Published in final edited form as:

J Adolesc Health. 2014 December ; 55(6 0): S39–S47. doi:10.1016/j.jadohealth.2014.08.024.

Predictors of substance use among vulnerable adolescents in five cities: Findings from the Well-being of Adolescents in Vulnerable Environments study

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Abstract

Introduction—Adolescent substance use has numerous consequences. Our goals in this paper are to compare the prevalence and correlates of substance use among ethnically diverse adolescents.

Methods—Data are from 2332 adolescents aged 15 – 19 years recruited via respondent driven sampling from disadvantaged settings in five cities. Multivariate logistic regression was used to identify correlates of current substance use.

Results—About half of the respondents were male. Most adolescents (73.4%) were currently enrolled in school; and identified a father (87.6%) and mother (89.6%) -figure and strong peer support (71.9%). About two-thirds reported lifetime use of at least one substance. Overall, the

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Conflicts of interest: None

most common substances ever used were alcohol (44.6%), cigarette (26.2%) and marijuana (17.9%). Mean age at first use of alcohol was 14.2 ± 3.1 years. Current alcohol use was highest in Johannesburg (47.4%) and lowest in Delhi (2.1%). The mean age at first use of cigarette was 14.4 ± 2.8 years. Current cigarette smoking was highest in Johannesburg (32.5%) and lowest in Delhi (3.7%). Male gender predicted current alcohol use in all sites, while older age was a predictor in Baltimore. Male gender (Johannesburg and Shanghai), older age (Baltimore and Shanghai) and being out-of-school (Baltimore, Johannesburg and Shanghai) predicted current cigarette smoking. Absence of a caring father figure was predictive of current alcohol use in Baltimore and Shanghai. Strong peer support predicted alcohol (Johannesburg and Shanghai) and cigarette use (Johannesburg).

Conclusion—Substance use is still a major issue among adolescents around the world underscoring the need for continued research and interventions.

Keywords

substance use; adolescents; global health; health behaviors; social determinants of health; health disparities

Introduction

Substance use among adolescents is an important public health problem [1, 2]. Data on global patterns of licit and illicit substance use among adolescents vary due in part to inadequacy of data in Africa and Asia [2]. Previous research has described substances commonly used by adolescents to include alcohol, tobacco, inhalants, marijuana and narcotics [3, 4]. Available data among adolescents in low- and middle-income countries reveal that adolescents often use socially acceptable and affordable substances like alcohol and cigarettes and legal substances like inhalants and cough syrup [5, 6, 7]. While global substance use has decreased, current rates are still high [2] and young people remain a high risk group for substance use initiation and dependence [2, 4].

Use of psychoactive substances by adolescents is associated with consequences such as using other psychoactive drugs, mental health problems, drunk driving, violence, engagement in risky sexual behaviors and subsequent unanticipated pregnancy and sexually transmitted infections [2 - 4, 8 - 10]. In China, for instance, a rise in injection drug use among youths correlates with increased rates of HIV among them [11]. Several factors influence the vulnerability of adolescents to substance use. These can be intrapersonal, such as adolescents' gender; interpersonal, such as conflict with family members and others in the community; and/or contextual including community structures and extant laws [12].

Adolescents residing in disadvantaged urban communities are at significant risk of substance use. First, they have high rates of impulsivity due to their age, and therefore proclivity to engage in risky behaviors [13]. Furthermore, poverty and instability in disadvantaged communities lead to significant amounts of stress which, when compounded by limited access to health information, could result in an increased tendency to use substances [14, 15].

Factors which mitigate the effects of disadvantaged urban environments on adolescents' risky behaviors include social support, social group cohesion, stable emotional relationships with relatives, and access to education [14, 15]. Paucity of data on substance use among adolescents in disadvantaged communities however limits development and implementation of appropriate interventions. It is therefore, important, to investigate factors at the inter- and intrapersonal levels that predict substance use among adolescents in disadvantaged environments, to inform prevention policies and programs for these populations. The purpose of this study is to examine the predictors and correlates of substance use among in and out-of school adolescents residing in low income sections of five major cities. Specifically, to: (a) compare the prevalence and types of substances used by these adolescents and (b) describe common individual and interpersonal factors associated with substance use among them.

Methods

Procedures and sampling

The Well-being of Adolescents in Vulnerable Environments (WAVE) study was conducted among adolescents aged 15 – 19 years residing in disadvantaged communities in five cities – Baltimore, USA; Delhi, India; Ibadan, Nigeria; Johannesburg, South Africa; and Shanghai, China. This cross-sectional study utilized a two-phase mixed methods approach. Phase I utilized a qualitative approach [16]. Information obtained from the qualitative phase was used to develop the study instruments utilized in the quantitative phase (Phase II). Data for this paper is based on the quantitative phase conducted among 2332 adolescents across the five sites.

Participants were recruited for the WAVE Phase II study utilizing respondent driven sampling (RDS) [17]. This methodology employs a chain-referral sampling strategy designed to reach hard-to-reach populations and/or marginalized groups [17]. Details of the RDS methodology as used in this study are described in the paper by Decker et al in this supplement [18]. The five cities included in the study were located in the home countries of the investigators who had existing research collaborations. The study sites selected represented vulnerable neighbourhoods within the major cities in each of the countries. The survey instrument was developed with input from the study investigators and was translated, back-translated, and piloted at each study site [18]. In all study sites, information was obtained using Audio Computer Assisted Self Interviewing (ACASI). Written informed consent was obtained from adolescents aged 18 years and above and parents of those aged 15 – 17 years and adolescents aged 15 – 17 years gave written assent. Ethical approval was obtained from the Committee on Human Research at the Johns Hopkins University and the respective Ethics Committees of the collaborating local organizations.

Measures

Outcomes—We obtained information on lifetime use of any substance. Respondents were asked if they had ever used alcohol, tobacco – cigarette or chewed tobacco, marijuana, cocaine, stimulants, inhalants, sedatives, hallucinogens, opiates, prescription drugs, injection drugs and other substances with a dichotomous “yes” or “no” response.

Two main outcome variables: current use of alcohol, and current use of cigarettes with responses – “yes” or “no” were utilized for additional analyses. These substances were selected because they are commonly used in many countries [2] and they are common (licit) gateway substances [19]. We focused on current use of these substances i.e. use ‘in the last 30 days’ to reduce reporting errors from recall bias. Additional information obtained were: age respondent first finished a glass/ serving of alcohol, frequency of drinking and history of binge drinking in the last thirty days, age when respondent smoked first cigarette, frequency of cigarette smoking and average number of cigarettes smoked in the last 30 days.

Predictors—The choice of predictors was guided by findings from previous literature [3, 4, 7, 13,]. Adolescent-related demographic factors included gender, age; dichotomized as younger = 15-16 years and older = 17-19 years groups (representing middle and late adolescent stages respectively [20]), current enrollment in school and currently working for income. Social support factors included availability of a mother/ father-figure assessed as “yes” or “no” responses, relationship of the mother/ father-figure (biological, step/ adoptive, grandparent, sibling, other relative, other non-relative), availability of a supportive mother- and father-figure, each assessed by the question: “How much do you feel the woman/man who raised you cares about you?” Responses were measured on a Likert scale, and ranged from 0 – “not at all”, 1 – “very little”, 2 – “somewhat”, 3 – “quite a bit”, 4 – “very much”, to 7 – “don't know”. Lower scores indicated less caring/ supportive parent-figures. Don't know responses were excluded from the analysis. Peer-related support was assessed via a scale of items where respondents stated if they had a friend who: (a) I can trust; (b) could lend me money if I needed it; (c) I can talk to about family problems or real personal problems; (d) I find it easy to talk to about sex; (e) I could turn to if I were in trouble; and/or (f) accepts me for who I really am.” Responses ranged from 0 – “agree a lot”, 1 – “agree a little”, 2 – “disagree a little”, 3 – “disagree a lot”, to 7 – “don't know”. During analysis, scores were reversed for ease interpretation. Scores were summed giving minimum and maximum obtainable scores of 0 and 18 respectively with higher scores indicating better peer support so that higher scores indicated better support. Entries with don't know responses were excluded from the computation of aggregate scores.

Analyses—Analyses were conducted using STATA Version 12.0 [21]. RDS sampling weights were generated via the RDS II estimator [22] to account for the inter-group (cluster) correlations resulting from the RDS study design. An age-adjusted RDS sampling weight was also developed to adjust for differences in age distributions across the sites. Frequencies and means were generated for the dependent and independent variables. Chi square statistic was used to test differences between socio-demographic and social support characteristics across sites. ANOVA tests were used to compare differences in the respondents’ mean scores for peer support, caring father/ father figure and caring mother/mother figure across sites. Multivariate logistic regression was conducted and odds ratios computed to examine the associations between selected independent (adolescent, family and peer-related) factors and current use of alcohol and cigarettes. A skip error in the programme in Johannesburg site resulted in respondents raised by a biological father or mother selecting the “not applicable” option for the question on father/mother cares. Hence in the multivariate analysis for Johannesburg, the variable availability of a father/ mother figure was entered

into the model to replace caring father/mother-figure variable which was not computed. We controlled for type of father/father figure and type of mother/ mother figure (data not included in the multivariate tables) in the multivariate analysis in each of the five cities. Age adjusted RDS sampling weights were used in all univariate and bivariate analysis; RDS sampling weights were used in multivariate analyses, as age was a covariate in each of those models.

Results

Demographic characteristics

Table 1 reports study sample demographic characteristics. The gender split was nearly even (49.9% males versus 50.1% females). Nearly three-fourths were currently enrolled in school and less than half (41.6 %) were currently working for money. Nearly three-fourths of Shanghai adolescents currently work for money, while one-fifth of Delhi site respondents reported doing so (73.9% versus 19.9%, respectively).

Social support factors

About 86% of respondents across all sites had a father-figure. The mean score for caring father/ father figure ranged from 3.8 (± 0.8) in Delhi to 2.2 (± 1.9) in Baltimore. Corresponding values for caring mother/ mother figure ranged from 3.8 (± 0.7) in Delhi to 3.4 (± 0.9) among adolescents in Shanghai. The average peer support score across all sites was 14.3 (± 4.0) out of a maximum obtainable score of 18 indicating that many felt they had high levels of peer support. The differences in family and peer support variables were statistically significant for all variables.

History of substance use

Nearly two-thirds of all respondents reported use of at least one substance in their lifetime (Table 3). Overall, the most common substances used were alcohol (44.6%), cigarette (26.2%) and marijuana (17.9%). However, within each study site, the substances used varied. In Ibadan, Johannesburg and Shanghai, alcohol use was most common. Marijuana and alcohol use were nearly even in Baltimore (54.9% vs. 52.3%, respectively). Inhalants were most common in Delhi (15.2%) followed by Johannesburg (8.4%) and Ibadan (7.4%). Chewing of tobacco was quite prevalent in Ibadan and Delhi.

The mean age at which adolescents first finished a glass of alcohol ranged from 14.0 years in Ibadan and Johannesburg to 14.5 years in Baltimore and Shanghai. Current use of alcohol was highest in Johannesburg (47.4%) and lowest in Delhi (2.1%). More than 40.0% of adolescents who reported currently using alcohol, in all the sites except Delhi, had ever taken more than five alcoholic drinks in a row. The mean age at first use of cigarettes ranged from 13.1 $\pm$ 3.9 to 14.9 $\pm$ 2.6 years among adolescents in Ibadan and Shanghai respectively. Overall, current cigarette use was 17.9% and it was lowest among adolescents in Delhi (3.7%) and highest among their counterparts in Johannesburg (32.5%). About a third of current users in Baltimore, Johannesburg and Shanghai reported smoking cigarettes every day. Over a quarter of adolescents in Shanghai, Ibadan, and Johannesburg reported smoking more than 10 cigarettes per day.

Predictors of alcohol use

There were variations in the predictors of alcohol use across all the sites (Table 4). Male gender was a predictor of current alcohol use in all sites. In Baltimore, older age (17 – 19 years) also predicted current alcohol use. Being out-of-school was a predictor of alcohol use among adolescents in Johannesburg. Adolescents in Ibadan and Shanghai who were currently working for money were significantly more likely to be currently using alcohol. Social support factors – perceived higher levels of care from fathers (Baltimore and Shanghai) and mothers (Ibadan and Shanghai) was associated with lower odds for alcohol use while higher peer support was as predictors of current alcohol use among adolescents in Johannesburg and Shanghai.

Predictors of cigarette use

Predictors of current cigarette use were identified for adolescents in Baltimore, Johannesburg and Shanghai, but not for Ibadan and Delhi because of the low rates of current use in these cities (Tables 5). Across the study sites, there was some variation in the variables that predicted current cigarette use. Male gender was a significant predictor of cigarette use in Johannesburg and Shanghai. In Baltimore and Shanghai, older adolescents were more likely than their younger counterparts to be current smokers. In all three sites, adolescents currently out of school were more likely to be currently smoking than in-school adolescents, with odds ranging from 1.84 in Baltimore to nearly 5.0 in Johannesburg. In Johannesburg, adolescents currently working were 1.7 times more likely to be current smokers than those not currently working for money.

Social support variables were additional predictors of current cigarette use in the three sites. In Baltimore and Shanghai, low scores for caring mother figure predicted cigarette use; while in Johannesburg, absence of a father figure and higher peer support were predictors of current cigarette smoking.

Discussion

The overall purpose of this study was to examine the prevalence of substance use among adolescents from disadvantaged urban settings from five cities across the globe. On the whole, about two thirds of adolescents had ever used at least a substance. The range of substances ever used was similar to those reported among in and out-of-school adolescents in other studies [3, 4, 23]. These high prevalence rates occurred despite the high presence of protective social support factors (e.g. parental figures). Similar to findings from other studies, we found that overall, alcohol, cigarette and marijuana were the most common psychoactive substance ever used by adolescents [1, 3, 23, 24, 25]. Inhalant use was highest in Delhi and previous have reported that up to one-fifth of adolescents in India abuse inhalants [26, 27]. The popularity of inhalant use among young people in India has been attributed to the fact that they are readily available, cheap and legal to procure and possess [28]. Furthermore, youth can be prosecuted for illicit substance use [7]. In Baltimore, marijuana was the most common drug ever used by over half of the adolescents. This is substantially higher than US-nationwide estimates of about 40% reported among in-school adolescents who participated in the 2011 YRBS [23]. Our findings support other studies that

marijuana use is increasingly common among adolescents in the United States [29]. Marijuana might thus be important as the drug of first use among adolescents in disadvantaged urban communities like Baltimore. Chewing tobacco was most common in Ibadan and this is in keeping with reports that smokeless tobacco is consumed in rural and urban areas in Nigeria for various reasons including pleasure, social reasons and as a “cure” for certain ailments [30].

The mean age at first use of alcohol ranged from 14.0 years among adolescents in Ibadan and Johannesburg to 14.5 years in Baltimore and Shanghai. Across all study sites, slightly more than a quarter of the adolescents were currently drinking alcohol. These rates differed from estimates reported in the different sites [5, 23, 26] which might be explained by the over-representation of in-school over out-of-school adolescents in these latter studies. Findings from our study also revealed that binge drinking was common among our respondents (more than 40% of all current alcohol users in all sites except Delhi), confirming findings that adolescents who drink often consume a lot of alcohol over a brief period of time [23]. We also observed that a higher proportion of the adolescents in Baltimore had been involved in binge drinking compared with national averages of about a fifth obtained in the US YRBS 2011 [23]. We found higher rates of binge drinking among adolescents in Shanghai, compared to rates of about ten percent rate reported in other studies among other groups of adolescents in Shanghai [31, 32]. This pattern suggests that alcohol might be the drug of choice among adolescents in these vulnerable communities, possibly due to easier access and more availability. This finding has implications for adolescent health, given the propensity of alcohol to reduce inhibition for engaging in other risky behaviors. Furthermore, alcohol has been described as a gateway drug to other illicit drug use [25, 33]. Interventions to reduce alcohol use should thus be priority in this population.

Rates of current cigarette use among our study population showed marked variation. The rates obtained in Johannesburg (32.5%), Shanghai (27.2%) and Baltimore (21.2%) were higher than those previously reported among adolescents in these countries (12.7%, 17.1% and 18.2% respectively) [23, 34] while rates in Delhi (3.7%) and Ibadan (3.8%) were comparable with existing data from the GYTS in the respective countries (4.4%; 3.5%) [34].

Our findings on the predictors of current cigarette and alcohol use revealed that male gender was a predictor of current alcohol and cigarette use in all sites except Baltimore where it predicted alcohol but not cigarette use. This is in keeping with various studies that report higher rates of substance use among males compared to females [5, 23, 24, 26, 29, 32 - 34]. Recent research in the US has also noted that the difference between the proportion of males and females who currently smoke is on the decline [35, 36]. Future interventions should therefore take into consideration gender-related differences in substance use patterns. Age was an additional predictor of alcohol and cigarette use in Baltimore with older adolescents being more likely to be using these substances. It is possible, therefore, that given the low-income status of most study respondents; older adolescents may be more responsible for assisting with earning income for the family. As a result, increased age and financial stresses may be contributing to substance use in this population, as shown in previous studies of adolescents [37, 38].

Our study underscored the importance of school enrollment as a protective factor against current cigarette use. Other predictors of substance use highlighted by our study were current working status in Ibadan and Shanghai (alcohol use) and Johannesburg (current cigarette smoking). Previous studies have documented that adolescents who have more spending money are more likely to smoke [39]. Research has shown that social support is a protective factor against negative health behaviors such as substance use initiation [11, 40]. After controlling for different types of father/mother-figures, having lower scores for parental caring variables was associated with a higher likelihood of substance use. Other studies have documented an association between low levels of closeness with parents and substance use among adolescents and young persons [4, 5, 40]. Our study revealed that generally, higher levels of peer support predicted substance use. Peer relationships are very important during the adolescent period and peers often exert a substantial influence which may predispose or protect adolescents from engaging in health risk behaviours such as substance use [4].

Study limitations

This study, and its findings, is subject to certain limitations. First, the study design was cross sectional and assessed correlational relationships between substance use and a limited number of factors. As a result, causal links between these relationships cannot be determined. Second, although RDS sampling is useful in recruitment of hard to reach populations and was appropriate for our sample, the tendency for participants to recruit others who have similar characteristics as themselves could result in some level of selection bias. This might have been responsible for the high numbers of adolescents aged 15 – 17 in some study sites although we controlled for this by using RDS age and sex adjusted weights. Finally, the data gathered for this study were obtained only from adolescents aged 15 – 19 and living in disadvantaged and/or low income urban neighborhoods in five specific cities hence the findings may not be generalizable to all young people in poor, urban environments. Given the amount of psychoactive substance use reported by our respondents, future studies should consider including younger adolescents, and/or other socioeconomic groups in the sample.

Conclusions

Despite these limitations, this study contributes information on substance use prevalence rates among a very large and culturally/ethnically diverse population of adolescents. Additionally, it provides data on hard-to-reach youth who are not in school, and traditionally excluded in research in adolescent health behaviors. Findings suggest that while substance use may be declining globally [1, 2], it is still a major issue among adolescents in the economically-disadvantaged neighborhoods that we studied. Although there were differences in predictors of current psychoactive substance across the study sites, male gender, older age, and being out of school were significant predictors in most sites. Social support from caring parents was protective against both alcohol and cigarette use. Protective factors of social support such as caring parents and peer support are established as buffers against substance use in health research [4, 5, 29, 31]. Interventions to build and strengthen the relationship between adolescents and their parents are therefore important. While most respondents reported social support, nearly two-thirds still reported a history of use of at

least one substance. Future studies and interventions to reduce and/or prevent substance use among adolescents should therefore seek to understand additional pathways beyond social support. The findings further suggest that interventions to reduce and prevent substance use among adolescents should target adolescents early and focus on keeping them in school during their adolescent years. Finally, our findings call for social policy changes, such as law enforcement strategies to reduce the availability of licit and illicit drugs to underage and/or vulnerable youth, in each of these countries.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgements

The Well-Being of Adolescents in Vulnerable Environments Study was funded in Ibadan by The Bill and Melinda Gates Institute at Johns Hopkins Bloomberg School of Public Health through its funding to The Centre for Population and Reproductive Health, University of Ibadan. In all the other sites, the WAVE study was funded by The Young Health Program, a partnership between AstraZeneca, Johns Hopkins Bloomberg School of Public Health and Plan International.

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Implications and Contribution

This study highlights disparities in prevalence and predictors of substance use among adolescents. While current rates of alcohol and cigarette use were low in some sites, lifetime use of alcohol, cigarettes and marijuana was high. It is important to prevent psychoactive substance use and its subsequent detrimental effects among adolescents.

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Fig 1.
Types of substances ever used by study site (RDS Age adjusted percentages)

Table 1

Demographic characteristics

Variables	Baltimore %Wtd (N, %)	Delhi %Wtd(N, %)	Ibadan %Wtd (N, %)	Johannesburg %Wtd (N, %)	Shanghai %Wtd (N, %)	Total %Wtd (N, %)
Number of adolescents (n)	449	500	449	496	438	2,332
* Sex						
Male	46.3 (258, 57.5)	52.8 (250, 50.0)	45.2 (220, 49.0)	56.7 (272, 54.8)	48.0 (222, 50.7)	49.9 (1222, 52.4)
Female	53.7 (191, 42.5)	47.2 (250, 50.0)	54.8 (229, 51.0)	43.3 (224, 45.2)	52.0 (216, 49.3)	50.1 (1110, 47.6)
* Age group						
15- 16	42.9 (248, 55.2)	47.5 (284, 56.8)	49.4 (267, 59.5)	50.6 (123, 24.8)	41.9 (127, 29.0)	46.5 (1049, 45.0)
17- 19	57.1 (201, 44.8)	52.5 (216, 43.2)	50.6 (182, 40.5)	49.4 (373, 75.2)	58.1 (311, 71.0)	53.5 (1283, 55.0)
* Current school enrolment						
Yes	80.2 (381, 84.9)	82.7 (428, 85.6)	81.1 (364, 81.1)	84.2 (406, 81.9)	37.2 (125, 28.5)	73.4 (1704, 73.0)
No	19.1 (67,14.9)	17.3 (72, 14.4)	18.5 (84, 18.7)	15.6 (88, 17.7)	62.8 (313, 71.5)	26.3 (624, 26.8)
Not Applicable	(1, 0.2)		0.4 (1, 0.2)	0.1 (2, 0.4)		0.3 (4, 0.0)
Do you currently work for money*						
Yes	35.1 (163, 36.3)	19.9 (101, 20.2)	51.2 (227, 50.6)	30.2 (150, 30.2)	73.9 (347, 79.2)	41.6 (988, 42.4)
No	64.7 (285, 63.5)	80.1 (399, 79.8)	47.4 (218, 48.6)	69.8 (346, 69.8)	26.1 (91, 20.8)	58.1 (1339, 57.4)
Don't Know	1 (1, 0.2)		1.0 (2, 0.4)			0.2 (3, 0.1)
Refuse			0.5 (2, 0.4)			0.1 (2, 0.1)

RDS age adjusted weights used

* statistically significant difference, p<0.05

Table 2

Family and social support factors

Variables	Baltimore %Wted (N, %)	Delhi %Wted(N, %)	Ibadan %Wted (N, %)	Johannesburg %Wted (N, %)	Shanghai %Wted (N, %)	Total %Wted (N, %)
Family support						
Has a father/father-figure	N = 448	N = 500	N = 448	N = 495	N = 438	N = 2330
Yes	61.2 (299, 66.7)	98.7 (493, 98.6)	92.2 (409, 91.3)	83.6 (418, 84.3)	95.8 (422, 96.3)	86.2 (2041, 87.6)
No	38.9 (149, 33.3)	1.3 (7, 1.4)	7.9 (39, 8.7)	16.5 (78, 15.7)	4.2 (16, 3.7)	13.8 (289, 12.4)
Type of father figure	N = 298	N = 493	N = 406	N = 417	N = 422	N = 2036
Biological father	66.6 (170, 57.0)	97.1 (477, 96.8)	81.6 (335, 82.5)	52.6 (208, 49.9)	87.7 (378, 89.6)	78.4 (1568, 77.0)
Step father/adoptive father	17.2 (52, 17.4)	0.2 (1, 0.2)	3.6 (14, 3.4)	17.3 (87, 20.9)	0.7 (2, 0.5)	6.9 (156, 7.7)
Grand father	6.0 (27, 9.1)	0.2 (3, 0.6)	5.1 (21, 5.2)	15.7 (67, 16.1)	7.0 (27, 6.4)	6.7 (145, 7.1)
Brother	3.8 (22, 7.4)	1.7 (9, 1.8)	5.0 (18, 4.4)	7.1 (30, 7.2)	0.8 (2, 0.5)	3.6 (81, 4.0)
Other relative	3.2 (16, 5.4)	0.8 (3, 0.6)	3.4 (12, 3.0)	4.5 (18, 4.3)	2.3 (9, 2.1)	2.8 (58, 2.8)
Other non-relative	3.2 (11, 3.7)	(0)	1.3 (6, 1.5)	2.9 (7, 1.7)	1.5 (4, 0.9)	1.6 (28, 1.4)
Father/ father figure cares [*]	N = 298	N = 491	N = 409	N = 210	N = 422	N = 1830
Not at all	3.8 (9, 3.0)	0.9 (5, 1.0)	4.5 (17, 4.2%)	7.0 (19, 9.0)	1.0 (5, 1.2)	2.9 (55, 3.0)
Very little	4.6 (13, 4.4)	1.7 (5, 1.0)	5.6 (18, 4.4)	11.0 (23, 11.0)	6.0 (21, 5.0)	6.0 (80, 4.4)
Somewhat	2.9 (15, 5.0)	2.5 (17, 3.5)	3.2 (14, 3.4)	7.9 (11, 5.2)	9.7 (41, 9.7)	5.1 (98, 5.4)
Quite a bit	12.8 (42, 14.1)	1.6 (7, 1.4)	9.7 (28, 6.8)	17.0 (30, 14.3)	29.2 (115, 27.3)	13.6 (222, 12.2)
Very much	75.9 (219, 73.5)	93.4 (457, 93.1)	77.0 (332, 81.2)	57.1 (127, 60.5)	54.1 (240, 56.9)	73.3 (1375, 75.1)
Mean score for caring father (0 – 4)	2.15 (1.89)	3.80 (0.76)	3.21 (1.41)	-	3.15 (1.13)	2.68 (1.72)
Has a mother/mother figure	UnWted M (SD)	3.79 (0.76)	3.25 (1.41)	1.29 (1.76)	3.21 (1.10)	2.77 (1.69)
Yes	N = 448	N = 500	N = 448	N = 496	N = 438	N = 2327
No	98.5 (442, 98.7)	100.0 (500, 100.0)	95.1 (426, 95.1)	99.7 (493, 99.4)	99.4 (434, 99.1)	98.6 (2297, 98.5)
Type of mother/mother figure	N = 442	N = 500	N = 424	N = 492	N = 434	N = 2292
Biological mother	79.5 (346, 78.3)	98.0 (491, 98.2)	77.8 (336, 79.2)	60.2 (283, 57.5)	84.9 (377, 86.9)	79.8 (1833, 80.0)
Step / adoptive mother	2.0 (9, 2.0)	0.4 (2.0.4)	10.7 (41, 9.7)	13.9 (85, 17.3)	0.1 (1, 0.2)	5.5 (138, 6.0)
Grandmother	11.9 (47, 10.6)	0.3 (2.0.4)	4.7 (18, 4.2)	18.2 (85, 17.3)	8.8 (31, 7.1)	9.0 (183, 8.0)

Variables	Baltimore %Wted (N, %)	Delhi %Wted(N, %)	Ibadan %Wted (N, %)	Johannesburg %Wted (N, %)	Shanghai %Wted (N, %)	Total %Wted (N, %)
Mother/ mother figure cares *	Sister	2.0 (10, 2.3)	0.7 (3.0, 6)	3.4 (14, 3.3)	2.5 (9, 2.1)	2.8 (59, 2.6)
	Other relative	3.0 (17, 3.8)	0.2 (1, 0.2)	0.8 (6, 1.4)	3.5 (14, 3.2)	1.8(52, 2.3)
	Other non-relative	1.7 (13, 2.9)	0.4 (1, 0.2)	2.7 (9, 2.1)	0.2 (2, 0.5)	1.1 (27, 1.2)
		N = 441	N = 499	N = 425	N = 434	N = 2008
	Not at all	0.6 (6, 1.4)	0.6 (5, 1.0)	3.5 (13,3.1)	6.7 (10, 4.8)	2.0 (38, 1.9)
	Very little	2.1 (11, 2.5)	3.2 (12, 2.4)	3.7 (12, 2.8)	5.3 (15, 7.2)	3.2 (61, 3.0)
	Somewhat	6.9 (26, 5.9)	2.2 (10, 2.0)	3.1 (13, 3.1)	6.0 (10, 4.8)	5.2 (94, 4.7)
	Quite a bit	5.6 (22, 5.0)	2.0 (3, 0.6)	5.8 (24, 5.6)	27.8 (116, 26.7)	10.3 (180, 9.0)
	Very much	84.8 (376, 85.3)	91.9 (469, 94.0)	83.9 (363, 85.4)	71.2 (159, 76.1)	79.3 (1635, 81.4)
	Wtd M (SD)	3.66 (0.85)	3.81 (0.68)	3.45, 1.23	-	3.10, 1.50
Mean score for caring mother (0 – 4)					3.40, 0.90	
<i>Perceived Peer support score</i> (0 – 18)	UnWted M (SD)	3.65 (0.90)	3.84 (0.66)	3.49 (1.19)	3.43 (0.88)	3.15 (1.48)
		N = 447 Mean (SD)	N = 498	N = 443	N = 433	N=2329
	Unweighted	15.1 (4.1)	13.6 (4.2)	13.4 (4.2)	14.1 (4.1)	14.3 (4.0)
	Weighted	14.6 (4.6)	13.6 (4.1)	13.4 (4.2)	14.0 (4.1)	14.1 (4.1)

RDS age adjusted weights used

* Computed only for respondents who stated that they had a father/mother-figure (In Delhi, a skip error resulted in all respondents with a biological parent selecting the not applicable option)

Table 3

History of substance use

	Baltimore % Wted (N, %)	Delhi % Wted (N, %)	Ibadan % Wted (N, %)	Johannesburg % Wted (N, %)	Shanghai % Wted (N, %)	Total % Wted (N, %)
<u>Ever use of at least a substance</u>	N=449	N=500	N=449	N=496	N=438	N=2332
Yes	73.2 (305, 67.9)	33.0 (158, 31.6)	53.8 (238, 53.0)	77.4 (391, 78.8)	71.9 (338, 77.2)	62.0 (1430, 61.3)
No	26.8 (144, 32.1)	67.0 (342, 68.4)	46.2 (211, 47.0)	22.6 (105, 21.2)	28.1 (100, 22.8)	38.0 (902, 38.7)
<u>Alcohol</u>						
Age respondent first finished a glass of alcohol						
Mean (SD)	14.5 (3.0)	14.4 (3.4)	14.0 (3.0)	14.0 (3.0)	14.5 (3.2)	14.2 (3.1)
Median (range)	15 (5 – 19)	15 (5 – 18)	15 (5 – 19)	14 (5 – 18)	15 (5 – 19)	15 (5 – 19)
Current use of alcohol	N= 449	N= 500	N= 449	N= 496	N= 438	N= 2332
Yes	23.7 (106, 23.6)	2.1 (10, 2.0)	12.4 (54, 12.0)	47.4 (256, 51.6)	46.5 (228, 52.1)	26.7 (654, 28.0)
Frequency of alcohol use in last 30 days	N= 215	N= 37	N=113	N=358	N= 322	N= 1045
Not at all	48.3 (96, 44.7)	66.2 (26, 70.3)	50.8 (58, 51.3)	30.8 (101, 28.2)	31.7 (89, 27.6)	38.4 (370, 35.4)
Once or twice	30.1 (67, 31.2)	27.9 (8, 21.6)	20.2 (21, 18.6)	34.7 (120, 33.5)	49.4 (163, 50.6)	36.2 (379, 36.3)
1× a week	11.1 (24, 11.2)	1.5 (1, 2.7)	14.0 (18, 15.9)	18.0 (74, 20.7)	12.4 (43, 13.4)	13.8 (160, 15.3)
> 1× a week	2.2 (7, 3.3)	1.5 (1, 2.7)	7.0 (8, 7.1)	14.9 (55, 15.4)	4.3 (15, 4.7)	7.5 (86, 8.2)
Everyday	1.8 (8, 3.7)	-	7.4 (7, 6.2)	1.1 (7, 2.0)	1.4 (7, 2.2)	2.0 (29, 2.8)
Don't know	6.5 (13, 6.0)	2.9 (1, 2.7)	0.4 (1, 0.9)	0.4 (1, 0.3)	0.8 (5, 1.6)	2.0 (21, 2.0)
Ever taken 5 alcoholic drinks within about 2 hours	N= 118	N= 10	N=54	N=256	N=232	N=670
Yes	44.4 (53, 44.9)	4.8 (1, 10.0)	41.5 (18, 33.3)	49.0 (129, 50.4)	42.1 (101, 43.5)	44.5 (302, 45.1)
<u>Age respondent smoked first cigarette</u>						
Mean (SD)	13.5 (3.1)	14.2 (3.1)	13.1 (3.9)	14.7 (2.5)	14.9 (2.6)	14.4 (2.8)
Median (range)	14 (5 – 18)	15 (5 – 18)	14 (5 – 18)	15 (5 – 19)	16 (5 – 19)	15.0 (5 – 19)
<u>Cigarette</u>						
Current Use of cigarettes	N=446	N=499	N=444	N=496	N=433	N= 2318

	Baltimore %Wted (N, %)	Delhi %Wted (N, %)	Ibadan %Wted (N, %)	Johannesburg %Wted (N, %)	Shanghai %Wted (N, %)	Total %Wted (N, %)
Frequency of cigarette use in last 30 days						
Yes	21.2 (79, 17.7) N= 126	3.7 (20, 4.0) N=46	3.8 (15, 3.4) N=30	32.5 (179, 36.1) N= 223	27.2 (141, 32.6) N=184	17.9 (434, 18.7) N=609
Not at all	36.7 (45, 35.7)	57.6 (25,54.3)	39.4 (13, 43.3)	25.9(44, 19.7)	27.8 (42, 22.8)	32.1(169, 27.8)
Once or twice	17.9 (21, 16.7)	16.3 (8, 17.4)	13.6 (3, 10.0)	25.7 (61, 27.4)	16.8 (32,17.4)	20.0 (125, 20.5)
1× a week	1.8 (4, 3.2)	7.6 (5, 10.9)	18.2 (6, 20.0)	10.0 (19, 8.5)	9.1 (17, 9.2)	7.9 (51, 8.4)
> 1× a week	7.3 (13, 10.3)	8.7 (3, 6.5)	10.6 (3, 10.0)	5.4(15, 6.7)	13.6 (16, 8.7)	8.6 (50, 8.2)
Everyday	34.5 (41, 32.5)	7.6 (4, 8.7)	13.6 (3, 10.0)	32.9 (84, 37.7)	32.7 (76, 41.3)	30.5 (208, 34.2)
Don't know	1.8 (2, 1.6) N= 56	2.2(1, 2.2) N=12	4.5 (2, 6.7) N= 8	0 N= 113	0 (1, 0.5) N= 107	0.8 (6, 1.0) N=296
Average number of cigarettes smoked per day						
10	87.8 (46, 82.1)	100.0 (11, 91.7)	56.2 (5, 62.5)	69.2 (84, 74.3)	72.7(73, 68.2)	75.5(219, 74.0)
More than 10	12.2(10, 17.9)	0 (1, 8.3)	43.8 (3, 37.5)	30.8 (29, 25.7)	27.3 (34, 31.8)	24.5(77, 26.0)

*** Not reported for Ibadan as respondents confused this with drugs purchased over the counter and other injections they received
RDS age adjusted weights used

Table 4

Multivariate analysis of Factors associated with current use of alcohol by vulnerable adolescents (RDS adjusted)

	Baltimore Weighted AOR (95% C. I.)	Ibadan Weighted AOR (95% C. I.)	Johannesburg Weighted AOR (95% C. I.)	Shanghai Weighted AOR (95% C. I.)
INTERPERSONAL FACTORS				
Sex				
Male				
Female (ref)	1	1	1	1
Age group				
15 -16 (ref)	1	1	1	1
17- 19	3.11 (2.12 – 4.55)***	1.47 (0.93 – 2.31)	0.89 (0.67 – 1.20)	0.84 (0.61 – 1.16)
Currently schooling				
No	1.12 (0.72 – 1.75)	0.64 (0.34 – 1.24)	2.44 (1.70 – 3.52)***	0.75 (0.52 – 1.09)
Yes(ref)	1	1	1	1
Currently working for money				
No (ref)	1	1	1	1
Yes	0.82 (0.58 – 1.17)	2.46 (1.56 – 3.87)***	1.30 (0.98 – 1.73)	2.13 (1.40 – 3.24)***
SOCIAL SUPPORT				
Father/ father figure cares (0 – 4)				
Father/ father figure cares (0 – 4)	0.75 (0.61 – 0.92)**	0.68 (0.96 – 1.19)	-	0.78 (0.64 – 0.94)**
Mother/ mother figure cares (0 – 4)				
Mother/ mother figure cares (0 – 4)	1.19 (0.93 – 1.52)	0.78 (0.62 – 0.97)*	-	0.72 (0.58 – 0.89)**
Has a father/ father figure[@]				
Yes	-	-	1.11 (0.75 – 1.62)	-
No	-	-	-	-
Has a mother/ mother figure[@]				
Yes	-	-	0.72 (0.09 – 5.85)	-
No	-	-	-	-
Peer support (score)	1.04 (0.99 – 1.08)	1.01 (0.96 – 1.06)	1.06 (1.02 – 1.09)**	1.11 (1.05 – 1.16)***

RDS adjusted weights used

** p< 0.001

All sites adjusted for type of father/ father figure [none, biological, other] and type of mother/ mother figure [none, biological, other]

This variable was entered into the multivariate model for Johannesburg only to replace caring father/mother-figure which was not computed for Johannesburg because of a skip error in the programme that resulted in respondents raised by a biological father or mother selecting the „not applicable“ option for father/mother cares

100 > d

**

500 > d

*

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Table 5

Multivariate analysis of factors associated with current use of cigarette by vulnerable adolescents (RDS adjusted)

Variables	Baltimore AOR (95% C. I.) Weighted	Johannesburg AOR (95% C. I.) Weighted	Shanghai AOR (95% C. I.) Weighted
INTERPERSONAL FACTORS			
Sex			
Male	1.22 (0.86 – 1.73)		
Female (ref)	1	3.26 (2.35 – 4.53)***	7.82 (5.57 – 10.97)***
Age group			
15 -16 (ref)	1		
17- 19	1.84 (1.23 – 2.76)**	0.80 (0.57 – 1.10)	1.69 (1.14 – 2.49)**
Currently schooling			
No	1.84(1.17 – 2.90)**	4.41 (3.03 – 6.42)***	1.70 (1.09 – 2.65)*
Yes (ref)	1	1	1
Currently working for money			
No (ref)	1	1	1
Yes	1.14 (0.79 – 1.64)	1.67 (1.22 – 2.29)**	1.14 (0.69 – 1.89)
SOCIAL SUPPORT			
Father/ father figure cares (0 – 4)	0.88 (0.71 – 1.08)		0.93 (0.74 – 1.16)
Mother/mother figure cares (0- 4)	0.78 (0.63 – 0.97)*		0.70 (0.54 – 0.91)**
Has a father/ father figure[@]			
Yes (ref)		1	
No		1.89 (1.24 – 2.87)**	
Has a mother/ mother figure[@]			
Yes (ref)		1	
No		0.00	
Peer support	0.97 (0.93 – 1.01)	1.04 (1.00 – 1.07)*	1.03 (0.97 -1.10)

RDS adjusted weights used

*** p< 0.001

All sites adjusted for type of father/ father figure [none, biological, other] and type of mother/ mother figure [none, biological, other]

This variable was entered into the multivariate model for Johannesburg only to replace caring father/mother-figure which was not computed for Johannesburg because of a skip error in the programme that resulted in respondents raised by a biological father or mother selecting the „not applicable“ option for father/mother cares

100 > d

**

500 > d

*

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