add sessions that address trauma, as focusing on resistance to peer pressure may not address the needs of adolescents with a history of trauma, who often use substances as a way of coping.

Using multimedia computer technology and combining a skills-based approach with family involvement strategies could be a promising path toward developing an engaging, cost-effective tool with high fidelity and easy scalability to address the dual risk of HIV and substance use among at-risk youth across Kazakhstan and the entire Central Asian region.

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### Supplementary Data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.jadohealth.2018.04.005>.

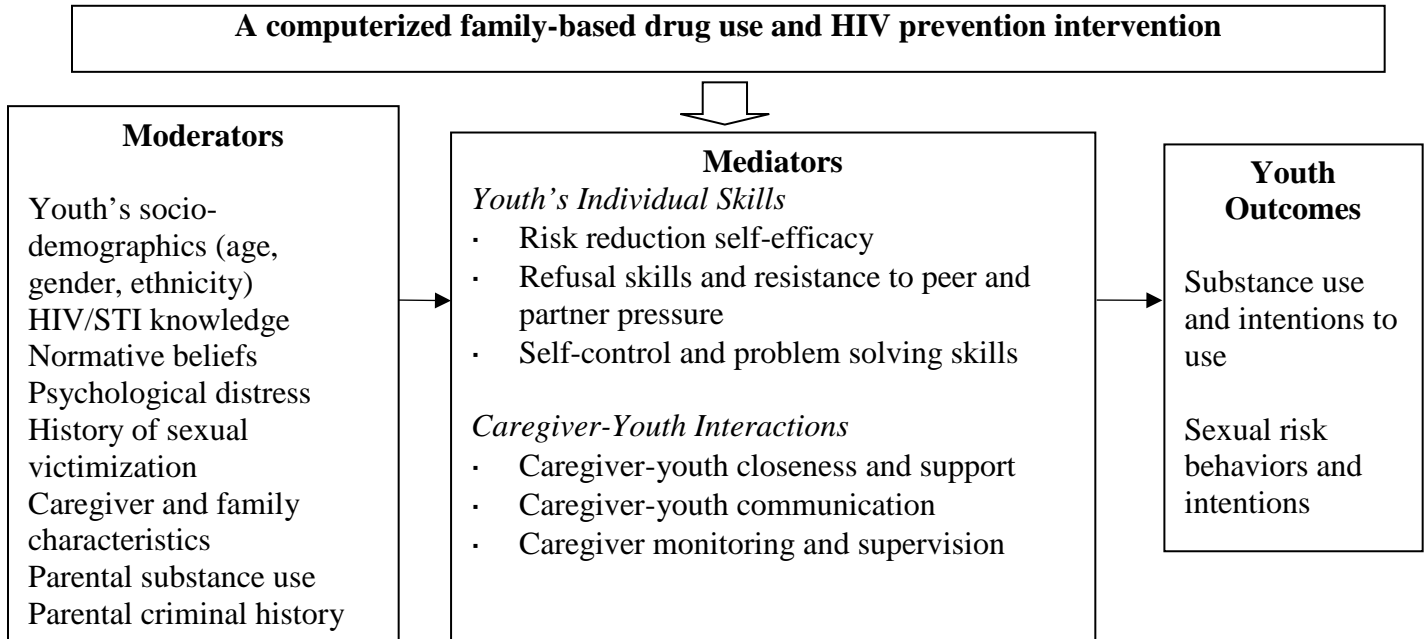
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## Appendix A, Supplementary Materials

### Conceptual Model



## **Appendix B, Supplementary Materials**

### ***Development and Adaptation Phase:***

In order to adapt, program and pre-test the KFT intervention, the formative phase included on-going work with two (Youth and Expert) Community Collaborative Boards, focus group interviews with at-risk youth and caregivers, and usability testing. First, we convened two Community Collaborative Boards (CCB) with about 7–10 members each: 1) *Expert CCB*, consisting of health education professionals working with at-risk families and youth and 2) *Youth CCB*, which included male and female 14–17 year old adolescents. Further, we conducted three rounds of focus group interviews with at-risk youth (n=20) and caregivers (n=20) (who were not members of either CCB) to collect information about youths' risk behaviors and social and family situations related to sex, drinking, drug use, and peer pressure. Following the qualitative phase, the investigative team worked jointly with the CCBs to culturally adapt and refine content for three multimedia pilot sessions that included storylines, skill demonstrations, exercises, quizzes, and games. Following the NIH guidelines for usability testing<sup>1</sup>, the beta version of these computerized sessions was pre-tested with six adolescent-caregiver dyads (mixed by age and gender) who met the same eligibility criteria but were excluded from the main RCT. Refined and finalized versions of the program were saved on USB flash drives so they could be available in settings with poor Internet connectivity.

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<sup>1</sup> Usability.gov: Your resource for designing usable, useful and accessible Web sites and user interfaces. U.S. Department of Health and Human Services.