Published in final edited form as:

J Child Adolesc Subst Abuse. 2014 ; 23(4): 253–261. doi:10.1080/1067828X.2013.786939.

Community Influence on Youth's Use of Inhalants and Other Legal Products to Get High in Rural Alaska

DAVID COLLINS, Ph.D.,

Pacific Institute for Research and Evaluation – Louisville Center, 1300 S. Fourth Street, Ste. 300, Louisville, KY 40208, (502) 238-7338, collins@pire.org

BRIAN SAYLOR, Ph.D., MPH, and

Institute for Circumpolar Health Studies, University of Alaska Anchorage (Retired)

KNOWLTON JOHNSON, Ph.D.

Pacific Institute for Research and Evaluation – Louisville Center

Abstract

This study examines the use of inhalants and other harmful legal products (HLPs) to get high among pre-adolescents in frontier Alaska communities. Community factors that may influence use of HLPs are highlighted. This study uses secondary data from two NIH studies in 19 Alaska communities. A hierarchical generalized linear modeling technique was used to model community level effects on HLP use. The results show that lifetime use was reported by 18% of the pre-adolescents. Pre-adolescents in “dry” communities (with laws restricting alcohol use) had much higher lifetime and past 30-day HLP use. The results suggest that additional study of the relationship between use of HLPs and local laws governing availability is warranted.

INTRODUCTION

Inhalants and other legal products that youth may use to get high are categorized in this study as harmful legal products (HLPs). Inhalants represent one of the most often recognized types of HLPs. Most inhalants are solvents, which can dissolve a number of other substances (Alberta Alcohol and Drug Abuse Commission, 2004). Examples include gasoline, paint thinners, and model airplane glue. Other inhalants include aerosols, nitrites, and anesthetics (Center for Substance Abuse Treatment, 2003; Wu, Schlenger, & Ringwalt, 2005). Other types of harmful legal products can be abused by ingestion. These include some common household products, such as mouthwash and disinfectants (Egbert, Liese, Powell, Reed, & Liskow, 1986; Vinje & Hewitt, 1992), and prescription and non-prescription (or over-the-counter) drugs (Boyd, McCabe, Cranford, & Young, 2007; Crouch, Caravati, & Booth, 2004).

Inhalant abuse can result in serious organ system dysfunction or even sudden death (Bowen, Daniel, & Balster, 1999; Kurtzman, Otsuka, & Wahl, 2001). Nonmedical use of prescription drugs may result in cardiovascular failure, seizures, physical dependence and addiction

(NIDA, 2005), and alterations in mental status that may contribute to judgment impairment leading to injury or fatality (Friedman, 2006). Abuse of non-prescription (or over-the-counter) drugs can result in serious health consequences (Crouch et al., 2004), and the same is true for common household products (Egbert, Reed, Powell, Liskow, & Liese, 1985). Effective prevention efforts may help avoid these potential health consequences of harmful legal product abuse.

Concerns about the use of harmful legal substances by Alaskan children have been raised by behavioral health providers in Alaska over the years. Reports of death from inhalant use (mostly gasoline huffing) have been published in the media. Despite these reports and concern, there is little data on the extent of use of these substances among Alaska's youth, especially preadolescents.

Community factors have been found to influence the extent of substance use in general among adolescents (Hays, Hays, & Mulhall, 2003), although no study has focused on community factors as predictors of HLP use. It is important to better understand the community factors that may influence use of HLPs. Understanding the factors which influence the use of HLPs among pre-adolescents is especially important in Alaska. Among frontier Alaskan communities, over 17% of pre-adolescents reported HLP use in an earlier Alaska study of four communities (Saylor et al., 2007). The study includes ecological factors which have been found to contribute to substance use and engagement in preventive programs. For the current study, we limited the wide range of community factors that have been found to be associated with substance use among adolescents.

Foremost, we were interested in community influence in the form of local laws governing the availability of alcohol. Laws associated with drug use have been found to be related to substance use behavior (Arthur, Hawkins, Pollard, Catalano, & Baglioni, 2002). In Alaska, such laws are important in establishing local control on the availability of alcoholic beverages in rural Alaskan communities. They give rural Alaskans the authority to restrict the sale, importation, and distribution of alcoholic beverages within their jurisdictions. Communities that prohibit the sale and importation of alcoholic beverages are called "dry" communities. Those that prohibit the sale but allow possession of alcoholic beverages are called "damp," and those with no restrictions are called "wet" communities. "Dry" or "damp" communities have lower rates of violent deaths (Berman, Hull, & May, 2000; Landen et al., 1997) and lower use of outpatient clinics (Chiu, Perez, & Parker, 1997).

We are also interested in examining the relationship between Alaska community factors and youth's use of HLPs including (a) proportion of minorities in the community; (b) proportion of female-headed households in the community; (c) income; and (d) civic participation. In the U.S., blacks, Hispanics, American Indians/Alaska Natives, and other minorities often bear a disproportionate burden of disease, injury, premature death, and disability. For persons of these racial/ethnic minority populations, health disparities can mean lower life expectancy, decreased quality of life, and loss of economic opportunities (Centers for Disease Control and Prevention, 2004). This study attempted to see if the extent of minorities in a rural Alaskan population had an influence on the use of HLPs among pre-adolescent youth.

Children living in single-parent families are more likely to experience a number of negative outcomes. Some research has indicated that children in single-parent families are at greater risk of emotional problems and academic difficulties than those in intact two-parent families. Single-parent families also face more difficulties in monitoring the activities of and spending time with their children. Monitoring of children has been shown to be a protective factor in preventing and reducing risks for substance abuse (Bahr, Hoffmann, & Yang, 2005). Conversely, lack of maternal involvement in a child's life has been found to be a risk factor for his or her later substance abuse (Swaim, 1991).

Poverty has long been considered a main determinant of health. A study of ecological factors contributing to substance abuse among Tennessee adolescents confirmed this relationship (Jones, Heflinger, & Saunders, 2007). The authors found that the largest effect among community-level predictors for identification and engagement in substance abuse treatment among adolescents was median family income.

Regarding civic participation, the potential to change individual risk behavior is considered within the social and cultural context in which it occurs (Goodman, Wandersman, Chinman, Imm, & Morrissey, 1996). Community coalitions have been found to be important in improving the success of prevention projects, due, to some extent, to the increased communication among community residents in assessing the community's stage of readiness and its competence to address pressing social concerns. The link between this increased communication and voter participation as an indicator of community communication was highlighted by an experimental study which extended the traditional participation game to allow for "neighborhood information exchange" (NIE) (Grober & Schramm, 2006). This study found substantially higher turnout when information is exchanged than is usually observed in experimental participation games. This study uses voter participation as a community measure of community civic participation.

In summary, the purpose of this exploratory study is twofold. First, the study is to increase the empirical knowledge about the use of HLPs among younger youth including inhalants, prescription drugs, non-prescription drugs, and common household products in frontier Alaska. Second, it is important to examine the extent to which a set of community level factors predicts HLPs use. Two specific research questions guided this investigation. Among pre-adolescents in frontier Alaska:

- Q1** What is the extent of use of HLPs (harmful legal products) to get high?
- Q2** To what extent do community factors predict the use of HLPs to get high?

METHODS

Sample

The sample for this study consists of 5th and 6th grade students in Alaska communities involved in two National Institute on Drug Abuse funded studies. Study 1 was a feasibility study involving four Alaska frontier communities from 2004-2007 in an intervention study of pre-adolescents' use of HLPs (Johnson et al., 2007; Saylor et al., 2007; Gruenewald et al., 2009). The four communities that participated were regional centers (with 2,000 or more

residents in the immediate community). Study 2 was a second intervention study that involved 15 smaller Alaska communities from 2005-2008 and was also concerned with pre-adolescents' HLP use (Johnson et al., 2010). In Study 2, nine of the fifteen communities were villages (with between 25 and 500 residents), two were towns (with between 500 and 2,000 residents), and four were regional centers (with 2,000 or more residents). Tables 1 and 2 in the results section provide descriptions of the community sample (n=19) and the student sample (n=834). The numbers of students in Study 1 and 2 were 342 and 492, respectively.

Dependent Variables

We used single dichotomous measures for lifetime and past 30-day use of inhalants, prescription drugs, non-prescription drugs, and household products. We also computed a composite measure for lifetime use by coding a "1" if the respondent reported using any of the four types of HLPs asked about in the survey and "0" if none were reported as being used. In our final analyses, we only used past 30-day use for the composite HLPs use measure, due to the low base rates of past 30-day use of the specific types of HLPs. We also measured, for comparison, lifetime alcohol use, and lifetime tobacco use. The latter variable was coded as "1" if the respondent reported using either cigarettes or smokeless tobacco and was coded as "0" if no use was reported.

Predictor Variables

The community factors used in this study are shown in Table 1. These factors were alcohol availability laws ("dry" = 1; "wet" or "damp" = 0), percent minority population (specifically the percent Alaska Native population), percent single female-headed households, median household income, and civic participation (specifically average voter turnout). We converted the continuous predictors to z-scores prior to running all models. This ensured that the odds ratios associated with dichotomous predictors would be more readily interpretable. (For example, the increased odds of using a substance associated with living in a dry versus wet/damp community.) We also controlled for community size (as measured by 5th and 6th grade enrollment) as a community-level characteristic in all of the models.

Covariates

When examining the community-level predictors' effects on substance use, we controlled for three individual characteristics: gender (1 = male, 0 = female), grade (1 = 6th grade, 0 = 5th grade) and ethnicity (1 = Alaska Native, 0 = non-Alaska Native, with the latter consisting of those who responded to six other standard ethnicity categories).

Data Collection

Community data were obtained from publicly available administrative data sets (Patton & Sawicki, 1993). Specifically, administrative data available online for each of the 19 communities included Alcoholic Beverage Control Board data (for local alcohol availability laws), the 2000 Census (for percent Native Americans, percent female-headed households in 2000, and median household income in 1999) and 2000 election data (for voter turnout). Data from student surveys were collected from samples of students in grades 5 and 6 at baseline in each of the two studies. Across the communities, the school districts, which

encompassed all regular public schools, were recruited to participate. All students enrolled in these grades in the participating schools were invited to be in the survey. Student surveys were administered during the school day in a designated class, mainly health classes. In both studies, the same consent and survey administration protocols were used.

Response rates for the HLPs use baseline data collection of the two studies were 51% for Study 1 and 75% for Study 2. In both studies, active written parental consent was required based on an Alaska state statute. This type of consent process has been shown to reduce response rates significantly (Johnson et al., 1999; Courser, Shamblen, Lavrakas, Collins, & Ditterline, 2009). In Study 2, the response rate was higher due in part to the study also including smaller communities with less history of study surveys, and the increased Alaska-based research team experience in gaining community support for a study survey.

Data Preparation and Analysis

Secondary data with the same measures were used in the analysis. Baseline data from both Study 1 and 2 were used in the analysis for this article. The total sample size was 834 when combining the baseline data from the two NIDA studies. We used a set of post-stratification sample weights in both studies to adjust the parameter estimates for survey data, since we knew that our sample under-represented Alaska Natives. Specifically, Alaska Natives—including Yup'ik people from Southwest Alaska, Tlingit and Haida people from Southeast Alaska, Aleut people from the Aleutian Chain, and Athabascan people from the Interior of the State—represented about 35% of our sample, as compared to approximately 56% in the communities themselves. The sample weights were developed using data from the Alaska Department of Education and Early Development (2010). Census data, while readily available, did not contain demographic data at the school level. Therefore, Department of Education data was considered to be the most applicable data set for calculating sample weights. From these data we took the counts of Alaska Native and non-Alaska Native students in grades 5 and 6 and determined the probability of selection and the appropriate level one weights. All analyses used weighted data.

To estimate the extent of substance use, we computed proportions or percent of use for the total sample in both studies. We examined whether there were any significant differences in the percent use between the two study samples using chi square analyses.

To assess the extent to which community factors predict the use of HLPs among pre-adolescents in 19 communities, we used hierarchical generalized linear modeling (HGLM) (Raudenbush & Bryk, 2002). Students attending school were nested within 19 communities. As described earlier, the same student survey was administered in both studies. We ran HGLM models with random intercepts as we suspect there is variability among communities on the outcomes of interest.

We used linear regression analyses of lifetime and past 30-day HLP use to test for collinearity problems before conducting the HGLMs. In the HGLM analyses, each dependent variable was regressed onto the five community-level (i.e., level two) predictors, one community-level characteristic, and three individual (i.e., level one) characteristics. All level two predictors were posed as predictors of the level one intercept. A random intercept

was used to deal with random variability in substance use, due to student nesting within a community. All analyses weighted individual observations by the inverse of their probability of selection.

Following these analyses, we also compared the extent of HLPs use for wet/damp versus dry communities via mean percents. These comparisons were conducted for lifetime and past 30-day use of HLPs.

RESULTS

Table 1 presents descriptive statistics for the community factors we examined for the 19 communities. The percent of dry communities (versus wet or damp) was 32%, with 6 of 19 communities being dry. The average percent Alaska Native population across the communities was 56%. The average percent of single female-headed households was 10%. The average median household income was \$45,100, and the average voter turnout was 50%. Table 1 also shows the range across communities for each of these factors.

Table 2 presents descriptive characteristics of the students in the two study samples. The proportion of Alaska Native students was 31% in Study 1 and 38% in Study 2. The percent male was 44% in Study 1, and 50% in Study 2. The proportion of students in grades was roughly the same in the two studies (51% in 5th grade in Study 1, and 53% in Study 2). The means and proportions in Tables 1 and 2 are for the sub-groups (Study 1 and Study 2) and for the total across both studies—the totals consist of 19 communities (Table 1) and 834 pre-adolescents (Table 2).

Extent of HLP Use

Table 3 shows that lifetime self-reported HLP use was 18% for the total sample. Past 30-day HLP use was 9% for the total sample. Six percent (6%) of preadolescents had used inhalants in order to get high (lifetime) and six percent (6%) had used household products to get high. Nine percent (9%) of preadolescents used prescription drugs in order to get high (lifetime), and 8% used non-prescription drugs. Table 3 also shows there was a difference that approached a significant level between the two study samples for lifetime prescription drug use ($p=.09$). In the Study 1 sample, 7% reported prescription drug use, compared to 11% in the Study 2 sample. There was a statistically significant difference between the two study samples for lifetime tobacco use ($p = .01$). Lifetime tobacco use was 7% in the Study 1 sample, but 13% in the Study 2 sample.

Community-Level Predictors of HLP Use

Table 4 presents unstandardized parameter estimates that reflect differences in the odds of using HLPs for five community-level predictors, controlling for the effects of one community-level covariate, and the three individual-level covariates. Results for lifetime and past 30-day (composite) HLP use are followed by results for lifetime use of each of the four types of harmful legal products (inhalants, prescription drugs, non-prescription drugs, and common household products) that made up the composite outcome variable.

These results show that living in a community that is dry or has a higher median household income was associated with greater odds of lifetime HLP use (7.17 greater odds for residing in a dry community; and odds = 1.72 for each standard deviation increase in median household income, respectively). However, being in a community with higher percentages of Alaska Native residents was associated with lower odds of lifetime HLP use (odds = 0.68 for each standard deviation increase in percent Alaskan Native population).

For past 30-day HLP use, residing in a dry community and in a higher median household income community were associated with greater odds of HLP use (3.78 greater odds for residing in a dry community; and odds = 1.67 for each standard deviation increase in median household income).

We also conducted a comparison of the proportions reporting HLP use for residing in wet/damp versus dry communities. This comparison showed that lifetime HLP use in wet communities (n=13) was 17%, while in dry communities (n=6) lifetime HLP use was 26%; across all communities, the proportion reporting lifetime HLP use was 18%. For past 30-day HLP use, the rates were 8% in wet communities, and 11% in dry communities; across all communities, the rate was 9%.

Examining results for the individual types of HLPs, residing in a dry community was associated with greater odds of lifetime *inhalant* use (4.70 greater odds). For lifetime *household product* use, living in a dry community (29.03 greater odds), or in a community with a higher median household income (odds = 2.00 for each standard deviation increase), or higher voter turnout (odds = 1.37 for each standard deviation increase) were associated with greater odds of use. However, living in a community with a higher proportion of Alaska Natives was associated with lower odds of *household product* use (odds = 0.27 for each increase in proportion of Alaska Natives in the community). Living in a dry community was associated with greater odds of lifetime *prescription drug* use (6.12 greater odds). Living in a community with a higher proportion of Alaska Natives was associated with lower odds of *non-prescription drug* use (odds = 0.54 for each standard deviation increase), while living in a community with higher median household income and greater voter turnout was associated with greater odds of such use (odds = 1.70 for each increase in median household income, and odds = 1.40 for each increase in voter turnout).

DISCUSSION

Extent of HLPs Use

When comparing our results based on 19 communities in Alaska to national study results for youth's extent of HLPs use for inhalant and prescription drugs without a prescription, we found the extent of inhalant use to be similar and higher for prescription and non-prescription (or over-the-counter) drugs. According to the 2006-2008 National Surveys on Drug Use and Health, 6.9% of 12-year-olds had used inhalants in their lifetime. This number is very similar to the 6% rate of inhalant use found in this study. For use of prescription drugs without a prescription among Alaskan pre-adolescents, the percentage is considerably higher than found in the 2006-2008 NSDUH survey of 12-year-olds (9% compared to 5.1%). The overall use of non-prescription (or over-the-counter) drugs among Alaskan pre-

adolescents is higher than results from a study which examined the use of non-prescription cough and cold treatments among high school students in Columbus, Ohio. Steinman (2006) found that 4.7% of high school students occasionally misuse non-prescription drugs to get high. The Alaskan result shows lifetime use among pre-adolescents at 8%, almost double the rate shown in Steinman's study. There was no comparable result on the use of common household products with which to compare the lifetime use among adolescents.

Although there are no comparable results for overall use for the four types of HLPs measured in this study, we believe the overall use of HLPs among pre-adolescents in rural Alaska is high. The results show that one in five (18%) pre-adolescent Alaskan students in rural communities used some kind of harmful legal product during his or her lifetime. While the lifetime use of each of the four categories of substances (inhalants, prescription drugs, non-prescription drugs, and common household products) ranges between 6% and 9% of all students, the proportion of pre-adolescent Alaskan students using HLPs was far greater than expected. It should also be noted that in the Study 2 sample, the proportion of pre-adolescents reporting use of some kind of harmful legal product (lifetime) was 20% as compared to 17% in Study 1 sample. While this difference between the two samples was not statistically significant, it may be related to the size of the communities that were included in the two studies (the 2006 study included communities that were much smaller on average than those in the 2004 study). Community level variables that could help us better understand the factors associated with this difference are explored further in the HLM analyses.

Predictors of HLPs Use

Human ecology literature confirms that community factors influence social behavior. In this study, the strongest and statistically most significant predictor of HLP use was community laws about the use and distribution of alcohol. However, we did not expect the consistent relationship between a community's "dry" law and the much higher lifetime and past 30-day use of HLPs. This relationship was present as well in the examination of the lifetime use of three of the four specific types of HLPs (the only exception being non-prescription drug use).

This phenomenon has been found in economic studies of the relationship between the price of alcohol and the use of marijuana (DiNardo & Lemieux, 2001; Chaloupka & Laixuthai, 1994). The results from this study suggest that there may be some unintended consequences of Alaska's local option authority. The intent of these laws is to allow communities to adopt measures to realize the public objective of protecting the public health and safety of the community by reducing the availability of beverage alcohol. Our results call into question the effectiveness of these laws in realizing this public objective, at least insofar as pre-adolescents are concerned. We might suggest that if pre-adolescents in dry communities have a higher probability of using HLPs to get high than their counterparts in wet and damp communities, local option laws may be only a part of the solution. Perhaps other means of restricting the availability of these products by local institutions and retailers would be an effective intervention.

Our results showed that percent Alaska Native at the community level was somewhat associated with harmful legal product use. This was the case for lifetime HLP use, lifetime household product use, and lifetime non-prescription drug use. For each of these outcomes, the relationship was such that the higher the percent Alaska Native population, the lower the odds of lifetime HLP use, non-prescription drug use, and household product use. The community level differences in HLPs use associated with the proportion of Alaska Natives in the population do not support the common perception that Alaska Natives living in rural communities are more likely than non-Alaska Natives to use available substances in order to get high. This may be because many of the participating rural Alaskan communities are majority Alaska Native, and therefore do not experience the pressures faced by minority populations in larger mixed-race communities.

The proportion of single female-headed households in a community was not a significant predictor of HLP use among pre-adolescents. The close social cohesion of rural Alaska Native communities may help support collective child rearing and disciplinary functions.

We also found that median household income was significantly associated with lifetime HLP use, past 30-day HLP use, lifetime household product use, and lifetime non-prescription drug use. The relationships for these substances were positive, indicating that higher community level income was associated with higher use of these substances. While it may seem counterintuitive that higher community level income is associated with higher use of HLPs, Hays, Hays, and Mulhall (2003) reported in a study of alcohol and other drug use in Illinois counties that greater economic constraints were found to decrease rather than increase substance use.

Community participation in alcohol prevention programs is often seen as a valuable programmatic element in youth substance abuse prevention programs (Johnson et al., 2007). We examined the extent of community participation in civic affairs (Goodman et al., 1996; Grober & Schramm, 2006) using voter turnout, a reasonable indicator of the extent of civic participation. Our results show that voter turnout only appeared slightly related to the lifetime use of household products and non-prescription drugs by pre-adolescents “in order to get high” and the relationship was positive, meaning that in communities with greater voter turnout, the use of these products was higher. This is an important finding because of the high costs of garnering community support for substance abuse prevention projects. The emphasis on community mobilization and involvement demands that prevention program sponsors and workers devote substantial resources to coalitions. Our result brings into question the value of the investment in time and energy in soliciting community support for prevention projects; this is consistent with some recent publications also calling this investment into question (Hallfors, Cho, Livert, & Kadushin, 2002).

CONCLUSIONS

This study is not without limitations. The cross-sectional design and issues with parental consent presented formidable challenges for the researchers and urge some caution in interpreting these results. First, these data come from baseline surveys of students participating in two separate but related studies (Johnson et al., 2007; Johnson et al., 2010)

of the use of HLPs among pre-adolescent Alaskan students. The results presented here are based on cross-sectional data collected at specific points in time. Therefore, there is no dimension of time that would allow causal inferences to be made. In addition, Alaska laws requiring parental consent for student participation in the study both reduced the number of subjects and may have introduced a bias into the data. There were problems with securing parental consent for participation in the first of the two studies that involved larger Alaskan communities. This resulted in lower than expected participation in the student survey. There may be an undetectable difference between the use patterns of those students surveyed and those students whose parents did not return consent forms. The existence or impact of this potential bias is not known.

Even with these limitations, this study is one of the first careful examinations of the nature and extent of HLP use, especially non-prescription drug and common household product use, by pre-adolescents. Further, these results that are based on data from rural communities may be applicable to other rural, remote, or culturally distinct populations. Additional work should be done to better understand this phenomenon. The study also revealed that HLPs may be a substitute for alcohol in dry Alaskan communities. It has been thought that communities could protect public health and safety by reducing the availability of alcoholic beverages. This study suggests that the substitution effect may partially defeat that policy objective. This warrants further research.

Acknowledgments

Preparation of this manuscript was supported in part by the National Institute on Drug Abuse grants R01 DA015966 and R01 DA019640, K. Johnson, PI. We wish to acknowledge Shannon Deike-Simms for his assistance in the preliminary analyses, Kristen Ogilvie, Diane Ogilvie and Stephen Shamblen for their revising various drafts, and Susan Squires and Chris Bayer for copyediting and formatting. We also wish to express our appreciation to the school personnel and students who made this study possible.

References

- Alaska State Department of Education and Early Development. Alaska's report card to the public. 2010. Accessed at <http://www.esed.state.ak.us/stats/>
- Alberta Alcohol and Drug Abuse Commission. Beyond the ABC's: Solvents/inhalants. 2004. Accessed at <http://www.aadac.com>
- Arthur MW, Hawkins JD, Pollard JA, Catalano RF, Baglioni AJ Jr. Measuring risk and protective factors for substance use, delinquency, and other adolescent problem behaviors: The Communities that Care Youth Survey. *Evaluation Review*. 2002; 26(6):575–601. [PubMed: 12465571]
- Bahr SJ, Hoffmann JP, Yang X. Parental and peer influences on the risk of adolescent drug use. *The Journal of Primary Prevention*. 2005; 26(6):529–551. [PubMed: 16228115]
- Berman M, Hull T, May P. Alcohol control and injury death in Alaska Native communities: Wet, damp and dry under Alaska's local option law. *Journal of Studies of Alcohol and Drugs*. 2000; 61(2):311–319.
- Bowen SE, Daniel J, Balster RL. Deaths associated with inhalant abuse in Virginia from 1987 to 1996. *Drug Alcohol Depend*. 1999; 53(3):239–245. [PubMed: 10080050]
- Boyd CJ, McCabe SE, Cranford JA, Young A. Prescription drug abuse and diversion among adolescents in a southeast Michigan school district. *Archives of Pediatrics & Adolescent Medicine*. 2006; 161:276–281. [PubMed: 17339509]
- Center for Substance Abuse Treatment. Substance abuse treatment advisory: Inhalants. 2003. Accessed at www.samhsa.gov

- Centers for Disease Control and Prevention. Health disparities experienced by racial/ethnic minority populations. *Morbidity and Mortality Weekly Report*. 2004; 53(33):755.
- Chaloupka, FJ.; Laixuthai, A. Social Science Research Network. Do youths substitute alcohol and marijuana? Some econometric evidence. Feb 1. 1994 NBER Working Paper No. W4662. Accessed at <http://ssrn.com/abstract=227964>
- Chiu AY, Perez PE, Parker RN. Impact of banning alcohol on outpatient visits in Barrow, Alaska. *Journal of the American Medical Association*. 1997; 278(21):1775–77. [PubMed: 9388156]
- Courser MW, Shamblen SR, Lavrakas PJ, Collins D, Ditterline P. The impact of active consent procedures on nonresponse and nonresponse error in youth survey data: Evidence from a new experiment. *Evaluation Review*. 2009; 33(4):370–395. [PubMed: 19506295]
- Crouch BI, Caravati EM, Booth J. Trends in child and teen nonprescription drug abuse reported to a regional poison control center. *American Journal of Health-System Pharmacy*. 2004; 61:1252–1257. [PubMed: 15259755]
- DiNardo J, Lemieux T. Alcohol, marijuana, and American youth: The unintended consequences of government regulation. *Journal of Health Economics*. 2001; 20(6):991–1010. [PubMed: 11758056]
- Egbert AM, Liese BA, Powell BJ, Reed JS, Liskow BI. When alcoholics drink aftershave: a study of nonbeverage alcohol consumers. *Alcohol & Alcoholism*. 1986; 21:285–294. [PubMed: 3768103]
- Egbert AM, Reed JS, Powell BJ, Liskow BI, Liese BS. Alcoholics who drink mouthwash: The spectrum of nonbeverage alcohol use. *Journal of Studies on Alcohol*. 1985; 46(6):473–481. [PubMed: 4087909]
- Friedman RA. The changing face of teenage drug abuse: The trend toward prescription drugs. *New England Journal of Medicine*. 2006; 354(14):1448–1450. [PubMed: 16598042]
- Goodman RM, Wandersman A, Chinman M, Imm P, Morrissey E. An ecological assessment of community-based interventions for prevention and health promotion: approaches to measuring community coalitions. *American Journal of Community Psychology*. 1996; 24(1):33–61. [PubMed: 8712187]
- Grober J, Schramm A. Neighborhood information exchange and voter participation: An experimental study. *The American Political Science Review*. 2006; 100(2):235–249.
- Gruenewald PJ, Johnson K, Shamblen SR, Ogilvie KA, Collins D. Reducing adolescent use of harmful legal products: Intermediate effects of a community prevention intervention. *Substance Use & Misuse*. 2009; 44(14):2080–2098. [PubMed: 20001696]
- Hallfors D, Cho H, Livert D, Kadushin C. Fighting back against substance abuse: are community coalitions winning? *American Journal of Prevention Medicine*. 2002; 23(4):237–45.
- Hays SP, Hays C, Mulhall PF. Community risk and protective factors and adolescent substance use. *Journal of Primary Prevention*. 2003; 24(2):125–142.
- Johnson K, Bryant D, Rockwell E, Moore M, Straub BW, Cummings P, Wilson C. Obtaining active parental consent for evaluation research: A case study. *American Journal of Evaluation*. 1999; 20(2):239–249.
- Johnson K, Courser M, Holder H, Miller B, Ogilvie K, Moore R, Collins D, Saltz B. A community prevention intervention to reduce youth from inhaling and ingesting harmful legal products. *Journal of Drug Education*. 2007; 37(3):227–247. [PubMed: 18047181]
- Johnson KW, Ogilvie KA, Collins DA, Shamblen SR, Dirks LG, Ringwalt CL, Norland JJ. Studying implementation quality of a school-based prevention curriculum in frontier Alaska: Application of video-recorded observations and expert panel judgment. *Prevention Science*. 2010; 11(3):275–286. [PubMed: 20358287]
- Jones DL, Heflinger CA, Saunders RC. The ecology of adolescent substance abuse service utilization. *American Journal of Community Psychology*. 2007; 40:345–358. [PubMed: 17906925]
- Kurtzman TL, Otsuka KN, Wahl RA. Inhalant abuse by adolescents. *Journal of Adolescent Health*. 2001; 28:170–180. [PubMed: 11226839]
- Landen MG, Beller M, Funk E, Propst M, Middaugh J, Moolenaar RL. Alcohol-related injury death and alcohol availability in remote Alaska. *Journal of the American Medical Association*. 1997; 278(21):1755–58. [PubMed: 9388152]

- National Institute on Drug Abuse. Research report series: Prescription drugs: Abuse and addiction. Washington, DC: 2005.
- Patton, CV.; Sawicki, DS. Basic methods of policy analysis and planning. 2. Upper Saddle River, NJ: Prentice-Hall; 1993.
- Raudenbush, SW.; Bryk, A. Hierarchical linear models. 2. Newbury Park, CA: Sage; 2002.
- Saylor B, Fair M, Dieke-Sims S, Johnson K, Ogilvie K, Collins D. The use of harmful legal products among pre-adolescent Alaskan students. *International Journal of Circumpolar Health*. 2007; 66(5): 425–436. [PubMed: 18274208]
- Steinman KJ. High school students' misuse of over-the-counter drugs: A population based study in an urban county. *Journal of Adolescent Health*. 2006; 38(4):445–447. [PubMed: 16549309]
- Swaim RC. Childhood risk factors and adolescent drug and alcohol abuse. *Educational Psychology Review*. 1991; 3(4):363–397.
- Vinje G, Hewitt D. Influencing public health policy through action-oriented research: A case study of Lysol abuse in Alberta. *Journal of Drug Issues*. 1992; 22(1):169–178.
- Wu LT, Schlenger WE, Ringwalt CL. Use of nitrite inhalants ("poppers") among American youth. *Journal of Adolescent Health*. 2005; 37(1):52–60. [PubMed: 15963907]

Table 1

Community Factors in the Two Study Samples.

	2004 Alaska Youth Survey ¹	2006 Alaska Youth Survey ²	Total
Community Factors	(N=4)	(N=15)	(n=19)
	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
Alcohol Availability Laws (Dry versus wet or damp)	25%	33%	32%
	<u>Mean (range)</u>	<u>Mean (range)</u>	<u>Mean (range)</u>
Percent Minority (Percent Alaska Native Population)	45.7 (23-77)	58.2 (9-98)	55.6 (9-98)
Percent Female-Headed Households (Percent Single Female Headed Households)	12.0 (7-21)	10.0 (4-20)	10.4 (4-21)
Income (Median Household Income in thousands of dollars)	53.6 (46-59)	42.8 (26-70)	45.1 (26-70)
Civic Participation (Percent Voter Turnout)	49.1 (46-55)	49.6 (41-55)	49.5 (41-55)

Notes:

¹ Four medium sized Alaska communities (average population = 5,836);² 15 communities (average population = 1,957).

Table 2

Student Characteristics in the Two Study Samples.

	2004 Alaska Youth Survey	2006 Alaska Youth Survey	Total
Student Characteristics	(N=342)	(N=492)	(N=834)
	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
Alaska Native	31%	38%	35%
Male	44	50	48
5th Grade	51	53	52

Table 3

Percentages Reporting Use of Harmful Legal Products (HLPs), Alcohol, and Tobacco in Two Samples of Students in Grades 5 and 6.

	2004 Alaska Youth Survey (N=342)	2006 Alaska Youth Survey (N=492)	Total (N=834)
	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
Lifetime HLP Use	17%	20%	18%
Past 30-Day HLP Use	7	10	9
Lifetime Inhalant Use	6	7	6
Lifetime Household Product Use	6	6	6
Lifetime Prescription Drug Use	7	11 *	9
Lifetime Non-prescription Drug Use	6	8	8
Lifetime Alcohol Use	16	15	15
Lifetime Tobacco Use	7	13 **	10

* $\chi^2(1, n = 834) = 3.31, p=.09$.

** $\chi^2(1, n=834) = 8.06, p = .01$.

Table 4

Hierarchical Linear Model Coefficients for the Odds of Harmful Legal Product Use*

	Lifetime HLP Use (N=817)			Past 30-Day HLP Use (N=757)		
	b (SE)	Odds	p	b (SE)	Odds	p
Alcohol Availability Laws	1.97 (0.34)	7.17	.000	1.33 (0.54)	3.78	.029
Percent Minority	-0.39 (0.13)	0.68	.013	0.06 (0.15)	1.06	.713
Percent Female-Headed Households	0.04 (0.06)	1.04	.553	-0.05 (0.10)	0.95	.583
Income	0.54 (0.13)	1.72	.001	0.52 (0.22)	1.67	.038
Civic Participation	0.04 (0.07)	1.04	.598	-0.01 (0.12)	0.99	.923
Lifetime Inhalant Use (N=795)						
	b (SE)	Odds	p	b (SE)	Odds	p
Alcohol Availability Laws	1.55 (0.68)	4.70	.041	3.37 (0.87)	29.03	.003
Percent Minority	-0.26 (0.33)	0.77	.451	-1.31 (0.49)	0.27	.020
Percent Female-Headed Households	-0.10 (0.12)	0.91	.425	0.27 (0.14)	1.31	.074
Income	0.43 (0.28)	1.54	.154	0.69 (0.19)	2.00	.004
Civic Participation	-0.14 (0.11)	0.87	.207	0.32 (0.08)	1.37	.003
Lifetime Prescription Drug Use (N=796)						
	b (SE)	Odds	p	b (SE)	Odds	p
Alcohol Availability Laws	1.81 (0.62)	6.12	.014	1.14 (0.70)	3.12	.128
Percent Minority	0.08 (0.21)	1.08	.713	-0.61 (0.21)	0.54	.014
Percent Female-Headed Households	-0.11 (0.10)	0.89	.302	0.21 (0.11)	1.23	.072
Income	0.47 (0.22)	1.60	.057	0.53 (0.20)	1.70	.020
Civic Participation	-0.04 (0.11)	0.96	.743	0.34 (0.11)	1.40	.012
Lifetime Non-prescription Drug Use (N=792)						
	b (SE)	Odds	p	b (SE)	Odds	p
Alcohol Availability Laws	1.81 (0.62)	6.12	.014	1.14 (0.70)	3.12	.128
Percent Minority	0.08 (0.21)	1.08	.713	-0.61 (0.21)	0.54	.014
Percent Female-Headed Households	-0.11 (0.10)	0.89	.302	0.21 (0.11)	1.23	.072
Income	0.47 (0.22)	1.60	.057	0.53 (0.20)	1.70	.020
Civic Participation	-0.04 (0.11)	0.96	.743	0.34 (0.11)	1.40	.012

* Note: The community level characteristic of Size (5th and 6th grade enrollment) and the individual level characteristics of Grade, Male, and Alaska Native were also included in these analyses. Of these characteristics, Size was significantly related to past 30-day HLP use (b = 0.25, OR = 1.30, p = .000). Grade was significantly related to lifetime household product use (b = 0.91, OR = .40, p = .003) and non-prescription drug use (b = 0.68, OR = .51, p = .006).