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Alcohol Use and Health-Related Quality of Life among Youth in Taiwan

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Abstract

Purpose—To examine the extent to which the use of the three most commonly consumed drugs in Taiwan (i.e., alcohol, tobacco, and betel nut) is related with health-related quality of life among adolescents. We probe whether the relationship linking alcohol use with health-related quality varies by health-orientated domains (e.g., physical, social, or emotional) and if it differs with other drug involvement.

Method—The data for this study come from a representative sample of 2235 adolescents (aged 12–18 years) collected as part of the 2001 National Health Interview Survey (NHIS), conducted in Taiwan. Recent alcohol, tobacco, and betel nut experiences were assessed by face-to-face interview. The 36-item short form Health Survey (SF-36) was used to assess respondents' generic health status.

Results—Youth with recent alcohol use tend to experience a poorer level of health-related quality of life. The estimated associations were not constant over the eight domains of general health examined, and multivariate modeling with generalized linear models and generalized estimating equations found that the strongest inverse relationship appears in the domain of role limitation due to emotional problems ($\beta = -10.5$, 95% confidence interval [CI]: -16.9 – -4.12 , $p < .001$). Greater deleterious effects were not found among youth also using tobacco and/or betel nut.

Conclusions—Alcohol use was shown to be associated with impaired levels of health-related quality of life in adolescents. Although the temporality between alcohol involvement and lower levels of mental health is not explicit, the findings suggest that youth who are actively drinking might be a possible target group to intervene and avert mental health-related problems.

Keywords

Adolescent; Alcohol; Tobacco; Betel nut; Quality of life

Epidemiological studies often find an association between alcohol and drug involvement and an array of negative consequences in later life, including physical and mental health problems, unfavorable role performance, and inadequate social adaptation [1–6]. Irrespective of the determinants related to the onset of alcohol or drug use, substance use can increase psychological symptoms either directly [2,7] or through effects on interpersonal and role functioning [8]. The consequences of alcohol and drug use may be evident quickly (e.g., nausea, sleep deprivation, depressed mood) or some time elapses before serious physical and health

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consequences are expressed. In a 12-year prospective study, Newcomb and Bentler found that adolescent alcohol and drug use had deteriorating effects on later adult mental health, such as an increase in depression, anxiety, and suicide ideation [9].

Generic health status or 'quality of life' has become an alternative widely used measure in health studies around the world. From a public health point of view, the concept of health-related quality of life refers to a person's perceived physical and mental health over a certain period of time. The sense of physical and emotional well-being as assessed via items inquiring about behaviors and feelings may be a proxy for the emergence of specific health, social, or behavioral problems, yet to fully develop among adolescents. The functional effects of drug use and the consequences (both short- and long-term accumulation) of involvement with drugs might affect particular health domains of the quality-of-life measure before serious health problems emerge.

Preliminary evidence derived from clinic- or hospital-based adult samples has suggested that quality of life is sensitive to contemporary drug use. Alcohol, tobacco, opiate, and cocaine users have been noted to have poor general health and a lower quality of life [10–14]. Other studies indicate that generic health status may not be consistent across various stages of drug involvement (e.g., current vs. former) or at different consumption levels [15–18]. For example, in a population sample of adults, Strine et al [18] reported an association between smoking status and nine health-related quality of life indicators, and suggested that current smokers experienced not only lower levels of generic mental health (e.g., infrequent vitality), but also poorer levels of generic physical health (e.g., frequent pains), as compared with former or nonsmokers.

Very few studies have explored drug consumption and health-related quality of life among population samples of younger ages. Among a household sample of urban adolescents surveyed in Vietnam, illegal drug use was found to be associated with lower scores on all of the health dimensions assessed ($p < .01$), whereas smokers and alcohol users had lower scores on more of the mental rather than physical measures [19]. A national drug survey of youth in Australia found that regular cannabis users had lower scores in generic health as well as in specific health-related domains, such as the mental health construct of vitality [20].

In light of current gaps in the connection between youthful drug involvement and quality of life, the present study examines the extent to which the use of three of the most commonly consumed drugs (i.e., alcohol, tobacco, and betel nut) in Taiwan is associated with health-related quality of life among a nationally representative sample of adolescents. We probe whether the relationship linking alcohol use with health-related quality varies by health-orientated domain (e.g. physical, social, or emotional) and explore whether the association is similar among youth who drink alcohol but do not use other types of drugs and among youth who, in addition to drinking alcohol, also use tobacco or betel nut.

Methods

Study Participants

The data for this study come from the recent National Health Interview Survey (NHIS), a cross-sectional survey of nationally representative household samples in Taiwan. The 2001 NHIS project involved a multi-stage probability design. With consideration of population distribution and geographic dispersion, seven, thirty, and four independent sampling regions (ISDs) were drawn accordingly for Taiwan main areas, mountainous areas, and offshore islands. Within each ISD, primary sampling units (i.e., townships) were stratified on the basis of urbanization and then selected with probability proportional to the size (PPS). Basic sampling units (i.e., households) were then randomly selected with each secondary sampling unit (i.e., lings; four

households per ling) based upon the household registration provided by the Ministry of Interior in Taiwan. In addition, in mountainous areas and offshore islands, households were over-sampled within lings to produce precise estimates. According to this sampling frame, a total 8458 households were initially selected.

Each of the 8458 households were sent a contact letter signed by the Director of Bureau of Health Promotion that included a description of the study protocol and instructions of what to do if the household residents had any questions. After the NHIS project excluded 1335 vacant or nonexisting households and added 234 extended households after sampling field staff validated the household registration data in person, a total of 7357 eligible households were selected for the final list. The survey participation rates were 91.4% at the household level, and 93.8% at the individual level. A more detailed description of methods and other information on the NHIS population and sample are available in published reports [21]. The present study's analyses primarily focus on the youth data obtained from Taiwan's main areas. With the restriction on the participants whose ages were 12–18 years at the interview, a total of 2235 youths were identified from 1525 households (524, 87, and 4 households with two, three, and four adolescent participants, respectively).

Assessment

The 2001 NHIS had several core components. The data for this study come from two components, both collected via face-to-face interviews administered by trained interviewers. One component assessed household characteristics (e.g., household composition and environment, and household socioeconomic status). The other component assessed personal characteristics and personal health information (e.g., sociodemographics, health-related quality of life, and healthy behavioral practices).

The interview began with an introduction of the research purpose and confidentiality assurance, followed by the modules obtaining information on individual sociodemographic characteristics, health status, medical service utilization, healthy behaviors, and perceived health-related quality of life. On average, it was 20 minutes before the interviewer asked some of the potential sensitive drug items in the healthy behavior section. Use of three of the most commonly consumed drugs in Taiwan (i.e., alcohol, tobacco, and betel nut) was assessed within the 30 days before the interview. Betel nut is a popular psychoactive substance consumed in Asian countries that has both stimulant and tranquilizing pharmacological effects [22]. In Taiwan, betel nut chewers are often also tobacco cigarette smokers [23].

The 36-item short form Health Survey (SF-36), selected from Medical Outcome Study (MOS) inventory, was used to assess respondents' health-related quality of life during the 30 days preceding the interview. In brief, to evaluate health status in a valid and efficient way, Ware and colleagues developed the SF-36 to reduce questionnaire constraints faced in prior standardized health surveys [24–26]. As opposed to disease-specific measures, the SF-36 is a measure of generic health status or quality of life that includes both physical and mental health concepts. Adaptation of the SF-36 scales for Taiwan was completed by Tseng et al [27], as well as translation and back-translation in English to Chinese, with slight modifications to make it conceptually equivalent (e.g., playing golf was replaced by playing Tai-Chi). Prior research on the basis of samples aged 12 years and above has suggested that the validity and reliability for the SF-36 Taiwan version is satisfactory [28].

The SF-36 covers eight health domains, with the Cronbach alphas among the adolescent sample being strong in each area: (1) Physical functioning (10 items, such as *Does your health now limit you in vigorous activities?* Cronbach alpha = .86); (2) Role limitations due to physical problems (four items, such as *Have you had to cut down the amount of time you spent on work or other activities as a result of your physical health?* Cronbach alpha = .85); (3) Bodily pain

(two items, such as *How much bodily pain have you had during the past 4 weeks?* Cronbach alpha = .64); (4) General health (five items, such as *I seem to get sick a little bit easier than other people.* Cronbach alpha = .78); (5) Vitality (four items, such as *Did you feel full of pep?* Cronbach alpha = .81); (6) Social functioning (two items, such as *How much of the time has your physical health or emotional problems interfered with your social activities?* Cronbach alpha = .58); (7) Role limitations due to emotional problems (three items, such as *Have you had to cut down the amount of time you spent on work or other activities as a result of your emotional health?* Cronbach alpha = .74); and (8) Mental health (five items, such as *Have you been a very nervous person?* Cronbach alpha = .72). The domains of physical, social, and role functioning generally capture behavioral dysfunction resulting from health problems, whereas the mental health, pain, and general health domains reflect more subjective components of health and general well-being [29]. The scores on each domain-specific scale range from 0–100, with higher scores representing better health. Compared with scores of respondents without any chronic condition, scores on the various domains have been shown to decline slightly (e.g., .6–3 points) among adults with less impairing conditions, such as allergies, and one sees an even larger decline in scores (e.g., 3–12 points) for more severe chronic conditions, such as diabetes and arthritis [30].

Statistical Analysis

The distribution of selected household characteristics as well as individual background and drug-related experiences were described by contingency table analyses. Student *t*-test and a series of linear regression analyses were performed to examine drug use in relationship to domain-specific health status scores. Mindful that ordinary linear regression models would fail to address the inter-domain correlation existing in the SF-36 (i.e., individuals who reported higher levels of vitality are more likely to report higher levels of mental health) [25,27], a multivariate response regression approach based upon the generalized linear model and generalized estimating equations (GLM/GEE) [31] was used to solve the intra-individual correlation issue. In our analyses, the possible link between drug use and health related quality of life was first estimated via a “common-slope” model, which assumes that drugs have uniform relationships across the different domains of SF-36. The domain-to-domain variation was captured by introducing product terms of health scores and drug-related variables of interests [32,33]. Results of this regression analysis are presented in the form of linear score estimates (i.e., the covariate-adjusted scores of reporting a given SF-36 scale for recent alcohol using youth vs. the corresponding scores for those without alcohol use in the past 30 days before the assessment). The 95% confidence intervals (CI) and *p* values are reported as an aid to interpretation, with variance estimation based upon the GEE working correlation structure and robust specifications for variance estimation [31]. Despite the multistage sampling design, the NHIS is self-weighting; thereby estimates do not require weights.

Results

The mean age of the 2235 youth participants was 15 years, and just over half (51.8%) were male (Table 1). Approximately 7%, 5%, and 1% of youths in the NHIS reported using alcohol, tobacco cigarettes, and betel nut, respectively, on at least one occasion within the 30 days before the interview. Among recent alcohol drinkers, about two-thirds (96 out of 148) were currently not smoking tobacco cigarettes or using betel nut.

As would be expected for a population sample primarily composed of healthy adolescents, the response distributions for each of the eight domains tended to be skewed in the direction of positive health. Figure 1 illustrates the average score, sub-grouped by recent drug-related experience. In general, differences in the average score were not detected. However, the one domain where scores differed was role-emotion. The estimated scores for alcohol users with

or without tobacco or betel nut use were significantly lower than the estimates of nonalcohol users ($p < .05$).

Table 2 summarizes coefficient estimates (β) for recent drug involvement in relationship to SF-36 scores derived from linear regression models. Before covariate adjustment, recent alcohol-only use was estimated to be inversely associated with quality of life in domains of bodily pains, general health, social functioning, and role-related emotional problems (e.g., $\beta = -9.33$, 95% CI -16.4 – -2.3 , $p < .01$). After statistical adjustment for age, gender, aboriginal ethnicity, and family income, the observed alcohol-related differences were still present. Recent alcohol users with other drug involvement (e.g., tobacco or betel nut) tend to experience more role-related emotional problems as compared with the reference group of nondrug users (Model 1: β : -11.02 , 95% CI -20.7 – -1.4), but are not more likely to experience decreased quality of health in other domains.

Table 3 presents results from a parsimonious ‘common slope’ model, with interdependencies taken into consideration via the GLM/GEE multivariate response profile models described in our Methods section. Under the ‘common slope’ model, recent alcohol use was associated with a reduced score of -2.84 in general health-related quality of life (95% CI -4.95 – $-.73$). The analyses derived from the ‘multiple slope’ model suggests that alcohol-related differences may not be homogeneous across the eight domains of SF-36. As compared with those who had no recent alcohol use, alcohol drinkers appear to be in greater distress, particularly in the domains of bodily pain and role-related emotional problems. After covariate adjustment, recent alcohol drinkers have an estimated score that is lower by 10.5 on the subscale of quality of life with respect to role-emotional domains as compared with nonalcohol using youths.

Discussion

In a representative household sample of youths who participated in the 2001 National Health Interview Survey in Taiwan, we see evidence that alcohol use among teenagers was generally associated with a lower level of health-related quality of life. More important, the associations linking alcohol use with lower levels of health-related quality of life were not constant over the eight domains examined in the study, and the strongest inverse relationships appear in the domains of role limitation due to emotional problems, bodily pains, and general health. In addition, concurrent use of other substances (e.g., tobacco and/or betel nut) with alcohol did not result in additional declines in health.

Some caveats should be kept in mind before we interpret the empirical findings of our study. First, deductions of causal inferences are constrained, due to the study design. The cross-sectional retrospective character of this survey limits our ability to establish the temporal sequencing of events. Our analysis is driven by an assumption that the direction flows from substance use to perceived health, as we perceive persistent drug involvement to be a chronic rather than acute condition and that use in the past 30 days reflects frequent usage. Future studies should seek to track the trajectories of drug involvement and quality of life to understand the sequencing and reciprocal nature of this relationship.

Second, it is important to note limitations with our measures of drug use and quality of life. The single-item measures of drug use do not sufficiently capture the onset, levels, or patterns of substance use that would be expected to provoke differences in perceived health. Although the SF-36 had good scale psychometric properties in our sample of youth, it may not be capturing all relevant aspects of health-related quality of life among youth, as the items were originally created to assess adult functioning. In addition, the wide age range of our youth, from 12 to 18 years of age, cuts across several developmental stages. Future studies might want to consider including additional developmentally appropriate items to strengthen the measures.

Little is known about methodological differences on collecting sensitive behaviors, such as drug use on Taiwanese samples. Data collected in face-to-face interviews may be underestimated because of the sensitive nature of admitting to non-normal or deviant behaviors [34,35]; however, we restricted our analyses to the three substances less stigmatized than drug involvement associated with greater deviant behavior (e.g., marijuana, cocaine, or amphetamines). Alcohol drinking and betel nut chewing are socially acceptable in many parts of Taiwan, even though the legal age to purchase alcohol and tobacco use in Taiwan is 18 or older. A consequence of our low prevalences, especially for the small polydrug-using groups, is that we may not have the optimal power to be able to detect meaningful differences, as the underreporting potentially may lead to nonmisclassification bias. However, the survey included two approaches found by others to promote honest reporting: building rapport before inquiring about behaviors [36], and embedding behavior specific items in a general health survey [37]. The past 30-day prevalence rates in this study are comparable with rates for frequent use reported on a self-administered school survey of junior high students (aged 12–17 years) in Taipei city [38].

Despite limitations mentioned above, the sample of youth drawn from nationally representative households in Taiwan provides one of few population-based findings on the topic of drug involvement and health-related quality of life in early life. Recall of recent events, such as the 30-day timeframe for both substance use and health-related quality of life, has been found to encourage more accurate estimates of consumption and general health. Prior research has often been limited to examining the association linking drug involvement with health-related quality of life using techniques that evaluate each item separately [18]. Our analytic approach adapting advanced statistical modeling techniques to control for the interdependencies between domains and other potential confounders offers a different perspective to the domain-to-domain variations in the links between drug involvement and health related quality of life.

In general, our findings are similar to the few other adolescent surveys that have also explored the association between drug involvement and health-related quality of life. Drug-using youth tend to have lower scores on health dimensions, in particular those related to mental health [19,20]. Several explanations have been proposed to reconcile the data on adolescent drug involvement and an excessive risk of negative consequences that may be captured in the poorer perception of quality of life, especially in the role-emotional domain. One possible explanation is that early-life drug experience may impair physical or mental functioning and interfere with learning and coping skills necessary for concurrent and subsequent roles [9]. Others theorized that drug involvement is just one feature of a latent underlying syndrome that actually accounts for other deviant or health-compromising behaviors [39]. It also has been postulated that observed excess in mental and behavioral disturbance may be a manifestation of ontogenetic changes in the neurobiological system [40,41]. Chambers and colleagues (2003), after reviewing evidence from laboratory research and clinical observation, suggested that developmental changes in neurocircuitry involving motivation may be a possible underlying mechanism accounting for a greater vulnerability to neurobiological effects of psychoactive drugs in adolescents [42].

Yet our study also differs from prior evidence. Our findings indicate that recent use of alcohol alone seems to have greater deleterious effects on general health rather than alcohol with tobacco/or betel nut, or tobacco alone (or with betel nut), contrary to the documented association of negative health consequences with adolescent polydrug use [43]. This observation could be, in part, explained by the nature of our sample (e.g., the small number of past-month betel nut users and tobacco smokers), the relatively short period of consumption of tobacco and/or betel nut with alcohol in our sample, or polydrug users either have a different threshold of problem perception or their alcohol drinking frequency or patterns (e.g., less binges) are different, so as not to result in consequences. It is also possible that the detrimental

influences related to use of tobacco (or betel nut) at these young ages may not be observed in the short-term context, as the emergence of health or social problems doesn't occur until young or mid-adulthood [15,44]. For example, the use of betel nut has been associated with deleterious effects on oral and dental health, such as oral leukoplakia and oral cancer [45,46].

In conclusion, our study elaborates on the findings of others who have explored generic quality of life and drug involvement in samples of youth. In this study, we found that recent alcohol-drinking teenagers tend to have a greater potential for being distressed, as indexed by the SF-36. It is noted that, independent of age, gender, socioeconomic status, tobacco or betel nut use, the inverse relationship seems much more salient in domains of subjective health and well-being, rather than behavioral dysfunction. Although the temporality between alcohol involvement and lower levels of mental health is not explicit, the findings suggest that youth who are actively drinking might be a possible target group to intervene and avert mental-health-related problems. Similarly, youth reporting low quality of life might benefit from interventions preventing substance use and health problems. Further clarification of the complex nature between quality of life and alcohol use is needed before we can stipulate the role that generic health status may have in the progression of abuse/dependence on alcohol as well as the role alcohol use may have on the progression of quality of life, in particular in the mental health domains.

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- a. Past 30 day substance use: None (no use of alcohol, tobacco or betel nut; n= 2,018), A only (alcohol use only; n=96), A+T/B (alcohol use with tobacco or betel nut; n=52), T or TB (no alcohol use, tobacco use with or without betel nut use; n=67).
- b. Student *t*-test's p-value for the RE scores between groups of "None" with "A only" was 0.005, and 0.02 between groups of "None" with "A +T/B".

Figure 1.
Comparison of SF-36 Scale Profiles among Taiwan adolescents by substance use in past 30 days.

Table 1

Sociodemographic characteristics and past 30-day drug-related experiences among youth in the National Health Interview Survey in Taiwan, 2001

Characteristics	n (%) ^a
Total	2235 (100%)
Sociodemographic characteristics	
Age	
Range	12–18
Means (SD)	15.26 (1.96)
Gender	
Female	1078 (48.2)
Male	1157 (51.8)
Aboriginal ethnicity	
Nonaboriginal	2203 (98.6)
Aboriginal (either parent)	32 (1.4)
Household income (NTD/per month) ^b	
0–29,999	587 (26.3)
30,000–69,999	1174 (52.5)
70,000 or above	455 (20.4)
Household size	
2–5 residents	1596 (71.4)
6 or more residents	639 (28.6)
Past 30-day drug-related experience	
Alcohol drinking	
No	2086 (93.3)
Yes	148 (6.6)
Tobacco cigarette smoking	
No	2116 (94.7)
Yes	119 (5.3)
Betel nut chewing	
No	2213 (99.0)
Yes	22 (1.0)
Poly-drug use profile	
None (no use of a drug)	2018 (90.3)
Alcohol only	96 (4.3)
Alcohol and tobacco only	36 (1.6)
Alcohol and betel nut only	0 (0.0)
Alcohol, tobacco and betel nut	16 (.7)
Tobacco only	62 (2.8)
Betel nut only	1 (.04)
Tobacco and betel nut only	5 (.2)

^a Some columns do not add up to 100% because of missing values or unknown responses.

^b New Taiwan Dollars (NTD): 29,999 NTD is approximate \$1,000, and 69,999 NTD is approximately \$23,330.

Table 2
Estimated relationships between adolescent alcohol use and eight scales of SF-36, the 2001 NHIS, Taiwan

SF-36 subscales	Physical functioning β (95% CI)	Role-physical β (95% CI)	Bodily pain β (95% CI)	General health β (95% CI)	Vitality β (95% CI)	Social functioning β (95% CI)	Role-emotional β (95% CI)	Mental health β (95% CI)
Unadjusted coefficient estimates ^a								
Alcohol only	.53 (-.8-1.9)	-1.35 (-6.0-3.3)	-4.41 (-7.2-1.6)	-5.20 (-8.9-1.5)	-2.92 (-6.4-.5)	-3.05 (-6.1-.02)	-9.33 (-16.4-2.3)	-3.01 (-6.1-.1)
Alcohol with tobacco or betel nut	.82 (-1.0-2.7)	-.37 (-6.6-5.9)	1.09 (-2.7-4.9)	.35 (-4.6-5.3)	-.76 (-5.4-3.8)	-.39 (-4.5-3.6)	-9.95 (-19.5-.4)	-1.86 (-6.0-2.3)
Tobacco only (or with betel nut)	.58 (-1.0-2.2)	1.94 (-3.6-7.5)	-1.23 (-4.6-2.1)	-1.62 (-6.0-2.8)	.37 (-3.7-4.4)	-.61 (-4.0-3.0)	2.26 (-6.2-10.7)	1.81 (-1.8-5.5)
Model 1, ^{a,b}								
Alcohol only	.40 (-1.0-1.8)	-1.37 (-6.1-3.4)	-4.85 (-7.7-2.0)	-5.06 (-8.8-1.4)	-2.86 (-6.3-.6)	-3.09 (-6.1-.03)	-9.58 (-16.7-2.4)	-3.33 (-6.4-.2)
Alcohol with tobacco or betel nut	.62 (-1.3-2.5)	-.52 (-6.9-5.9)	.28 (-3.5-4.1)	.46 (-4.5-5.5)	-1.04 (-5.7-3.6)	-.59 (-4.7-3.5)	-11.02 (-20.7-1.4)	-2.59 (-6.8-1.6)
Tobacco only (or with betel nut)	.27 (-1.4-1.9)	1.91 (-3.8-7.6)	-2.18 (-5.6-1.2)	-2.04 (-6.5-2.4)	.55 (-3.6-4.7)	-.71 (-4.4-3.0)	2.32 (-6.3-10.9)	1.40 (-2.4-5.1)

* $p < .05$;

** $p < .01$;

*** $p < .001$; CI = confidence intervals.

^aReference group: no use of alcohol, tobacco cigarettes, and betel nut in the 30 days before the 2001 NHIS assessment.

^bEstimated regression coefficients were based on linear regression models adjusted for age, gender, aboriginal ethnicity, family income, and household size.

Table 3

Estimated relationships between adolescent alcohol use and SF-36, the National Health Interview Survey, Taiwan, 2001

SF-36	Coefficient (95% CI)
Common slope model	
Crude	-2.84 (-4.95—-.73) **
Model 1 ^a	-3.07 (-5.16—-.99) **
Model 2 ^b	-3.72 (-5.98—-1.48) ***
Multislope model ^c	
Physical functioning	-.30 (-1.44—.88)
Role-physical	-1.97 (-6.26—2.32)
Bodily pain	-3.34 (-5.88—-.79) **
General health	-4.10 (-7.44—-.76) *
Vitality	-2.99 (-5.78—-.21) *
Social functioning	-3.05 (-5.84—-.26) *
Role-emotional	-10.5 (-16.9—-4.12) ***
Mental health	-3.60 (-6.56—-.58) *

*
 $p < .05$;

**
 $p < .01$;

 $p < .001$.

^a Estimated regression coefficients were based on linear regression models adjusted for age, gender, aboriginal ethnicity, family income, and household size.

^b Estimated regression coefficients were based on linear regression models adjusted for age, gender, aboriginal ethnicity, family income, household size, tobacco use, and betel nut use.

^c Estimated regression coefficients were obtained by alcohol and subscale*alcohol product terms, adjusted for age, gender, aboriginal ethnicity, family income, household size.