

Strategies to reduce risky alcohol use among underage girls

AN EVIDENCE REVIEW



McCreary
Centre Society

**Strategies to reduce risky alcohol use among underage girls:
An evidence review**



Prepared for
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Youth Research Academy



The Youth Research Academy (YRA) is a group of youth aged 16 to 24 with government care experience who, with the support of McCreary staff, develop, analyze, and disseminate research projects of interest to youth with government care experience and service providers.

Female members of the YRA contributed to this project through their involvement on the project advisory committee, undertaking a review of media messaging, and conducting a search of McCreary literature about risk and protective factors for harmful underage alcohol use.

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Executive summary

Risk and protective factors for alcohol use among female adolescents are often different from those for males, as are their motivations for drinking. For these reasons it is important to carefully consider which strategies are the most promising for addressing underage girls' problematic alcohol use.

An extensive search of the academic and grey literature was performed to identify policies and interventions which addressed risky drinking among underage girls. Although most studies did not separate out data for underage girls, 27 rigorously evaluated interventions and nine policy studies were identified which provided gender-specific data or were targeted only at female adolescents. In addition, our search identified a number of promising programs that had adequate (non-gender specific) evidence to include them in this report.

Additionally, McCreary's Youth Research Academy reviewed published and unpublished data about risk and protective factors for harmful female alcohol use and investigated messaging aimed at reducing harmful alcohol use.

Underage female youth at risk for problematic alcohol use included those who were economically advantaged, experienced victimization and trauma, had negative body image, and were going through periods of transitions. The strongest protective factors were those which built resilience and strengthened healthy relationships.

Family interventions appeared to be the most consistent in reducing risky alcohol use among girls. Computer- and audio-based programs delivered in the home environment created opportunities for caregivers and their daughters to build skills together, and may be particularly effective at reaching those who cannot or are reluctant to attend in-person sessions.

Interventions that were tailored to specific cultural contexts; took into account personality traits associated with increased risk for problematic substance use; and addressed girls' previous experience with alcohol also appeared helpful.

Universal school-based interventions were generally more effective with younger girls than older ones, and with those who had not yet tried alcohol in comparison to those who were already using alcohol.

Interventions with a motivational interviewing component which invited young women to self-reflect on how their alcohol use was affecting their ability to meet their goals were effective with older youth.

Interventions that addressed motives for alcohol use and discussed healthier alternatives appear to be especially effective for girls identified as 'at-risk' for harmful alcohol use.



Policy interventions such as raising the legal drinking age and drunk-driving laws were somewhat effective for females, but appeared to be more consistently effective for males. However, other policy changes such as alcohol pricing increases and those that contribute to creating a more inclusive school environment appeared to be helpful in reducing risky underage alcohol use among girls.

As studies have shown increased exposure to alcohol advertising is related to alcohol initiation and increased consumption and related harms, policies aimed at reducing youth's exposure to advertising may be a promising approach.

Messaging targeting risky alcohol use among underage girls was less effective if it focused on health consequences and harms, than if it focused on social consequences and the benefits of moderated drinking.

Finally, as harmful alcohol use is often not seen in isolation from other risk behaviours and challenges (e.g., mental health problems), interventions that focus on promoting protective factors may be more effective than those which focus on eliminating or reducing a specific health risk behaviour. Additionally, policies and interventions targeting underage female alcohol use should take into account girls and young women's experiences of systemic and individualized trauma and discrimination.

Introduction

Alcohol is the most commonly used substance in Canada (Canadian Centre on Substance Abuse [CCSA], 2014). It is estimated that alcohol-related harms cost Canadians billions of dollars a year in health care services, law enforcement, loss of productivity, and other social costs (Rehm, Patra, & Popova, 2006).

Although the legal drinking age in British Columbia is 19, many male and female youth begin to use alcohol before this age, and 72% of BC high school students have tried alcohol by the age of 18 (Smith et al., 2015a). Despite recommendations that females should drink less than males, in 2013, 39% of BC females who had tried alcohol engaged in heavy sessional drinking in the past month (a similar rate to their male peers), and younger females were more likely to drink at this level than younger males (Smith, Stewart, et al., 2014).

In 2013, the Canadian Medical Association expressed concern that girls were no longer waiting longer than boys to have their first drink and were drinking at the same rate as boys from a young age (Flegel, 2013). A narrowing of the gap between males and females in alcohol consumption and heavy sessional drinking has also been seen in the United States (Substance Abuse and Mental Health Services Administration [SAMHSA], 2015).

Underage alcohol use has been associated with many negative consequences during adolescence and later in life, including motor vehicle accidents and other unintentional injuries; suicides, homicides, and violence; risky sexual behaviour; impaired academic performance; and alcohol-related problems and dependence later in life (SAMHSA, 2015; Smith et al., 2015a).

Adolescent females have a higher likelihood than males of alcohol-related harms such as getting into arguments with their family, getting injured,

getting into trouble at school, experiencing violence, feeling anxious or depressed, having unwanted sex, or getting drunk to the point of passing out (Evans-Whipp, Plenty, Catalano, Herrenkohl, & Toumbourou, 2013). Female-specific risks include unwanted pregnancy and inadvertent alcohol consumption during early pregnancy. In addition, alcohol is the most common substance associated with sexual violence (Atlantic Collaborative on Injury Prevention, 2014). For example, young adult females who were heavy drinkers were found to be at greater risk of sexual intimate partner violence (Waller et al., 2012).

Females may be more vulnerable to the effects of alcohol than males. For example, females' body composition and metabolism mean they process alcohol at a slower rate than their male peers (National Research Council and Institute of Medicine, 2004; SAMHSA, 2015). Heavy alcohol use has been shown to affect bone development in young women (National Research Council and Institute of Medicine, 2004). As well, females may progress to alcohol dependence or abuse at a faster rate than males, and are more vulnerable to brain, heart, and liver problems related to alcohol (The National Centre on Addiction and Substance Abuse [CASA], 2003). A recent cohort study found that girls who start using alcohol early in high school are prone to harmful use by graduation (Flegel, 2013).

Reducing alcohol-related harms is therefore especially important for adolescent females. This evidence review identifies the most promising strategies to prevent risky drinking behaviour in underage girls.

Methodology

Search criteria

A structured search of the published literature was conducted using relevant research databases including Academic Search Complete, CINAHL, Cochrane Central Register of Controlled Trials (CENTRAL), Cochrane Database of Systematic Reviews (CDSR), Communication & Mass Media Complete, ERIC, CABI Global Health, Medline, PsycINFO, PubMed Central, and Social Sciences Full Text. Research studies were also obtained by looking through the reference lists of relevant articles and using the “similar articles” feature available in some databases.

A search of the grey literature, including governmental and non-governmental reports, was also conducted using search engines available through the Canadian Best Practices Portal for Health Promotion and Chronic Disease Prevention, Canadian Institute of Health Information, the New York Academy of Medicine Grey Literature Report, the SAMHSA registry of evidence-based programs and services, and Google.

The search was limited to English language articles published between 1990 and February 2017. Evaluation studies that assessed the impact or effectiveness of approaches, resources, and messages regarding the prevention of risky and harmful alcohol use among underage girls were of primary interest (e.g., binge drinking, drinking and driving, alcohol-related consequences).

Search terms included combinations of terms such as:				
Heavy alcohol use	Intervention	Best practices	Girls	Polysubstance use
Problematic alcohol use	Policy	Evidence	Females	Mixing alcohol
Harmful alcohol use	Resources	Effective	Underage	Adverse childhood
Risky alcohol use	Messages	Prevention	Adolescent	Trauma
Binge drinking	Strategies	Protective factors	Youth	Drinking age
Alcohol misuse			Young people	Drinking and driving
Alcohol abuse			Young women	Zero tolerance
Alcohol dependency			Teen	Alcohol outlet
			High school	Alcohol availability

Search results

The search yielded 5,805 original articles. The titles, abstracts, and keywords of these studies were reviewed. Articles that did not focus on risky or harmful adolescent alcohol use or did not include females in the sample were eliminated. This left 855 results.

A brief full text review of these articles identified over 100 that discussed the effects of alcohol policies and messaging on female adolescents, and more than 200 that focused on youth alcohol misuse interventions. Among these articles, 27 interventions and 9 policy papers were rigorously evaluated and provided gender-specific information. Few of these interventions and policy papers had been implemented in Canada, so additional studies of interventions were sought which had not been as rigorously evaluated but showed promising results.

Evaluation of key articles

The 27 interventions and 9 policy papers that included gender-specific data were reviewed for their methodological quality, relevance, and applicability to the BC context. A review scoring sheet with criteria for ranking the strength of the research design; sampling (e.g., including comparison or control groups); outcome measures reported; and data analysis was used to evaluate the evidence. In the case of quantitative research, the statistical analyses used to assess effects (especially effect sizes) were also evaluated.

Of the 27 high quality interventions (detailed in Appendix A), those with the most positive results for female participants were seen in 7 interventions targeted specifically at girls (Fang & Schinke, 2013; O'Donnell, Myint, Duran, & Stueve, 2010; Schinke, Cole, & Fang, 2009; Schinke, Fang, & Cole, 2009; Schinke, Fang, Cole, & Cohen-Cutler, 2011; Schwinn, Schinke, & Di Noia, 2010; Watt, Stewart, Birch, & Bernier, 2006), 6 mixed-gender interventions that reported more positive results for females than males (Longshore, Ellickson, McCaffrey, & St. Clair, 2007; Mason et al., 2009; Smith et al., 2008; Vogl et al., 2009; West et al., 2008; Wurdak, Wolstein, & Kuntsche, 2016), and 2 interventions that appeared equally effective for girls and boys (Shope, Copeland, Maharg, & Dielman, 1996; Stafström & Ostergren, 2008).

Calculation of effect sizes and Numbers Needed to Treat (NNT)

For the quantitative intervention studies that contained results for females, effect sizes were calculated if they were not already presented in the article, if adequate details were available. Such effect size measures may have included odds ratios, risk ratios, relative risk ratios, Cohen's *d*, Hedges *g*, and η^2 (eta squared). Most of these measures have general guidelines to identify what counts as small, moderate, and large effect sizes. They can also often be transformed from one to another.

In addition to these more general measures of effect size, there is a practical extrapolation of these measures that is often used to interpret health care interventions, called the Number Needed to Treat (NNT). The NNT can be interpreted as the number of people who need to be exposed to the intervention for one person to have the specific improvement (or reduction in negative outcome). Where applicable, for each effect size in a study that could be transformed to be included in the calculation of NNT, these calculations were performed. Unfortunately, few studies provided adequate information for female adolescents to perform the NNT calculations.

Limitations

This study has several limitations, most notably a single intervention delivered in isolation is unlikely to reduce risky alcohol use among underage girls, however positive that intervention. Although not the primary focus of this review, it is important to note that other literature suggests that comprehensive, multi-component interventions that focus on building resilience and developing supportive, healthy relationships for young people are more effective in reducing health risk behaviours than interventions that focus exclusively on the behaviour we wish to reduce or extinguish.

Reflecting the experience of other researchers (e.g., Blake, Amaro, Schwartz, & Flinchbaugh, 2001) who have sought to identify interventions that are effective for girls in reducing risky alcohol use, it was challenging to isolate interventions which provided results for girls under the age of 19. There were even fewer studies which had been conducted in Canada or with specific at-risk subpopulations such as Indigenous girls, those who had experienced violence and abuse, or sexual minority girls.

Additionally, most interventions which had been evaluated focused solely on alcohol use rather than on polysubstance use, even though mixing alcohol and other drugs can be particularly risky for girls (Office of National Drug Control Policy, 2006).

Most of the literature that was available came from the U.S. where the legal drinking age is older than in Canada (e.g., 21 years of age compared to 19 in British Columbia).

Finally, some interventions such as the prescription of periods of abstinence from alcohol or voluntary abstinence pledges did not appear to have any evaluation results which would be applicable to underage female youth. However, there were some evaluations completed in the 1980's with older adolescents and young adults which would suggest these interventions may not be effective. For example, one study of male and female college students found that following a 10 day period of abstinence, participants consumed more alcohol in the weeks after the intervention than they had prior to the intervention. Additionally, the heaviest alcohol consumers did not complete 10 days of abstinence (Burish, Maitso, Cooper, & Sobell, 1981). A subsequent study focused exclusively on female social drinkers found that a period of abstinence did not negatively or positively affect future drinking behaviours (Carey, Carey, & Maitso, 1988).

Terms used in the report

The following definitions were used in this report, unless otherwise noted:

Alcohol abuse

Alcohol abuse refers to a pattern of drinking too much alcohol or drinking alcohol too often which is often associated with risky behaviour and negative consequences. It does not necessarily imply alcohol dependence.

Binge drinking

Binge drinking refers to having multiple drinks on a single occasion. For females, this means having three or more alcoholic drinks, and for boys refers to having four or more alcoholic drinks.

Heavy sessional drinking

Heavy sessional drinking or heavy episodic drinking refers to having five or more alcoholic drinks within a couple of hours. (Note that some authors cited in this report may have referred to this level of drinking as binge drinking.)

Harmful/risky alcohol use

Harmful/risky alcohol use is use that can damage health. It does not include trying alcohol or drinking within low risk guidelines.

Early adolescence/younger youth

Early adolescence/younger youth refers to youth between the ages of 10 and 14 years old.

Older youth

Older youth refers to young people aged 15–18.

NNT or Numbers Needed to Treat

NNT or Numbers Needed to Treat is a statistical calculation which estimates how many young people need to receive the intervention for one youth to report a positive effect on their risky substance use.

Cochrane Reviews

Cochrane Reviews are systematic reviews of primary research studies that investigate the effects of interventions.

RCT or Randomized Control Trial

RCT or Randomized Control Trial is a scientifically rigorous way of evaluating an intervention, which compares participants in an intervention with a matched group who did not receive the intervention.

Risk and protective factors for harmful underage alcohol use among females

This section reviews the published literature about risk factors for harmful alcohol use among underage girls and identifies protective factors that can buffer against such use. Members of the Youth Research Academy also reviewed information provided to McCreary from young people across BC through surveys, focus groups, and workshops. Many of the same risk and protective factors that were identified for risky alcohol use in the academic literature were discussed by youth in BC and their recommendations are included on page 17.



Risk factors

Transitions

A national review of pathways to substance abuse among females in the U.S. identified transitions as key risk periods. For example, girls who frequently move from one home or neighbourhood to another are at increased risk of harmful alcohol use (CASA, 2003).

School transitions may also be associated with increased alcohol use. For example, high school entry has been found to be a critical event linked with more rapid increases in alcohol use than before entry (Andreas & Jackson, 2015); and for girls, specifically, the transition was associated with initiation of alcohol use (Jackson & Schulenberg, 2013). Transitions from elementary or middle school may contribute to risky alcohol use as girls try to manage their anxiety or attempt to fit in with older or different friend groups (CASA, 2003; Longshore et al., 2007; Shortt, Hutchinson, Hutchinson, Chapman, & Toumbourou, 2007), deal with increased academic pressure, and be immersed in an environment that involves less adult monitoring and more individual freedom (Andreas & Jackson, 2015; Jackson & Schulenberg, 2013). In BC, young women who had experienced harms from their alcohol use confirmed that the transition from elementary to high school was a time when their use increased because of feeling overwhelmed and stressed and wanting to fit in with older students (McCreary Centre Society, 2015).

The transition to college includes many similar stressors including changes in peer and family relationships and academic pressure, as well as dealing with being an independent adult (Morton, Mergler, & Boman, 2014). This transition can also be a vulnerable time because underage drinking is typically normative for young adult women (LaBrie, Feres, Kenney, & Lac, 2009). In addition, this is a time when they associate alcohol with dealing with boredom and depression (CASA, 2003). Research has indicated an increase in young women's experience of alcohol-related sexual consequences in the first year of college compared to the last year of high school (Orchowski & Barnett, 2012). This study found that the onset of these types of consequences in the first year of college was associated with motives to enhance positive affect and with parents not knowing about alcohol use during high school. Young women in BC with post-secondary experience identified the availability of alcohol combined with its social acceptability as increasing their use (McCreary Centre Society, 2015).

An early entry into puberty is another transition associated with increased alcohol consumption (CASA, 2003; Hummel Shelton, Heron, Moore, & van den Bree, 2012). Specifically, girls who mature early are more likely than those who mature on time to report early initiation of alcohol use, increased alcohol use and abuse, and advanced drinking including multiple instances of drunkenness, frequent drinking, and high consumption levels (Bratberg, Nilsen, Holmen, & Vatten, 2005; Hummel et al., 2012; Lee et al., 2014). There is some evidence, however, that suggests that these relationships may not persist into late adolescence (Kaltiala-Heino, Koivisto, Marttunen, & Fröjd, 2011).

Mental and emotional health challenges

Underage females are more likely than males to use alcohol to manage their emotions, such as to improve mood or to cope with depression, anxiety, eating disorders, or body dissatisfaction (e.g., Kuntsche & Muller, 2012; Owens & Shippee, 2009; Schinke, Fang, & Cole, 2008). In BC, females aged 12–19 were more likely than males to use alcohol to manage challenges such as stress, anxiety, and depression (Smith et al., 2011; Smith, Stewart, et al., 2014; Smith et al., 2015a).

Females as young as 11 years who reported high levels of depression were over twice as likely to use alcohol as their female peers who did not report depression (Schinke, Fang, & Cole, 2008), and those who reported drinking to manage their mental health challenges were more likely to drink at risky levels (Kuntsche & Muller, 2012; Lammers, Kuntsche, Engels, Weirs, & Kleinjan, 2013). In BC, girls aged 12–19 with mental health challenges were more likely to engage in risky drinking. For example, among those who had tried alcohol, those with a mental health condition were more likely than those without such a condition to binge drink (42% vs. 30%; Smith et al., 2015a), as well as engage in heavy sessional drinking (46% vs. 36%) and consume alcohol on three or more days (35% vs. 25%) in the past month (McCreary Centre Society, 2013).

Trauma

A history of trauma or abuse is a risk factor for harmful alcohol use among girls and young women (e.g., CASA, 2003; Poole & Dell, 2005; Weiss & Nicholson, 1998). For example, girls in BC who had been physically or sexually abused were more likely to report heavy sessional drinking in the past year than their peers who had not been abused (Smith et al., 2015a; Tourand, Smith, Poon, Saewyc, & McCreary Centre Society, 2016). They were also more likely to start drinking before they were 13 years old, and to report last drinking because they were stressed or feeling sad (Smith et al., 2015a).

BC females aged 12–19 who had been bullied in person or cyberbullied were more likely to report heavy sessional drinking in the past month than their peers without these experiences (Smith et al., 2015a). These youth were also more vulnerable to negative peer influence. For example, those who had been bullied in the past year were more likely than their peers to report drinking because their friends were doing it (Smith et al., 2015a).

Discrimination, such as experiences of racism or because of a disability, can also be a risk factor for harmful alcohol use (Schinke et al., 2011; Smith et al., 2015a; Weiss & Nicholson, 1998) as are traumatic experiences such as entering government care, living in extreme poverty, and being the victim of dating violence (Smith et al., 2011; Smith et al., 2015a).

Family challenges

Factors such as family alcohol abuse, maternal alcoholism, maternal drug abuse, insecure attachment, low parental monitoring, having older siblings, unstructured home environment, and family conflict are all predictors of risky substance use among girls (e.g., Kumpfer, 2014; LaBrie et al., 2009; Paschall, Grube, Black, & Ringwalt, 2014; Schinke, Fang, & Cole, 2008; Soloski & Berryhill, 2016; Toumbourou, Douglas Gregg, Shortt, Hutchinson, & Slaviero, 2013). Additionally, female youth whose mothers smoked or drank heavily during pregnancy are more likely to use alcohol than underage males with similar experiences (CASA, 2003).

In BC, female youth aged 12–19 whose parents did not know what they were doing with their free time were more likely to report heavy sessional drinking than those whose parents monitored their leisure time (e.g., Tourand, Smith, Poon, Saewyc, & McCreary, 2016). In addition, homeless and street-involved female youth in BC who had someone in their family with a substance use challenge were more likely to have used substances themselves (Smith et al., 2015b).

Peer pressure

It has been suggested that female adolescents may be more susceptible to the pressures and social influences to use alcohol than their male counterparts (Amaro et al., 2001; CASA, 2003). Having a best friend or romantic partner who misuses alcohol can be a stronger predictor of risky alcohol use for female youth than males (Amaro et al., 2001; Schinke, Fang, & Cole, 2008; Schinke et al., 2011). For example, middle school girls in the U.S. who experienced high peer pressure to drink were twice as likely to use alcohol as those who did not experience this level of peer pressure. This was not the case among boys (CASA, 2003).

Among youth who completed the BC Adolescent Health Survey, females were more likely than males to report using substances because they wanted to have fun, their friends were doing it, and they felt pressured into doing it (e.g., McCreary Centre Society, 2015; Tourand et al., 2016). Data from the survey also showed that girls who had six or more friends were more likely to report heavy sessional drinking in the past month than their peers with fewer friends (Smith et al., 2015a), as were those who regularly participated in organized sports such as hockey and soccer teams (Smith, Stewart, Poon, Saewyc, & McCreary Centre Society, 2011b).

Higher family and neighbourhood income

Studies from the U.S., Europe, and China have linked heavy sessional drinking or drunkenness to adolescents growing up in families with high socioeconomic status (CASA, 2003; Humensky, 2010; Legleye et al., 2013; Lu et al., 2015; Lu et al., 2016; Melotti et al., 2013; Song et al., 2009; Tomcikova, Geckova, van Dijk, & Reijneveld, 2011; Zaborskis, Sumskas, Maser, & Pudule, 2006). For example, U.S. studies have shown that female youth growing up in affluent suburban neighbourhoods are at particularly high risk for heavy alcohol use (Botticello, 2009; Reboussin, Preisser, Song, & Wolfson, 2010). Other studies have indicated that economically disadvantaged or unsafe neighbourhoods are not associated with problematic alcohol use among underage girls (Fagan, Wright, & Pinchevsky, 2013; Svensson & Hagquist, 2010; Tucker et al., 2013).

It has been suggested that upper-middle class females constitute an “at-risk” population because they face multiple pressures with educational expectations, family dynamics, and peer norms while having the resources such as a car and money which allow them to obtain and use alcohol frequently and heavily (Luthar, Barkin, & Crossman, 2013). Drinking among this population is often seen as socially and culturally acceptable. For instance, parents may not impose serious consequences for risky drinking, and excessive use can be seen as normative in a culture of affluence with a ‘Work hard, play hard!’ mentality (Luthar et al., 2013).

Personal income as well as family income can also be a risk factor in BC. Girls aged 12–19 who were employed were more likely to engage in risky alcohol use than their same age peers who had not worked in the past 12 months (Smith et al., 2015a).

Other risk factors

Results from the BC Adolescent Health Survey showed other youth at risk for problematic substance use, such as binge drinking, heavy sessional drinking, and frequent or early alcohol use. These included girls who identified as lesbian or bisexual, lived in rural areas, or were born in Canada (Smith et al., 2015a). In contrast, immigrant girls were generally less likely to engage in problematic alcohol use in BC (Smith et al., 2015a). However, high acculturation has been found to weaken girls' bond with their parents, which increases their risk for potentially harmful alcohol use (Schinke et al., 2011).

Experiencing very high social self-esteem has also been associated with problematic substance use among girls (Fisher, Miles, Austin, Camargo, & Colditz, 2007). Additionally, certain personality traits or characteristics, such as negative thinking, impulsivity, and sensation seeking have been identified as being associated with problematic alcohol use for girls more than boys (Lammers et al., 2013). Young women who identify as being sensitive to high levels of anxiety are more likely to use alcohol to cope, to conform with peers, and because they expect that drinking helps reduce tension. Additionally, compared to low anxiety sensitivity females, they experience more negative consequences related to alcohol such as going to school drunk, or not being able to complete homework or study for a test (Watt et al., 2006).

Protective factors

The presence of protective factors can reduce the risk of female adolescents engaging in problematic alcohol use, even if those girls also experience identified risk factors (Smith, Stewart, et al., 2014).

Family connectedness

Having positive relationships with family and spending time with them can be protective against early and problematic substance use for girls (CASA, 2003). It can also mitigate risk factors for heavy episodic drinking, such as spending time with peers who drink and having parents who provide alcohol (Danielsson, Romelsjö, & Tengström, 2011). Family does not necessarily have to be biological. For example, youth with government care experience in BC who felt highly connected to the people they thought of as their family were less likely to engage in regular heavy sessional drinking than their peers who felt less connected (Smith, Stewart, Poon, Saewyc, & McCreary Centre Society, 2011a).

Female youth in BC who felt their family paid attention to them and that they had fun together were less likely to drink heavily than those who did not feel this way (Smith et al., 2015a). Having a helpful adult in their family to turn to and feeling understood by their family was especially protective against girls' binge drinking and heavy sessional drinking (Smith et al., 2009; Smith et al., 2015a).

BC youth with both mental health and substance use challenges who were living outside the family home reported that reconnecting with family could lower the likelihood of substance use among youth, if that was a positive experience (Cox, Smith, Peled, & McCreary Centre Society, 2013). However, BC youth with FASD who experienced substance use challenges found that reconnecting with their biological family was only protective if their family of origin did not engage in harmful substance use (Peled, Smith, & McCreary Centre Society, 2014).

The relationships between girls and their mothers can be particularly protective against harmful alcohol use (Schinke, Fang, & Cole, 2008), and has been associated with less frequent alcohol use among middle school girls with high-risk peer networks (Kelly et al., 2011). Having a strong bond with their mother reduced the risk that female youth would engage in substance use due to stress, low self-esteem, and body image issues (Schinke et al., 2011). Additionally, while some studies have shown that parental disapproval of alcohol is unlikely to lower alcohol use (Kelly et al., 2011), younger adolescent girls who have not yet tried alcohol may wait longer to do so if their mother urges them to abstain (Schinke et al., 2008).

School connectedness

School connectedness, including feeling like a part of school, feeling that teachers care, and having positive relationships with peers at school, was associated with lower rates of heavy sessional drinking and binge drinking among girls in BC (Smith et al., 2015a). This was true for youth in general and for vulnerable and disadvantaged groups such as girls with government care experience (Smith, Peled, et al., 2015) and Aboriginal girls (Tourand et al., 2016).

Feeling connected to school has also been associated with higher academic performance, which in turn has been linked to lower alcohol use (CASA, 2003). It has also been associated with a willingness to look after intoxicated friends, more so for girls than for boys (Chapman, Buckley, Reveruzzi, & Sheehan, 2014).

Having post-secondary plans can also reduce the likelihood that girls aged 12–19 use alcohol frequently or binge drink (Smith et al., 2009).

Positive peer relationships

Positive peer influence has been linked to a lower likelihood of binge drinking among youth in BC. For example, females with friends who would be upset with them if they got drunk were less likely to engage in heavy sessional drinking in the past month and to drink at risky levels on the Saturday before completing the survey (Smith et al., 2009; Smith et al., 2015a).

Community and cultural connectedness

Connection to community and culture and feeling safe in their neighbourhood can all be protective against risky alcohol use for girls in BC (Smith et al., 2015a). For example, feeling connected to their community or culture was associated with a lower likelihood of binge drinking among BC females aged 12–19 (Smith et al., 2015a). In the U.S., frequent attendance at religious services in the community was associated with a lower likelihood of alcohol use or heavy sessional drinking, especially among younger adolescent girls, and feeling connected to religion and spirituality was particularly protective among older girls (CASA, 2003).

Youth with several risk factors for problematic alcohol use can benefit from connecting with their community. For example, females with government care experience who volunteered in their community were less likely to report heavy sessional drinking than those who were less engaged (Smith, Stewart, Poon, Saewyc, & McCreary, 2011a).

The structure provided by engaging in extracurricular activities has been shown to be protective against alcohol use (CASA, 2003; Smith et al., 2015a). However, in BC finding those activities personally meaningful was particularly important for girls and was associated with a lower risk of binge drinking and heavy sessional drinking (Smith et al., 2015a).

Other protective factors

McCreary research also shows that having positive body image, post-secondary aspirations, and volunteering in the community are all protective factors against risky alcohol use for girls in BC (Smith, Stewart, et al., 2014).

Youth's recommendations

Several McCreary reports include recommendations from young people to reduce the risk of excessive drinking among youth:

- ✓ Having youth-friendly spaces and a variety of extracurricular activities as alternatives to substance use (Tourand et al., 2016).
- ✓ Supporting youth to have goals for the future (Sadler, 2006).
- ✓ Having access to positive and affordable alternative activities, such as programs to help develop skills in sports and art (Sadler, 2006).
- ✓ Having access to meaningful work and employment programs (Peled et al., 2014).
- ✓ Helping youth feel connected to their community and culture (Peled et al., 2014).
- ✓ Providing more funding for counselling so that youth do not rely on drugs and alcohol to cope with problems (Martin et al., 2007).
- ✓ Hiring more outreach workers to specifically address youth's drug and alcohol use (Martin et al., 2007).
- ✓ Offering community-based substance-free girls' groups (Smith, Warren, Cox, Peled, & McCreary Centre Society, 2014).
- ✓ Having sober mentors (Smith, Warren, et al., 2014).
- ✓ Having positive relationships with adult family members and other important adults (Smith, Warren, et al., 2014).
- ✓ Having structure and routine (Smith, Warren, et al., 2014).

Interventions to reduce harmful underage alcohol use among females

A review of the literature shows that many older interventions focused on prevention of alcohol use, emphasizing moral and legal objections to alcohol and the detrimental effects it could have on users. By the 1980's more emphasis was put on self-esteem building and decision-making skills, and in the 1990's programming began to include a focus on social influences and the life skills needed to resist social pressures (Weiss & Nicholson, 1998). More recent interventions have expanded to include social media and online interventions.

Relatively few interventions that were reviewed considered the contextual risk and protective factors associated with girls engaging in health risk behaviours such as risky alcohol use. However, those that did appeared to have the most success, such as those that strengthened healthy family relationships, promoted positive peer interactions, and included community engagement (See Appendix C).

Family-based interventions

Interventions that strengthened family connectedness and communication appeared to be consistently among the most effective against risky adolescent alcohol use (Mason et al., 2009; O'Donnell et al., 2010; Schinke, Cole, & Fang, 2009; Schinke et al., 2011; Toumbourou et al., 2013), and could also reduce alcohol use into adulthood (Foxcroft & Tsertsvadze, 2011a).

The interventions that were most successful in reducing harmful alcohol use among girls often combined supporting the development of parenting skills—including nurturing behaviours, establishing clear boundaries or rules, and parental monitoring—while also supporting girls to develop positive relationships with family and peers (Foxcroft & Tsertsvadze 2011a). Interventions that placed too much emphasis on family rule setting and monitoring without also strengthening family communication and relationships were not successful (Koning, van den Eijnden, Verdurmen, Engels, & Vollebergh, 2012).

One successful example was a rigorously evaluated three-year Swedish multi-component intervention that included 13 activities which promoted family connectedness and communication, and encouraged parents to maintain restrictive attitudes towards alcohol use and to meet their children's friends. Post intervention results showed lower intoxication rates among participating male and female youth, and delayed alcohol initiation by an average of a year in comparison with matched control group adolescents (Pettersson, Özdemir, & Eriksson, 2011).



Another successful example was the Dutch 'Prevention of Alcohol use in Students' (PAS) program which engaged parents of youth aged 13-16 to set boundaries around adolescent alcohol use and included a brief program with youth on healthy attitudes and refusal skills. A randomized control trial (RCT) reported delayed onset of weekly heavy drinking and lower rates of heavy weekend drinking, which persisted until young people were four years over the legal drinking age (Koning, van den Eijnden, Verdurmen, Engels, & Vollebergh, 2011; Koning, van den Eijnden, Verdurmen, Engels, & Vollebergh, 2013). Even among at-risk males and females who had begun drinking before 12 years old, there were no increases in alcohol frequency and quantity, as was seen among peers in the control group (Koning, Lugtig, & Vollebergh, 2014).

The 'Resilient Families' intervention in Australia was delivered to 12-year-olds who received a social relationship-based curriculum in schools which covered family rules, communication, problem solving, peer resistance, and refusal skills. At the same time, parents received written information about practical parenting strategies and participated in parent education events. At two-year follow-up, an RCT with 2,000 students found a small but significantly lower risk of heavy alcohol use in the previous two weeks (Toumbourou et al., 2013). The number needed to treat (NNT)

analysis indicated that if 48 boys and girls received this intervention, one would be prevented from engaging in heavy alcohol use.

Interventions which included opportunities for girls and their female caregivers to build skills together appeared particularly effective. These interventions focused on building communication skills (particularly around the topic of alcohol) including emphasis on trust, respect, empathic listening, sharing of feelings, and conflict management; increasing the daughters' self-image and self-esteem; establishing parental monitoring practices; and spending quality time together (Fang & Schinke 2013; Mason et al. 2009; O'Donnell et al., 2010; Schinke, Cole, & Fang, 2009; Schinke, Fang, & Cole, 2009).

Some family interventions appear to work across cultures and settings. For example, a U.S. program called Strengthening Families offered separate workshops for Grade 6 students and their parents, followed by joint training sessions. Parent sessions taught participants how to clarify expectations, manage their emotions, and develop appropriate disciplinary practices; while the children's sessions included peer resistance and relationship skills training. The combined workshops focused on conflict resolution, communication, and developing a strong family bond. An RCT with over 600

participants found a 40% reduction in harmful alcohol use among male and female youth at four-year follow-up (Spoth, Redmond, & Shin, 2001). Foxcroft and colleagues (2002) completed an NNT analysis of this data which showed that for every nine young people who went through the program, there would be one who was positively impacted to not use alcohol, one who would not use alcohol without permission, and one who would not get intoxicated.

This same intervention was adapted for use with African American youth, and was effective in reducing past month alcohol use in comparison to a control group (Brody, Chen, Kogan, Murray, & Brown, 2010). It has also been adapted for use in BC with 6- to 14 -year-olds although no evaluation data was available (Sea to Sky Community Services, n.d.; Communities that Care Squamish, n.d.). Nevertheless, based on the evidence of the Strengthening Families programs in the U.S., this is a potentially promising BC intervention.

Although family-based interventions are often offered to both boys and girls, they may be more effective for girls. For example, an RCT with over 400 families of youth in Grade 6 in the U.S. program 'Preparing for the Drug Free Years' found females who had participated in the intervention had significantly lower rates of alcohol abuse (met DSM-IV criteria) than females in the control group at 10 years follow-up, a result that was not seen among males (Mason et al., 2009). The intervention focused on promoting prosocial family bonding including increased family interaction, clear rules about drug and alcohol use, parental monitoring, refusal skills for youth, and reducing family conflict (Mason et al., 2009).

Online interventions

Attending in-person family programs can be a challenge for low income, single parent, or working households. There is some evidence that online interventions that can be completed by female caregivers and their daughters at home can be effective across different cultures including Black, Hispanic, and Asian American girls (Fang & Schinke, 2013; Schinke et al., 2011). These interventions can reach those who might be reluctant or unable to attend in-person sessions (Schinke, Cole, & Fang, 2009; Schinke et al., 2011). Additional evidence suggests that girls may prefer the more anonymous web-based programs to discussing alcohol-related behaviours in a group (D'Amico et al., 2006).

One U.S. program delivered 14 modules over three weeks to girls aged 10–13 and their mothers. Each module included voice-over narration, skill demonstrations by animated characters of an adolescent girl and her mother, and interactive exercises to teach refusal skills, build respect, and strengthen bonds. Evaluated with over 200 mother-daughter pairs, intervention participants reported better communication with their mothers, more household rules against drinking, more parental monitoring, greater conflict resolution skills, more normative beliefs about adolescent alcohol use, higher self-efficacy in avoiding alcohol, lower alcohol consumption, and lower intention to use alcohol at two months follow-up in comparison with a control group (Schinke, Cole, & Fang, 2009; Schinke, Fang, & Cole, 2009). A similar nine-week program evaluated with an RCT showed that 12 months after the intervention, participants reported better communication with their mothers, more knowledge of family rules around alcohol use, more awareness that their parents were monitoring their free time, increased ability to refuse peer pressure, and reduced frequency of self-reported alcohol use in the past 30 days in comparison to a control group (Schinke, Fang, & Cole, 2009).



Online interventions that build positive peer relationships using a similar format can also be effective. For example, 'RealTeen' combined the use of an older female animated character to guide participants through knowledge and skill building sessions relating to alcohol with opportunities for peer to peer communication among participants. Participants showed small but significant increases in self-efficacy and lower frequency of past month alcohol use in comparison to girls in the control group at six-month follow-up (Schwinn et al., 2010).

Using story telling

An audio-based program also showed some success, including with urban Black and Latino girls. The 'Specially for Daughters' program involved Grade 6 girls and their caregivers listening at home to audio CDs containing stories that increased awareness of alcohol use and its risks; taught parents supportive skills; and taught girls about peer pressure, handling emotions, and sensation seeking. An RCT was used to evaluate the

intervention with 268 families when the girls were in Grade 7, and found a lower likelihood of sexual risks, alcohol use, and alcohol intoxication among the girls in the intervention group in comparison to the control group (O'Donnell et al., 2010).

Similarly, using a comic book or a cartoon-based teenage drama that parents and youth worked through together at home were both methods of teaching about alcohol harms and ways to address or avoid these harms through stories which were more effective among girls than boys (Vogl et al., 2009; West et al., 2008).

The success of family-based interventions appears to be based on the opportunity they provide for female youth to build positive relationships with their caregivers (or peers), as studies of universal online interventions without this relational component have not generally found reductions in substance use among adolescent girls, and in some cases, have been associated with increased use (Spijkerman et al., 2010).

Interventions targeting personality traits

Certain characteristics such as negative thinking, impulsivity, and sensation seeking have been more strongly associated with risky alcohol use for girls than boys (Lammers, Kuntsche, Engels, Wiers, & Kleinjan, 2013). For example, young women who identify as being sensitive to high levels of anxiety are more likely to drink to cope, to conform with peers, and expect that drinking would help reduce tension. Additionally, compared to low anxiety-sensitivity females, girls prone to anxiety experience more negative consequences relating to alcohol, such as going to school intoxicated or being unable to complete homework or to study for a test (Watt et al., 2006).

Although most interventions targeting personality characteristics did not include specific results for girls, many did include a majority female sample. The few that did report gender-specific results showed some success, particularly for girls considered to have high anxiety sensitivity.



The ‘Prevention’ group intervention has been delivered in BC and Nova Scotia to high school students aged 14–17 who exhibited sensation seeking, anxiety sensitivity, and hopelessness. Most of the participants were female. The intervention focused on motivation for alcohol use and maladaptive coping and was evaluated with an RCT of 297 participants. At four-month follow-up, the intervention appeared effective in reducing rates of binge drinking (more than three or four drinks for girls) but not frequency of drinking (Conrod, Stewart, Comeau, & Maclean, 2006). Conrod and colleagues (2006) suggest that this is because quantity of alcohol is associated with internal motivational factors whilst frequency of drinking is more related to external factors such as opportunity and peer influences. The Vernon School District in BC is currently implementing the program (Turcato, 2017).

Australian and UK versions of the ‘Prevention’ program were delivered to 14-year-old youth by trained therapists in two 90 minute sessions focusing on personality styles, cognitive thoughts, and personality-specific coping strategies. An RCT found the strongest effect was among youth with high anxiety-sensitivity but there was also a mild effect among high sensation seeking youth (Conrod, Castellanos-Ryan, & Mackie, 2011). Among sensation-seeking youth who used alcohol, those who participated in the UK program were 50% less likely to binge drink (four or more drinks for girls; five or more drinks for boys) at 12 months follow-up than their peers in the control group, and at two-year follow-up they reported lower rates of problem drinking than the control group (Conrod, Castellanos, & Mackie, 2008). A three-year follow-up in Australia found a significant reduction in the likelihood of consuming alcohol, binge drinking, and experiencing related harms during the past six months for youth in the intervention group compared to the control group (Newton et al., 2016).

The Preventure program is delivered by skilled therapists and this makes it difficult to implement widely (O’Leary-Barrett, Mackie, Castellanos-Ryan, Al-Khudhairi, & Conrod, 2010). However, an adapted version (the UK based ‘Adventure program’) which was offered by trained teachers and school counsellors also showed some promising results. Two years after delivery of the intervention, an RCT of over 1,000 participants (mean age 13.7 years, over 50% female) found a 55% decrease in binge-drinking (four or more drinks for girls; five or more drinks for boys) among participants compared with controls for those who had already drunk alcohol before the start of the intervention (O’Leary-Barrett et al., 2010). An NNT analysis indicated that one case of binge drinking could be prevented if seven participants received the intervention. Additionally, there was a mild effect on reducing risky alcohol use among the general population of students who were in the intervention schools but did not participate themselves (Conrod et al., 2013).

Evidence of the effectiveness of interventions targeting certain personalities or characteristics among Indigenous youth is inconclusive although available studies are based on small sample sizes. For example, a program developed for Mi’kmaq First Nations in Nova Scotia offered teachings from the Mi’kmaq culture to 29 youth aged 14–18 (69% females) who were categorized as sensation seeking, anxiety sensitive, or experienced hopelessness/negative thinking. At four-month follow-up, the intervention group reported a lower but not statistically significant frequency of heavy sessional drinking. The authors maintain that with a larger sample size the results would have been significant (Mushquash, Comeau, & Steward, 2007).

One of the few interventions that provided gender-specific results was a brief cognitive behavioural therapy program delivered in three 50 minute sessions to first year female undergraduate students in Canada who experienced high anxiety sensitivity. The program included education about anxiety; cognitive restructuring training to change coping strategies, attitudes, and beliefs; and a physical activity component (Watt, Stewart, Birch, & Bernier, 2006). An RCT with over 200 students found the intervention produced a small but significant reduction in conformity motives for drinking and expectations that drinking would help provide emotional relief. It also reduced problem drinking (drinking resulting in negative consequences) by 50% at 10 week follow-up, although this result was only marginally significant statistically. However, as with other similar interventions, it did not reduce overall drinking frequency rates (Watt et al., 2006).

Knowledge and skills training

Interventions that focus on building knowledge and skills to address risky alcohol use are most commonly delivered in a school setting (Sussman et al., 2004). The interventions typically discuss attitudes towards alcohol, offer information about harmful alcohol use, and build skills. These skills include problem solving, decision-making, goal setting, critical thinking, communication, and assertiveness with the aim of reducing susceptibility to negative social influences, increasing resilience, and decreasing motivation to use alcohol (Botvin & Griffin, 2014).

Vogl and colleagues (2009) suggest that school-based knowledge and skill building programs are often not effective for youth who have already started using alcohol, especially if they focus on abstinence. Interventions can also be ineffective when there are problems with implementation resulting from poor teacher training, poor program adaptation, teacher characteristics and program characteristics not being a good fit, and lack of integration of the program into the syllabus (Vogl et al., 2009).

One program that was ineffective was the police led 'Take Charge of Your Life' program delivered to close to 20,000 Grade 7 students in the U.S. RCT results showed that when participants reached Grade 11, female students who had participated in the intervention were 5% more likely to engage in heavy sessional drinking in the previous 14 days than their peers in the control group. The increased risk among intervention students compared to control group students was strongest among those who did not use alcohol at baseline (Sloboda et al., 2009).

Increasing knowledge

Knowledge building appeared to be a successful component of a program when it provided girls with information about the effects of alcohol, the consequences of risky use, the benefits of non-use; dispelled myths about alcohol; discussed the potential for risk and harm in common teenage drinking scenarios; and offered specific information such as gender-specific low-risk drinking guidelines and where to access help (Longshore et al., 2007; Vogl et al., 2009; Wurdak, Wolstein & Kuntsche, 2016). Interventions that focused exclusively on the negative consequences of heavy alcohol use were ineffective for girls (D'Amico et al., 2006; Sloboda et al., 2009; Spijkerman et al., 2010).

Offering "social norming" education to girls that addresses their misperceptions about the prevalence and social acceptance of alcohol use can be effective for girls (Caria, Faggiano, Bellocco, & Galanti, 2011; Vigna-Taglianti et al., 2009). This may be because girls' risky alcohol use is more strongly associated with social norms and situations than boys (Longshore et al., 2007). When sustained changes occurred in girls' normative beliefs, this led to lower past month alcohol use at 6-month follow-up (Schwinn et al., 2010). One study found that when a component that addressed misperceptions of alcohol use was removed from the intervention, there was an increase in drinking quantity among young women who participated (Spijkerman et al., 2010). This finding reinforces the value of addressing misperceptions through social norming interventions.

Building social competence and resistance skills

Increasing social competence and resistance skills were components present in effective interventions for girls. The more successful interventions included components that strengthened self-efficacy, such as the confidence to resist social pressures to use alcohol (e.g., Schwinn et al., 2010), built self-esteem and positive body image (Fang & Schinke 2013; Schinke, Fang, & Cole, 2009; Schinke et al., 2011), and offered training including recognizing social pressures, refusal skills, decision making, goal-setting, assertiveness and communication skills (Fang & Schinke 2013; Longshore et al., 2007; Mason et al., 2009; Schinke, Cole, & Fang, 2009; Schinke, Fang, & Cole, 2009; Schinke et al., 2011; Schwinn et al., 2010; Smith et al., 2008; Vogl et al., 2009; West et al., 2008).

However, such interventions only appeared to be effective with younger girls, and primarily with those transitioning to high school (Jansen et al., 2016; Smit, Cuijpers, Lemmers, Jonkers, & De Weerd, 2003; Smith et al., 2004; Vigna-Taglianti et al., 2009; Weiss & Nicholson, 1998). Interventions that did not address motivations for drinking and building self-esteem, or focused solely on building resistance skills or stress management skills were not effective (Graham, Johnson, Hansen, Flay, & Gee, 1990; Vigna-Taglianti et al., 2009).



Some of the more effective interventions included the opportunity for young people to practice decision-making and problem-solving skills through role playing different scenarios which allowed them to reflect and share experiences (Schwinn et al., 2010; West et al., 2008). Furthermore, interventions that addressed the context and situations in which girls use alcohol (e.g., at parties or to alleviate boredom) and identify safer enjoyable alternative ways to spend leisure time have shown promise when combined with life skills training (O'Donnell et al., 2010; Smith et al., 2008; West et al., 2008; Wurdak et al., 2016). However, such interventions may only be successful for baseline non-drinking girls in reducing regular use but not for those already engaging in heavy use (Smith et al., 2008).

Combining knowledge and skill building

A combination of increasing knowledge of alcohol harms and developing a range of skills (e.g., resistance skills, coping skills) appears more effective for girls than focusing solely on knowledge or skill development (e.g., Graham et al., 1990). Some such interventions have been associated with lower negative alcohol-related consequences, including problems with parents, peers and school staff, getting injured, feeling anxious or depressed, and drinking and driving (Evans-Whipp et al., 2013), and with small reductions in weekly alcohol use for male and female adolescents (Strøm, Adolfsen, Fossum, Kaiser, & Martinussen 2014).

However, while most knowledge and skills programs have been effective in increasing knowledge of alcohol's effects and harms, this has not always led to reduced risky alcohol use (Morgenstern, Wiborg, Isensee, & Hanewinkel, 2009; Wynn, Schulenberg, Maggs, & Zucker, 2000), or a sustained impact (Smith et al., 2004; Weiss & Nicholson, 1998).

More effective interventions have included discussion about the reasons girls might use alcohol, such as peer pressure, handling emotions, and sensation seeking (O'Donnell et al., 2010); reasons for getting drunk (Vogl et al., 2009); coping with puberty and bodily changes (Schwinn et al., 2010); and also taught skills to manage stress and anxiety, and how to relax using alternatives to alcohol (Fang & Schinke, 2013; Schwinn et al., 2010; Schinke, Fang, & Cole, 2009; Schinke et al., 2011).

One example of a successful intervention was the 'Alcohol Misuse Prevention Study' (Shope et al., 1996) which taught Grade 10 students in five 45 minute sessions about short-term effects of alcohol use and the risks of excessive alcohol use, in combination with the skills to deal with social pressures to drink. The intervention was evaluated with an RCT of over 2,000 Michigan students. At two-year follow-up, girls had higher alcohol refusal skill rates than boys, and both boys and girls in the intervention group had lower rates of negative consequences of alcohol use, such as drinking and driving, in comparison with youth in the control group (Shope et al., 1996). A similar rigorously evaluated 12-session African intervention offered to Grade 8 and 9 students from low income families in South Africa (Healthwise) combined life skills training involving emotion management, decision making, and self-awareness with alcohol and sexual health education. The evaluation found a significant decrease in the likelihood of heavy alcohol use (defined as four or more drinks on a single occasion) among both boys and girls in the intervention group compared to control (Smith et al., 2008).

Knowledge and skill development initiatives may be more effective for younger girls than older ones, possibly because the skill enhancement component helps girls to cope better with puberty-related social and emotional changes (Vigna-Tagliant et al., 2009). For example, an RCT with over 7,000 European students who participated in 'Unplugged', a substance use and life skills program found it to be generally more successful for boys than girls (Caria et al., 2011; Vigna-Tagliant et al., 2009). However, at 18-month follow-up, girls aged 12 or younger at baseline had a reduced risk for alcohol-related problems such as arguing, fighting, relationship problems, poor school performance, and hospitalization (Caria et al., 2011). Our calculations indicate that for every 38 young girls exposed to the intervention, one would be prevented from experiencing alcohol-related harms.



While universal school-based knowledge and skill building interventions may have some positive effects for younger girls, a different approach may be needed for older ones. For example, a Dutch study found that the same knowledge and skills program (Healthy School and Drugs Program) delivered to younger youth was more effective with younger girls than younger boys but was more effective for older boys than older girls (Smit et al. 2003).

These findings suggest it may be beneficial to ensure any intervention is not delivered in a single instance but is age-adapted and delivered again in later grades. For example, 'Project ALERT Plus' is a U.S. program focusing on risky alcohol use. It initially consisted of 11 knowledge and skill building sessions for students in Grade 7 and three booster sessions in Grade 8 that discussed consequences and benefits of non-use, identified social pressures to use alcohol, developed resistance skills, and enhanced self-efficacy. However female intervention participants showed no difference over control group participants in Grade 11 until

additional sessions were added for students in Grade 9 which covered the challenges of transitioning from middle school to high school (Ellickson, McCaffrey, Ghosh-Dastidar, & Longshore, 2003; Longshore, Ellickson, McCaffrey, St. Clair, 2007). There were no significant effects on alcohol use for boys in Grade 11.

Programs that took a harm minimization approach showed some success in significantly reducing weekly alcohol use (Longshore et al., 2007; Vogl et al., 2009), heavy sessional drinking (Vogl et al., 2009), and alcohol-related harms for girls (Longshore et al., 2007; Vogl et al., 2009). Useful elements appeared to include building knowledge and skills to recognize and help people who are intoxicated or are in an unsafe situation because of their alcohol use, and reviewing how to prevent alcohol-related harms in common teenage drinking scenarios (Vogl et al., 2009). These programs may be more effective with girls than boys because adolescent females experience alcohol-related harms more than their male counterparts (Evans-Whipp et al., 2013).

The Australian 'CLIMATE program' discussed how to keep people safe who are drinking too much, and what to do in a medical emergency, including learning first aid responses such as the recovery position. At 12-month post-intervention, an RCT with approximately 1,500 13-year-olds found boys and girls showed increased knowledge. However, only girls reported any impact on their drinking behaviour, with those in the intervention group reporting lower heavy sessional drinking rates than girls in the control group (Vogl et al., 2009).

This review found very few interventions that targeted or were effective for older youth. 'Project Towards No Drug Abuse' was an example of an intervention in mainstream schools which could be effective among youth in older grades who had used alcohol. It discussed negative stereotypes of young people who drank heavily in addition to the common components of building communication and refusal skills. When delivered to Grade 9–11 mainstream high school students, participating heavy alcohol users at baseline had a significantly lower rate of alcohol use at one-year follow-up in comparison to a control group. However, there were no significant effects for participants in alternative schools or for those who did not use alcohol or engaged in moderate use at baseline (Dent, Sussman, & Stacy, 2001).

Members of McCreary's Youth Research Academy reviewed the different interventions highlighted in this review, and felt that the Fourth R, a Canadian developed school-based curriculum delivered over 28 hours to build healthy relationships and decrease unhealthy and abusive behaviours could be particularly effective at reducing harms for adolescent girls, as it includes the opportunity to practice negotiating skills in a series of realistic and escalating scenarios. Evaluation results of the intervention with 196 Grade 9 students who participated in scenarios where they experienced increasing peer pressure from older student actors around alcohol use found improved negotiation skills, increased refusal skills and delayed usage among female participants in comparison to a control group (Wolfe, Crooks, Chiodo, Huges & Ellis, 2012).

The mixed results seen for knowledge and social skills interventions delivered in isolation suggest they may be more successful when combined with other approaches such as restricting availability and engaging communities (World Health Organization, 2015), and include different modes of delivery such as online learning and classroom discussion (Vogl et al., 2009).

Culturally responsive interventions

Interventions that were developed or modified to reflect the cultural background of the girls who participated were not common but showed some promise (Schinke, Tepavac, & Cole, 2000).

Several interventions have been identified by the Canadian Best Practices Portal as successful practices in Aboriginal contexts (referred to as ‘Aboriginal Ways Tried and True interventions’). These interventions *“have undergone a rigorous, culturally-relevant assessment process based on the following six criteria: basis in the community, holistic approach, integration of Indigenous cultural knowledge, building on community strengths and needs, partnership/collaboration and demonstrated effectiveness. Accepted standards of evidence include both Aboriginal and academic research approaches”* (Government of Canada, n.d.).

One example is the ‘Nimi Icinohabi Substance Abuse Prevention program’ in Alberta for young people in Grades 3 to 9 in Alexis Nakota Sioux Nation School. The program was adapted from the Botvin Life Skills Training (LST) to include cultural elements related to beliefs, values, language, and visual imagery. The program was found to change youth’s alcohol refusal skills, self-beliefs, and knowledge about consequences of alcohol use (Government of Canada, 2016). However, it is unclear if it affected consumption.

Although not specifically identified as an ‘Aboriginal Ways Tried and True intervention,’ an adaptation of the Nimi Icinohabi Program was carried out with the Maskwacis community in Alberta. A three year pre- and post evaluation of the program with elementary and junior high school students indicated that students’ knowledge and attitudes about alcohol improved as did cultural knowledge and life skills including those around substance use refusal (Baydala et al., 2016). The

intervention was seen as successfully incorporating “Western and Indigenous pillars of knowledge” (Baydala et al., 2016, p. 74) that allowed for “two-eyed seeing”, acknowledging diverse perspectives on substance abuse prevention. Findings pointed to the importance of building partnerships among the community, schools, Elders, and the university and how this benefits students (Tremblay, Baydala, Rabbit, Louis, & Ksay-yin, 2016).

Adapted from the ‘Strengthening Families’ program, ‘Listening to One Another’ is a family-centred substance abuse program for youth aged 10–14, delivered in First Nations communities in four provinces including BC (Culture and Mental Health Research Unit, 2017a). The program uses Indigenous values to enhance communication and social skills and tools for healthy lifestyles. Early findings of an adaptation of the intervention in the U.S. indicated that the program delayed onset of drinking for 10- and 11-year-old girls, but had no effect on older youth or for those who had tried alcohol before the intervention (Whitbeck, Hoyt, & Stubben, n.d.). Evaluation results of the current Canadian programs are not yet available (Culture and Mental Health Research Unit, 2017b).

A school-based program that used a culturally adapted life skills approach was evaluated with an RCT that included 1,396 Native American youth in Grades 3 to 5. The program sessions were led by community leaders and included older peers demonstrating skills to resist alcohol. Participants were also assigned homework to gather information and testimonials on drug and alcohol use from their family and community. At 32-month follow-up, youth who had participated in the program were less likely to have four or more drinks a week than participants in the control group (Schinke et al., 2000). The intervention had a stronger effect on boys’ alcohol use, but overall alcohol use rates also decreased for girls (Schinke et al., 2000).

Brief Alcohol Interventions

Brief Alcohol Interventions (BAIs) aim to motivate and provide resources to moderate participants' alcohol use. The interventions are short in length (one to five sessions) and typically include a discussion of alcohol consumption, feedback on level of use, comparison to norms, information on potential harms, and goal setting (Tanner-Smith & Lipsey, 2015).

Three large scale systematic reviews and meta-analyses concluded they could be effective (Hennessy & Tanner-Smith, 2015; O'Donnell et al., 2014; Tanner-Smith & Lipsey 2015), as there was a small but significant effect on alcohol-related problems such as going to school drunk and experiencing negative consequences of alcohol use (Tanner-Smith & Lipsey 2015). There was a reduction in days on which alcohol was consumed when BAIs were delivered to individuals, but there were no such effects for BAIs delivered in a group setting (Hennessy & Tanner-Smith, 2015).

Brief interventions can be effective for those who are experiencing harmful alcohol use (Babor, 2010; World Health Organization [WHO], 2009). However, there is insufficient evidence to draw conclusions for subpopulations, including females and adolescents (O'Donnell et al., 2014) and a recent Cochrane review concluded that it was not yet possible to determine the effectiveness of BAIs among high school students (Carney, Myers, Louw, & Okwundu, 2016).

Motivational interviewing

Motivational interviewing is a non-judgemental, client-centred counselling style that helps clients explore discrepancies between goals and behaviours and supports efficacy to change.

While the effectiveness of BAI's has not yet been determined, there is some evidence that the motivational interviewing component of those interventions can be effective for some older girls across different cultures (Mason et al., 2011). For example, an RCT of 287 young women (average age of 17–18) who participated in a 90-minute motivational interview to address female specific reasons for drinking found that five weeks after the session, there were significant reductions in binge drinking (four or more drinks) among participants who had a family history of alcohol abuse in comparison to the control group, but no significant effect on young women with no family history of alcohol abuse (LaBrie et al., 2009).

Motivational interviewing might be particularly effective when young women have personally experienced alcohol-related harms. The 'HaLT' program is widely-used in German emergency rooms with youth admitted for alcohol intoxication. It uses motivational interviewing to address drinking motives through short exercises which teach alternative ways to fulfill the role alcohol plays in a young person's life. At four-week follow-up, large effects were seen for female patients aged 14–16 who had received the motive-tailored intervention as they had decreased drinking frequency, heavy sessional drinking, and drunkenness to a greater degree than males (Wurdak et al., 2016). A similar smaller scale motivational interviewing intervention in the U.S. was offered to male and female youth aged 18 and 19 who were treated in the ER for an alcohol-related event. The program was effective in reducing rates of drinking and driving, alcohol-related problems, and injuries at six-month follow-up compared to youth in a standard care control group (Monti et al., 1999).

Mentorship

Mentorship interventions entail a caring individual providing support, guidance, and consistency to help develop youth's strengths and set them on a healthy trajectory (Thomas, Lorenzetti, & Spragin, 2013). A systematic review found a moderate effect of mentorship on adolescent alcohol use but concluded there have been insufficient well-designed studies to make a firm conclusion (Thomas et al., 2013). However, other studies have found no evidence of mentorship programs reducing risky alcohol use in underage girls (Bodin & Leifman, 2011; Herrera, Grossman, Kauh, & McMaken, 2011).

Mentorship did appear as a component in a successful intervention that also included school-based life-skills curriculum and volunteering in the community. Evaluation results from 400 U.S. students in Grade 6 reported significant reductions in alcohol use; lower levels of impulsive behaviour; and higher levels of self-confidence, self-control, family and school attachment, and cooperation among youth who participated in the mentorship program, which were not seen if youth only participated in the other components (Aseltine, Dupre, & Lamlein, 2000).

Although structured mentorship programs were not generally effective, interventions which included role models for non-use of alcohol (Longshore et al., 2007), enhanced parents as role models (Schinke, Fang, & Cole, 2009; Weiss & Nicholson, 1998; West et al., 2008), and included female health educators (Longshore et al., 2007) proved to be more successful with girls than boys.



Multi-component interventions

There does not appear to be a single intervention type that is universally successful at addressing underage girls' risky alcohol use. Multi-component interventions are ones that involve multiple settings such as family and school (Foxcroft & Tsertsvadze, 2011b). The evidence for multi-component interventions was also mixed. The National Research Council and Institute of Medicine (2004) found a combination of school curriculum, parental involvement, and community mobilization may be effective. A Cochrane Review noted that although multi-component interventions were effective, there was insufficient evidence to indicate they were any more effective for preventing risky alcohol use among school-aged youth than single component interventions (Foxcroft & Tsertsvadze, 2011b). The authors of this latter review noted that reporting methods of studies generally do not allow for an analysis to determine what intervention content or ingredients differentiate effective from ineffective programs.

Interventions which include a community component often involve education of community members (e.g. retailers, bar staff, club members, and neighbourhood groups) combined with efforts to reduce underage alcohol availability through police enforcement, educating adults not to provide alcohol to underage youth, and enforcing the legal age for alcohol sales.



There is some evidence from Europe that interventions focusing on community education, regulation, and enforcement have promising results for underage girls. In eight participating Dutch communities, interventions were aimed at encouraging moderation among 10- to 19-year-old youth, and activities were carried out in multiple settings including school, home, recreational centres, and bars. Intervention activities varied across communities and may have included parent focused activities such as parenting skills and education about the effects of alcohol on the adolescent brain; health education to youth by school nurses; and instructions to community establishments that served alcohol. Younger females and males (aged 13–14) were less likely to engage in heavy sessional drinking compared to their peers in non-participating regions, although there was no effect on youth aged 15–16 (Jansen et al., 2016). An NNT analysis could not be performed for girls specifically, however, for the group of 13- and 14-year-old males and females, one case of heavy sessional drinking could be prevented if 21 individuals received the intervention.

A similar Swedish intervention targeted 15- to 16-year-olds in six communities that carried out community-based information and media advocacy programs, school-based social and emotional learning interventions, integrated motivational interviewing into school health services, and trained police around availability and enforcement. Most communities also offered programs to educate and support parents to maintain a restrictive attitude towards adolescent alcohol use and trained bar owners and servers in responsible beverage service programs (Hallgren & Andreasson, 2013). Repeated cross-sectional surveys were conducted with over 8,000 youth until they were 19 years old. Results showed the intervention was most effective among females aged 15–16 years old as binge drinking (number of drinks not specified) was reduced by 20% in the trial communities compared to 10% in the control communities. However, there were no significant differences among female youth aged 17 and older and no differences overall between trial and control communities at five-year follow-up (Hallgren & Andreasson, 2013).

Another Swedish multi-component intervention included student, parent, and community education as well as city and school policies about alcohol availability. The intervention was associated with a significant reduction in heavy drinking and spirit consumption among 15–to 16-year-old girls and boys in the participating community at four year follow-up, which was associated with a decrease in alcohol-related accidents and violence (Stafstrom & Ostergren, 2008). In this case, one case of alcohol-related violence could be prevented if 15 individuals received the intervention.

A North American example of a multi-component intervention was 'Project Northlands.' It was conducted over three years in two large U.S. cities and combined school curricula, parent engagement, youth-led community service projects, and a community task force to reduce underage alcohol availability. It was not effective in reducing risky alcohol use among a general population of youth in the U.S. (Foxcroft & Tsertsvadze, 2011b;

Langford et al., 2014). However, when delivered in Croatia, an RCT of almost 2,000 Grade 6 students found that at three-year follow-up, the intervention was effective in reducing intention to use alcohol and frequency of use among girls but not boys (West et al., 2008). The Croatian version of the project was adapted to address the traumatic effect the recent war may have had on young people and included a youth leadership component where youth participants conducted surveys with parents and students; interviewed representatives from the police, medical community, and local shopkeepers; and wrote letters to the President, which they presented to the community (West et al., 2008).

Communities That Care (CTC) is a community-based multi-component delivery model that may help to build resilience, as its aim is to foster protective factors and reduce problem behaviours (Communities That Care, 2017). The program involves five phases centered around community consultation and partnership development, assessment of youth risks and strengths, defining outcomes and selecting evidence-based policies and programs to address community needs, and implementation and evaluation.

The model has shown some promising results with respect to alcohol use. For example, a randomized trial involving 24 communities in seven states in the U.S. began with a cohort of fifth graders. By Grade 8, students in CTC communities were less likely to have initiated alcohol use than those in control communities and rates of past month alcohol use and heavy sessional drinking were lower (Hawkins et al., 2009). The results for abstinence from alcohol were sustained to 12th grade although past month substance use did not differ (Hawkins, Oesterle, Brown, Abbott, & Catalano, 2014). Furthermore, results from the trial indicated that at the time the students were in Grade 8, higher levels of protective factors were found in CTC communities compared to controls including higher levels of prosocial involvement, prosocial peer interaction, and social skills (Kim, Gloppen, Rhew, Oesterle, & Hawkins, 2015).

Interventions in British Columbia

The Communities That Care model is being used in Williams Lake, BC where they completed their risk and strengths assessment and found early onset of alcohol and drug use to be a key priority (Social Planning Council of Williams Lake and Area, 2010). It is also the model being used in Squamish where they are aiming to prevent a handful of health risk behaviours including substance abuse (Communities that Care Squamish, 2017b). They are using the Strengthening Families intervention as well as a multicomponent community-based intervention to reduce high-risk drinking (Communities that Care Squamish, 2017a).

The School Age Children and Youth (SACY) Substance Use Prevention Initiative is a multi-component intervention for Vancouver students in Grades 8–9, which aims to strengthen relationships to family, school, and community (Boute, 2013). Two key programs of SACY are S.T.E.P., a three-day alternative to suspension program for regular substance users; and capacity cafes, where youth and parents are brought together to talk about their lives. The SACY programs incorporate multi-lingual meetings for Asian parents. There are also Aboriginal Capacity Cafes which emphasize intergenerational kinship and bring together family members, Elders, and other adults to hear about lived experiences of Aboriginal youth in their community, learn about what supports are being provided, and about traditional ways which can further support youth (Arbor Educational & Clinical Consulting Inc., 2012). A four-year evaluation of SACY completed in 2013 found 57% of participating youth set personal limits for their alcohol use and 20% reported using less alcohol (Boute, 2013).

PLEA Community Services provides residential substance use treatment services for BC youth. Females entering treatment reported very high rates of negative consequences of their alcohol use. During their stay in PLEA they received individualized supports, attended school and lived in a family care home. Analyses of over 60 female youth six months after discharge indicated that girls who felt they had gained important skills, had been supported to develop healthier relationships with family, had positive relationships with PLEA staff, and had positive peer relationships during their time in treatment reported lower rates of alcohol use (McCreary Centre Society, 2012).

Intervention summary

The most common interventions examined in this review were interactive, provided information about alcohol use, taught skills to resist social pressures to drink, and taught stress management skills. However, limiting a program to the common components of knowledge and skill building may not be the most effective for girls, and a broader more comprehensive approach may be necessary.

Overall, family-based interventions and interventions targeted at certain personality characteristics appeared to be more effective for girls than some of the other interventions. However, most programs that were effective for girls were focused on younger girls or only produced significant results for younger girls. Targeted interventions which examined older girls' motivations for drinking and exposed them to motivational interviewing techniques appeared to be more effective for them and for those who had experienced alcohol-related harms.

Interventions which appeared to be more effective in preventing or reducing risky alcohol use for girls included components which:

- ✓ Engaged caregivers and strengthened relationships with families, especially youth's mothers.
- ✓ Increased knowledge about alcohol effects, consequences of use, misperceptions, low risk drinking guidelines, benefits of non-use, and sources of help for girls.
- ✓ Addressed the reasons young people use alcohol.
- ✓ Took a harm minimization approach that included education on accessing help for someone who is intoxicated.
- ✓ Built skills for resisting social influences to use alcohol.
- ✓ Developed self-efficacy and self-esteem.
- ✓ Provided gender-specific information about alcohol and its effects.
- ✓ Were tailored to address youth's specific needs, culture, age, and experience with alcohol, and the needs of their families.
- ✓ Identified typical situations when alcohol use occurred and offered alternatives to alcohol use.

Less successful interventions:

- ✓ Had a single component.
- ✓ Focused on abstinence.
- ✓ Focused exclusively on the risks and consequences of alcohol use.
- ✓ Had facilitator or program characteristics that were not a good fit for the youth.
- ✓ For school-based programs, were not integrated well into class syllabus.

Effective policies for reducing harmful underage alcohol use among females

We used a few key publications to review effective policies to reduce harmful underage alcohol use. For example, evidence-based alcohol policy has been a focus of the World Health Organization (WHO) in Europe for over 40 years. They have sponsored several reviews, including *Evidence for the effectiveness and cost-effectiveness of interventions to reduce alcohol-related harm* (WHO, 2009), which was based on systematic reviews, reviews of systematic reviews, and meta-analyses of evidence primarily from North America and Northern Europe.

Another key publication was a summary of the book *Alcohol: No ordinary commodity—Research and Public Policy (Second edition)* by Babor (2010). An international group of scientists conducted a critical review and rated various alcohol policies based on the effectiveness evidence, the amount of scientific evidence, and availability of evidence across countries, and subsequently identified best practices for policies to reduce alcohol-related harms.

These reviews covered population level policies including education, drinking and driving, alcohol availability, alcohol advertising, alcohol pricing, and drinking context or environment. Knowledge-based interventions have already been addressed elsewhere in this report. More generally, education and information strategies including school-based education, public information campaigns, and health warnings have been found to be ineffective in affecting behaviour or alcohol-related harm, although they may increase knowledge, change attitudes, and raise awareness (Babor, 2010; WHO, 2009). For example, according to a Centre for Addictions Research of BC (CAR-BC) review of international alcohol policy strategies, alcohol warning labels on bottles and cans are noticed and understood by the majority of adolescents but have little effect on their drinking behaviour and related harms (Stockwell, 2006).

However, there is some evidence from tobacco research that when health warning labels include graphics or pictures that are updated regularly, these may be effective in preventing non-users from starting to use during adolescence (Bach, 2016).

On the other hand, policies regarding pricing, availability of alcohol, advertising, and drinking and driving have been considered best practices in reducing consumption and alcohol-related harms (Babor, 2010; WHO, 2009). For example, alcohol control policies may reduce sexual violence which is of particular concern for young women (Atlantic Collaborative on Injury Prevention, 2014). Some of the policy research had specific evidence for underage youth, and these are discussed in the sections that follow. (Nine papers that contained gender-specific data for policies to reduce risky alcohol use are detailed in Appendix B.)

A review of provincial programs and policies in Canada aimed at reducing alcohol-related harms and costs ranked the provinces on 10 policy dimensions based on scope (population reach) and effectiveness. These included alcohol pricing, availability, drinking and driving, marketing and advertising, legal drinking age, and warning labels and signs (Giesbrecht et al., 2016). BC ranked among the top provinces overall, as well as on the majority of the individual dimensions, although no province ranked higher than 50% when compared to ideal policies. BC did receive a bottom ranking for their alcohol control system (e.g., type of retail system, availability of alcohol through alternative means such as online, whether a government ministry has responsibility over alcohol control, etc.) and a below average ranking for the pricing policy dimension and warning labels (Giesbrecht et al., 2016).

School policies and regulations

School policies and regulations about alcohol use at school and issuing fines for alcohol-related rule breaking did not appear to be effective in reducing risky alcohol use for girls (Smit et al., 2003; Jansen et al., 2016). However, policies which help to create a more inclusive and welcoming school environment could be effective. A recent evidence review provided evidence that LGBTQ-inclusive policies in schools contribute to better health among both sexual minority and heterosexual students (Saewyc, Poon, Kovaleva, Tourand, & Smith, 2016). For example, Konishi and colleagues (2013), using data from the BC Adolescent Health

Survey, found that the presence of anti-homophobia policies in BC schools was associated with reductions in regular heavy sessional drinking in the past month among both heterosexual girls and boys (NNT=23-26) and multiple harmful consequences in the past year among heterosexual girls (NNT=21). The review indicated that in a typical BC school of 1,000 students, such supportive policies would result in 37 fewer students engaging in heavy sessional drinking on six or more days in the past month, and 21 fewer students with problem substance use (Saewyc et al., 2016).



Minimum legal drinking age laws

One policy aimed at reducing alcohol-related harms among youth is the establishment of a minimum legal drinking age (MLDA) which determines the age at which youth are legally able to purchase, possess, and consume alcohol.

Most of the evidence regarding MLDA policy comes from the U.S. For example, a review of over 130 studies conducted between 1960 and 2000 (a period when the MLDA was lowered and raised in the U.S.), concluded there was strong evidence that the MLDA was inversely related to alcohol consumption and motor vehicle crashes (Wagenaar & Toomey, 2002). Specifically, among studies identified as being of higher quality (i.e., used either longitudinal designs, comparison groups, probability sampling, or a census), a third showed evidence of reduced alcohol consumption and 58% showed a reduction of motor vehicle crashes.

More recent U.S. reviews of MLDA laws confirm that increasing the minimum age to 21 was associated with decreases in alcohol consumption, including heavy use, underage consumption, and alcohol-related motor vehicle accidents. In addition, they suggest long-term impacts such as heavy drinking and alcohol dependence in adulthood as well as increased risk of adverse birth outcomes, suicide, and violence for women (McCartt, Hellinga, & Kirley, 2010; Dejong & Blanchette, 2014).

Despite the positive impacts of raising the MLDA, the results for girls are not as consistent as they are for boys. For example, heavy sessional drinking rates for youth generally decreased in the U.S. following the establishment of an MLDA of age 21 (Grucza, Norberg, & Bierut, 2009). However, according to data from the National Survey on Drug Use and Health, the relative risk for heavy sessional drinking did not change among females aged 12 to 20 and increased for underage minority females as well as for college females aged 21 to 23 (Grucza et al., 2009).

Lowering the drinking age from 20 to 18 years in New Zealand was associated with an increase in alcohol-related motor vehicle accidents for both males and females, but increases in hospitalizations for traffic crash injuries were found only for males (Kypri et al., 2006). In Australia, having legal access to alcohol at age 18 was associated with increased hospitalizations for males and females (Lindo, Siminski, & Yerokhin, 2016).

Several recent Canadian studies have looked at gender differences in relation to MLDA. For example, Callaghan and colleagues (2016) found an overall increase in alcohol-impaired driving incidents when young people were slightly below the legal drinking age compared to when they were slightly above it. For females, alcohol-impaired driving incidents rose by 40% in provinces with an MLDA of 18. However, there was no such increase for females in provinces with a legal drinking age of 19 years, such as BC (Callaghan, Gatley, Sanchez, Ashbridge, et al., 2016).

Nationally, there were increases in severe and fatal alcohol-related collisions for males older than the MLDA compared to younger, but not for females. The stronger effects for males may be attributable to males being more likely than females to engage in hazardous drinking and drinking and driving (Callaghan et al., 2016; Callaghan, Sanchez, Gatley, & Stockwell, 2014).

In Canada, inpatient hospitalization rates for alcohol use disorders or alcohol poisoning were higher for both males (17%) and females (21%) who were slightly older than the MLDA compared to those who were slightly younger (Callaghan, Sanches, & Gatley, 2013). However, at the population-level males slightly older than the MLDA had increases in mortality compared to those slightly younger than the MLDA for all causes, which was not the case for females (Callaghan et al., 2014).

It has been suggested that the legal drinking age in BC should be raised to 21 years of age (Thompson, Stockwell, Vallance, Giesbrecht, & Wettlaufer, 2013), and there is evidence for higher minimum legal drinking ages for youth in general (Giesbrecht et al., 2016). However, it may be that MLDA policies may be less effective for underage girls than for boys in reducing risky drinking and related harms.

Zero tolerance drink driving laws and graduated licenses

Zero tolerance laws make it illegal for drivers to have measurable amounts of alcohol in their blood. In places where this is an element of graduated driver licensing programs for young or inexperienced drivers, it can also mean returning to the beginning of their graduated licensing stage. Some U.S. states have zero tolerance policies for all drivers under the age of 21 (Carpenter, 2004).

Although this may also be connected to MLDA laws, there is some evidence that zero tolerance laws can reduce the frequency of alcohol-related crashes. For example, enactment of zero tolerance laws among young and inexperienced drivers in the U.S. was associated with a 9–24% decline in fatal crashes and an 11% decline in crashes where it was believed the driver had been drinking (Shults et al., 2001). Additionally, enactment of a lower blood alcohol limit for driving in Japan was associated with a 64% reduction in alcohol-related crashes among youth between the ages of 16 and 19 (Desapriya, Pike, Subzwari, Scime, & Shimizu, 2007).

A U.S. study found zero tolerance laws decreased heavy episodic drinking among young men aged 18–20 by 13% and there were corresponding increases in lighter alcohol use (Carpenter, 2004). However, these laws were not associated with reductions in number of drinks or heavy episodic drinking among young women. For young women, there was a marginally significant trend ($p < 0.1$) towards increased likelihood of self-reported drunk driving, though this may have been because of changing perceptions on drunk driving after enactment of zero tolerance laws (Carpenter, 2004).

A Canadian study suggested that decreases in youth drunk driving may be attributable to declining trends in alcohol use and changing cultural norms rather than policy changes (Carpenter, 2006). For example, there was a 35% decrease in drunk driving among 16 and 17 year olds in Ontario after a graduated driver licensing program was instituted in 1994. However, these decreases were also found among older and younger groups who were not impacted by the policy changes (Carpenter, 2006).

An evaluation of the graduated licensing program in BC found a significantly higher proportion of alcohol-involved crashes among graduated licensing program participants as compared to before the change was enacted, but this may have been due to increased reporting by police officers (Wiggins, 2004).

Price increases

Evidence suggests that alcohol consumption in adults is associated with youth alcohol consumption and therefore policies aimed at adults (e.g., pricing, hours of sale, etc.) also affect underage alcohol consumption (SAMHSA, 2015). Price increases and taxation can be one of the most effective ways to reduce alcohol-related harms (Babor, 2010).

Meier and colleagues' (2008) systematic review concluded that price increases do reduce consumption and related harms, including for those under age 18; and young drinkers, binge drinkers (drinking twice the recommended daily allowance), and harmful drinkers are the most likely to consume cheaper drinks (Meier et al., 2008). One study with gender-disaggregated data was based on a nationally representative sample of over 17,000 college students in the U.S. (Chaloupka & Wechsler, 1996). The study found higher beer prices would slightly reduce drinking, drinking frequency, and binge drinking in underage females (four or more drinks) but not males (five or more drinks) (Chaloupka & Wechsler, 1996). In addition, Kenkel (1993, cited in National Research Council and Institute of Medicine, 2004) concluded that a 10% increase in price would reduce the risk of drinking and driving by 21% among young females and 13% among young males.

Minimum pricing for alcohol has been adopted by several Canadian provinces. Some of these pricing policies are designed to encourage the consumption of lower strength alcohol products (e.g., higher minimum prices for stronger alcohol content). However, those which have imposed flat rates per litre of alcohol may have the opposite effect (National Alcohol Strategy Advisory Committee, 2015). Minimum pricing policies may have an impact on higher risk drinkers who experience harms as well as young drinkers (Centre for Addictions Research of BC, n.d.).

A study of minimum pricing in BC over a 20-year period estimated that 10% increases in minimum prices reduced consumption of spirits by 6.8%, alcoholic sodas and packaged cider by 13.9% (although marginally significant), beer by 1.5%, wine by 8.9%, and all alcoholic drinks by 3.4% (Stockwell, 2011). Although these estimates were not specific to underage youth, the estimated reductions could be pertinent to girls as the 2013 BC Adolescent Health Survey indicated that a third of female drinkers binge drank on the Saturday before taking the survey (Smith et al., 2015a); and 32% of female youth who had tried alcohol consumed spirits on the Saturday before the survey, 27% drank coolers, 18% consumed beer, and 7% drank wine (McCreary Centre Society, 2013; Smith et al., 2015a).

In 2010, Saskatchewan introduced pricing policies based on type of beverage and alcohol content leading to an increase in prices on 9% of alcoholic drinks (Stockwell, Auld, Zhao, & Martin, 2012). For the population aged 15 and older, a 10% increase in minimum price was associated with an 8.4% decrease in total alcohol consumption. Greatest reductions in consumption were seen in higher alcohol content beer, wine, and cocktails which also had the greatest price increases. No effect was seen for higher strength coolers and spirits, perhaps due to the possibility that consumers were switching from higher strength beers. The higher effect sizes in Saskatchewan overall compared to BC were attributed to the minimum pricing policy applying to most beverage types in Saskatchewan as opposed to BC's focus on spirits.

Minimum unit pricing has also been implemented in parts of the UK (Stockwell, 2014). As in Saskatchewan, minimum unit pricing is established based on alcohol content and this creates a uniform price “floor” when measured as price per standard unit of alcohol. Evaluation data has found consistent evidence for reducing alcohol-related harm, and that these policies would affect harmful drinkers more than moderate drinkers (University of Sheffield, 2017). For example, a 10% increase in minimum price was associated with a 9% decrease in acute hospital admissions attributed to alcohol and an estimated 9% decrease in chronic admissions two years later (Stockwell et al., 2013).

Restricting commercial availability

Stockwell and colleagues (2011) noted a decline in adult consumption of alcohol in BC until 2002 when partial privatization of alcohol sales coincided with increasing rates of per capita alcohol consumption. High private liquor store density was associated with an increased number of alcohol-related deaths in BC (Stockwell et al., 2011). A study from the U.S. found fewer instances of heavy sessional drinking among high school students from states with a retail monopoly over spirit and wine in comparison to students from non-monopoly states (Miller, Snowden, Birckmayer, & Hendrie, 2006). Additionally, re-monopolization of beer in Sweden decreased rates of alcoholism, alcohol intoxication, and alcohol psychosis among youth aged 10 to 19 years old by 20% (Campbell et al., 2009).

As policies related to altering the drinking context or environment (e.g., training bar staff and alcohol outlets to ensure responsible beverage service practices) are largely dependent on strong enforcement, they may not be a cost-effective approach to reducing alcohol-related harms (Babor, 2010; WHO, 2009).

Additionally, most female adolescents who use alcohol get it from informal or social connections such as family members, rather than through commercial outlets (Harrison, Fulkerson & Park, 2000; Hearst, Fulkerson, Maldonado-Molina, Perry, & Komro, 2007; Treno, Ponicki, Remer, & Gruenewald, 2008). A longitudinal study in California noted that restricting alcohol outlet density in certain zip codes was ineffective among adolescents if those living in low alcohol density neighbourhoods were in medium income households and had a friend with a car (Chen, Grube, & Gruenewald, 2010).

However, it has been suggested that having a high number of commercial alcohol outlets available in a neighbourhood may increase the perception of normative alcohol use, especially for girls (Kuntsche, Kuendig, & Gmel 2008; Milam, Johnson, Furr-Holden, & Bradshaw, 2016), and regulating commercial access to alcohol may still therefore have some benefits for underage girls. For example, a study with over 10,000 Australian high school students found that a higher density of off-premises alcohol sales outlets was associated with parents supplying alcohol to their male and female children (Rowland, Toumbourou, & Livingston, 2015). In addition, a high density of bars was associated with lower levels of parental monitoring, which was subsequently associated with higher levels of risky behaviours among youth such as substance use (Freisthler, Brynes, & Gruenewald, 2009).

Two European interventions that reduced alcohol access for youth through responsible beverage services programs in combination with a mass media campaign on radio, posters, and TV commercials were effective in reducing alcohol use among girls aged 13 to 15, but not among older girls aged 16 to 19 (Hallgren & Andreasson, 2013; Jansen et al., 2016). One of the programs worked closely with journalists to increase the number of media reports describing alcohol-related problems and harms occurring at the local level in the intervention towns and was effective in decreasing the proportion of parents who offered alcohol to their children (Hallgren & Andreasson, 2013).

Finally, although there were no results specific to girls, a systematic review found that alcohol bans were only effective in isolated communities. People in less isolated communities travelled to areas of higher alcohol availability, which increased the likelihood of alcohol-related injuries (Campbell et al., 2009).

Reducing exposure to advertising/media

In 1996, the Canadian Radio-television and Telecommunications Commission introduced regulations for the content of radio and television advertisements. Among these are restrictions that messages not be directed at non-drinkers or to underage youth, involve any association of alcohol with youth or youth activities, include any endorsement by youth role models, portray alcohol as being necessary for the enjoyment of life or an activity or event, or imply that alcohol is associated with social, personal, professional, or athletic success. These regulations apply to all types of advertising in BC including print, web, and promotional materials (Advertising Standards of Canada, 2016).

In the U.S., the alcohol industry has voluntary exposure guidelines restricting alcohol advertising to youth whereby advertisements are not to occur when more than 30% of the audience is expected to be underage (Center on Alcohol Marketing and Youth, 2010). Even stricter guidelines have been recommended to drop the cut-off to 15%, which is reflective of the proportion of underage youth aged 12 to 20 in the population (Center on Alcohol Marketing and Youth, 2010). According to the latter guideline, non-compliance would indicate youth “overexposure” to alcohol advertising.

Noel, Babor, and Robaina (2016) conducted a review of studies evaluating content and exposure of alcohol advertising. Nineteen content studies in 19 countries found violations of content codes, most commonly including associations of alcohol with social or sexual success and those intended to protect youth. Additional content analyses revealed themes potentially appealing to youth including humour, relaxation, cartoons, animals, sports, and social and financial success. With respect to exposure research, 79% of the 57 studies reviewed from 18 countries reported youth exposure to advertising or marketing.

For example, much research from the Johns Hopkins Center for Alcohol Marketing for Youth indicates that the U.S. alcohol industry has failed to follow these guidelines in radio (Center on Alcohol Marketing and Youth, 2011) and television (Center on Alcohol Marketing and Youth, 2010b) and less so in magazines (Center on Alcohol Marketing and Youth, 2010a). For example, a study of television programs popular with youth (aged 12–21) in 25 major metropolitan markets in the U.S. found 24% of the advertisements in 2010 violated the 30% cut-off guideline and 35% violated the 15% cut-off; and if these were to be eliminated, alcohol advertising on these programs would drop by a third and 54%, respectively (Jernigan, Ross, Ostroff, McKnight-Eily, & Brewer, 2013). Cable television accounts for most exposure violations (Ross, Brewer, & Jernigan, 2016), and youth exposure to alcohol advertising on cable television increased by 3% from 2014 to 2015 with 1 out of 8 advertisements not complying with regulations (Ross, Henehan, Sims, & Jernigan, 2016).

Despite recommendations to reduce or ban alcohol advertising directed at youth (e.g., Giesbrecht et al., 2013), young women are increasingly targeted by alcohol companies. This includes the marketing of specific products such as sweeter beverages (CASA, 2003; Ross et al., 2014) and distilled spirits and wine (Centre on Alcohol Marketing and Youth, 2011). Girls and young women are also susceptible to the sexualized content of marketing:

Alcohol marketing frequently depicts sexual content, sexism, and messages intended to promote gender norms of masculinity and femininity. The increased likelihood of social and sexual success in relation to alcohol use is a common underlying theme. Although hypersexualized and gendered marketing do not cause sexual violence, they intersect with broader social and cultural norms that support sexualized violence.

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There is a lack of consensus about the degree to which reducing exposure to alcohol advertising is directly linked with reduced consumption among youth (Giesbrecht et al., 2013). Nelson's (2010) review of 20 longitudinal studies of youth alcohol use and advertising noted several methodological shortcomings, and concluded that causal interpretations are not warranted and that results of such studies should not be used as support for bans on alcohol advertising. Likewise, Grube (2004) conducted a review and concluded that there was little evidence that advertising influences underage alcohol use and related harms.

However, a more recent review of 13 longitudinal studies from the U.S., Europe, and New Zealand looked at the effect of alcohol advertising and media exposure on underage alcohol use. All but one of the studies found that exposure was linked with initiation of alcohol use among male and female non-drinkers and increased consumption among drinkers. Further, over half the studies indicated a dose-response relation, with increased exposure associated with increased consumption (Anderson, de Bruijn, Angus, Gordon, & Hastings, 2009).



A more recent study in Los Angeles followed 3,890 Grade 7 students over four years. Exposure to TV advertising was measured in the first year followed by subsequent measurement of alcohol outcomes. Results indicated that advertising exposure and liking of ads in Grade 7 was predictive of increased alcohol use and alcohol-related harms in Grade 10 for both boys and girls, even after controlling for factors such as problems at baseline, age, exposure to peers or close adult drinking, and parents' jobs and education level (Grenard, Clyde, Dent, & Stacy, 2013).

Policy summary

Generally speaking, pricing, availability, advertising, and drinking and driving regulations are best practices for reducing risky alcohol use. However, little research was found that addressed the effectiveness of policies specifically for underage girls and the available evidence was somewhat inconsistent. Furthermore, it was difficult to tease out which laws and policies may be effective in isolation, and appeared more likely that a combination of approaches would be necessary to make a difference. It was also difficult to ascertain why different laws with similar objectives would have differential effects on girls. For example, although both policies aim to restrict access to alcohol, increases in minimum legal drinking age were not consistently associated with reductions in drinking and driving, but the evidence indicated that price increases could reduce this risky behaviour.

Nevertheless, the current review of the published literature suggests that policies aimed at changing the environment have the potential to affect alcohol use and related harms among underage girls.

- ✓ Making school environments more inclusive may reduce heavy sessional drinking and problematic drinking (i.e., experiencing negative consequences as a result of alcohol use).
- ✓ Increasing the price of alcohol may reduce consumption and alcohol-related harms such as drinking and driving.
- ✓ Minimum pricing policies could reduce consumption if applied to types of alcohol beverages favoured by girls.
- ✓ Restricting the commercial availability of alcohol through de-privatization or re-monopolization may help to reduce risky drinking and alcohol-related harms.
- ✓ Reducing exposure to alcohol advertising may reduce alcohol initiation and decrease consumption and related harms including sexual violence.



Messaging to reduce harmful alcohol use among females

Messages that have been shown to be effective at reducing risky underage alcohol use include emphasizing alternative safer ways to achieve the benefits of alcohol (Goldberg, Halpern-Felsher, & Millstein, 2002); emphasizing the negative social consequences of heavy drinking, combined with messaging about the positive health consequences of not drinking (Kingsbury et al., 2015); presenting both the positives and negatives of drinking (Cornelis, Cauberghe, & De Pelsmacker, 2014); and ensuring messaging is realistic, relatable, and gendered including female-specific statistics and consideration of reasons why young women drink (Canadian Women's Health Network, 2014).

A focus on shaming or blaming young women for alcohol-related sexual violence, although common, was reported to be ineffective at reducing risky alcohol use by young women (age 20–25) in Ontario. These young women suggested that women respond negatively to moralized media that engages in shock-tactics and provides unhelpful 'facts'. More effective messaging portrayed examples of people they could relate to, offered realistic scenarios, shared gendered information, and provided helpful advice to mitigate risks (Canadian Women's Health Network, 2014).

Offering targeted messaging for either binge drinkers (in excess of four drinks for women or five drinks for men) or more moderate drinkers (fewer than four drinks for women or five drinks for men) may be more effective than offering one message for both (Lee & Chen, 2013). For example, negative slogans such as "Don't drink" increased perceptions of risks associated with heavy drinking and increased underage moderate drinkers' intentions to reduce their drinking, but had the opposite effect on underage male and female binge drinkers who demonstrated a lower intention to change their drinking behaviour (Lee & Chen, 2013). Presenting a balanced picture of the effects of drinking alcohol was associated with a lower intention to binge drink among male and female adolescents who had already binge drank than just presenting information on the harms of drinking (Cornelis et al., 2014).

In summary, the evidence suggests that alcohol messaging targeting underage girls is less effective if it focuses on health consequences and risks, whereas focusing on social consequences and the benefits of moderated drinking are more effective.

Media review methodology

Having reviewed the literature around messaging, six female members of McCreary's Youth Research Academy looked at media messaging around risky alcohol use among girls and young women. They reviewed 29 different media messages (see Appendix D) and provided their assessment of what aspects of the messages were effective or ineffective.

The search was conducted using search engines such as Google and Ask.com, as well as the video search engine YouTube. When searching for videos on YouTube, additional videos were obtained through the 'Up Next' feature.

Combinations of the following search terms were used: girls, females, youth, underage, teens, adolescent, young women, young people, underage drinking, binge drinking, risky alcohol use, underage alcohol abuse, youth heavy drinking, messages, campaigns, strategies, media, underage binge drinking Canada, and BC.

Through this search the Academy members collected and analyzed a wide range of media messages including websites, poster campaigns, public service announcement videos, and videos created by independent YouTube users. Inclusion criteria included messages that targeted both underage alcohol use in general and specifically underage girls. Messages that were directed only to adults or only to males, as well as ones that had a specific focus on substances other than alcohol were excluded from the analysis.

Summary of findings

While the literature shows that focusing solely on the risks associated with alcohol use is an ineffective way of framing preventative messages about harmful alcohol use for girls and young women, 15 out of 29 media messages were found to use this strategy.

Over a quarter of the messages addressed the benefits of not drinking or of less harmful alcohol use, which has been found to be a more effective strategy (Kingsbury, Gibbons, Gerrard, 2015). For example, a poster campaign released by the Wesleyan University in Illinois presented harm-reduction approaches to alcohol use and promoted awareness that not all young people drink alcohol (Illinois Wesleyan University, n.d.).

One media message created counter-advertising, which may be effective in reducing harmful alcohol use among underage girls (Banerjee, 2013). This poster campaign and website portrayed young people having fun with their friends without drinking.

An educational website created by an organization in the UK offers strategies for moderating drinking and addressing risky alcohol use for people who have concerns about their use (<https://www.drinkaware.co.uk/>). This site was the only one found that offered different targeted messaging for binge drinkers and moderate drinkers, which Lee and Chen (2013) suggest may be more effective than having one message for everyone.

While the majority of these messages did not use the positive strategies discussed above, and instead focused on the negative consequences of heavy alcohol use, a number of them did address risk and protective factors and youth's reasons for drinking. The most commonly addressed risk factors included concern for peer approval and gender differences in metabolizing alcohol. Many of the other risk factors that have been shown to contribute to harmful alcohol use, such as history of victimization, low self-esteem, weight concerns, and challenging life stages such as school transitions were either absent or present in only 1 or 2 of the 29 media messages analyzed.

Some of the media messages promoted protective factors such as encouraging dialogue between friends about risky alcohol use, having clear rules around alcohol consumption, and promoting positive norms with friends including an awareness that not all youth drink. One media message contained a portrayal of positive communication between a young person and his family, which Mason and colleagues (2009) found to be protective against risky alcohol use (discussed below, titled “The Dangers of Underage Drinking: My Instead Movie”).



Youth Research Academy's reflections

Women have reported feeling angry about messages that place blame and shame on females for being the victim of sexual violence because of their alcohol use (Canadian Women's Health Network, 2014). Similarly, members of the Youth Academy felt many of the messages they reviewed placed unfair responsibility on girls and young women to protect themselves from sexual assault and other harms. For example, the “Don't Be That Girl” poster campaign released by students at the University of Windsor showed a girl dressed provocatively asking the question “Let's see how many guys will buy me a drink tonight. I didn't wear this outfit for nothing” (Reid, 2013).

These messages stigmatized the sexuality and agency of females and can make girls feel that it's their fault if something happens to them if they've been drinking, which can lead them to not report assault or seek help.

The members of the Youth Research Academy felt there should be more messages that teach young women how to support their friends if they're drunk or show them how to get home or to another safe place instead of focusing on scare tactics.

As shown in the literature, the focus on negative consequences and health risks are not very helpful because female youth aren't thinking about these things when they're drinking. For example, the drinking and driving ads often show events leading up to an accident but youth often don't think about the consequences when they decide to get in a car after drinking or with someone who has been drinking.

A lot of the messages members of the Youth Research Academy reviewed talked about peer pressure, with comments from youth like “one more drink won't kill you,” or “don't be lame just do it, we all have done it before.” It can be hard to resist peer pressure but youth-led messaging can counteract these and be effective because it is coming from a peer and not from a guardian/parent.

In the experience of the Youth Research Academy, having a harm reduction approach also seems like a better approach than messages to abstain from drinking altogether, such as “just say no” or “don't do it.” For example, a better way to say it might be “if you have a drink, wait and see how you feel in a bit before you have another.”

Based on our research and our personal experience, we believe that concise video ads based on real-life experience or scenarios give a more realistic approach to the effects and risks of drinking. Interactive online games depicting what a night out drinking with your friends might be like and how your choices will lead you in many different directions in a split second are also good. “Love and accept yourself” messages help female youth remember that they don't need to get drunk to feel good about themselves or to fit in, whereas “shame based” messages just make youth feel like they have done something wrong and won't make the situation any better.

Many youth don't watch “regular television” or read newspapers, so advertising in these places is not effective at reaching young people. Instead, video ads through YouTube, for example, would be more effective.



Example of effective messaging:

The dangers of underage drinking: My instead movie

(<https://www.youtube.com/watch?v=aY4B1wSEqIY>)

In the video, Andy's male friends have encouraged him to steal a bottle of alcohol from his parents and are now wanting him to drink it with them and a female friend. Next the video gives you three options for how this story ends.

1: Andy dumps out the bottle instead. The boys get upset with him and leave. However the girl is proud of him for not caving into peer pressure. He offers to walk the girl home.

2: An adult shows up and asks if they have seen the missing bottle. They all shake their heads. The adult continues to talk about the effects of drinking and says if they happen to see it to put it back or leave it on the porch. The adult leaves and Andy and his friends run to the porch and leave the bottle.

3: Andy takes a drink and passes it around. The girl gets the bottle but before she takes a sip, Andy starts to feel sick and throws up. His friends leave.

Reflection

This video shows a realistic scenario of peer pressure and the different choices you can make. The video is also good because the adult knew the boy had taken the bottle, but didn't get mad. Instead, he told the group about the effects and gave them information to help them make the right decision.



Example of ineffective messaging:

Teen anti-drinking campaign

(<https://www.youtube.com/watch?v=Bhk4fh6Sld0>)

Music is playing and teens are standing around hanging out at a house party. In one version, a girl declines a drink from a boy, meets another boy who takes her number, and leaves the party with her friends.

In the second version, she accepts the drink from the first boy, drinks too much, ends up having sex at the party, feels ashamed, and is judged by her friends. Words slide on to the screen "DRINKING. Where are your CHOICES taking you?"

Although this video had some good points about how drinking too much can affect your choices, it was very blaming and shaming and for that reason we didn't find it effective.

Building resiliency

This review has focused on identifying effective strategies to reduce risky alcohol use among underage girls. Excessive alcohol use is one risky behaviour that adolescents participate in that can compromise their health and well-being. However, risky behaviours often cluster together, such as alcohol, tobacco, and other substance use; risky sexual behaviour; and poor school attendance (Rew & Horner, 2003; Smith et al., 2015a). Therefore, interventions that focus on promoting protective factors and overall well-being may be more effective than those which focus on eliminating or reducing a specific health risk behaviour. One model which seems to be a promising approach is Communities That Care as it aims to promote protective factors as a way to reduce problem behaviours.

Interventions that build protective factors such as increasing self-confidence; feeling connected to family, school and community; and feeling skilled or competent can provide young people with a buffer against risk factors such as problematic alcohol use and can promote healthy behaviours (Rew & Horner, 2003).

The most successful interventions found in this review were those which sought to promote protective factors such as family connectedness. Healthy family connectedness is repeatedly identified as one of the strongest protective factors against a range of health risk behaviours for youth in BC (Smith et al., 2015a). It has been shown to mitigate risk factors for alcohol misuse, such as having peers who drink heavily and living in a community where excessive alcohol use is normative (Pisarska, Eisman, Ostaszewski, & Zimmerman, 2016).

Engagement in extracurricular activities can help to build resilience among young people by offering opportunities for positive social interactions, skill development, and providing opportunities to engage in a healthy alternative to substance use (Moilanen, Markstrom, & Jones, 2014).

Land and nature based programs whose primary aim is to offer an opportunity for Indigenous youth to connect with their culture, learn their history, and improve their leadership and life skills have been associated with reduced substance use among male and female youth (Palmer, 2013). Similarly, mindfulness interventions that have aimed to help youth cope with stress and regulate emotions have been associated with a lower likelihood of lifetime alcohol use among male and female high school students (Robinson, Ladd, & Anderson, 2014).

Finally, the review of protective factors found that youth who felt connected to school, community, religion/spirituality, and peers had healthier relationships with alcohol. Also, policies which helped to create a more inclusive and welcoming school environment could be effective in reducing risky alcohol use among underage girls.

Discussion

This review has outlined specific risk and protective factors for adolescent girls and reviewed interventions, policies, and messaging related to underage alcohol use. It has highlighted the importance of looking beyond specific alcohol related behaviours when developing best practices.

The context in which young women use alcohol must be recognized and addressed. For example, despite current Canadian alcohol advertising regulations, girls and young women are exposed to marketing strategies specifically tailored to increase alcohol consumption and to marketing content that is hypersexualized. This type of advertising can trivialize sex and normalize cultural attitudes about the objectification of girls and women, and has been associated with sexual violence (Kilbourne, 2014).

Canada subscribes to the United Nations sustainable development goal to achieve gender equality, including ending discrimination and violence against women and girls (United Nations, 2016). Initiatives and policies which seek to address these issues and programs which empower girls and young women by encouraging them to be critical thinkers and learn about body image, sexuality, and violence in media (such as those provided by Canadian organizations like the Girls Action Foundation) may also provide girls with the skills to critically assess their alcohol use and misuse.

In line with the World Health Organization's aims to develop policies and programs that are responsive to the needs of girls and boys and account for the complex context and intersecting social determinants of health (Mager, 2015; World Health Organization, 2017), this review has highlighted what should be taken into account when developing strategies to address the unique challenges that underage girls face. These include females' different metabolism of alcohol in comparison to males, their motivations for using alcohol, the specific harms they can experience as a result of risky use (such as sexual violence and unwanted pregnancy), and their exposure to cultural norms and marketing messages about alcohol which include using alcohol to excess and as a way to enhance enjoyment and to manage stress.

This report has shown that a gender-specific approach to reducing risky alcohol use and related harms among underage girls is necessary. Unfortunately, the review of published literature indicated that gender-specific data is relatively limited. Nevertheless, we have attempted to unpack gender-specific risk and protective factors as well as intervention and policy components. In doing so, we aimed to inform and encourage a discussion about gender-responsive approaches to reducing risky alcohol use among underage girls.



Recommendations

Based on the evidence reviewed, it is recommended that:

The focus of any intervention should be to address risk and protective factors strongly associated with girls' reasons for using alcohol (such as enhancing positive self-image; strengthening relationships with family, school, community, and peers; dealing with stress and trauma; and addressing mental health challenges), rather than on alcohol abstinence.

Any interventions focused specifically on risky alcohol use should seek to enhance knowledge and skills, strengthen family connectedness and communication, and increase self-image.

Engaging families and particularly female caregivers in interventions that can be delivered at home and do not require attendance in group settings can be effective at reaching girls and their families who may not be willing or able to engage in more traditional interventions.

Providing opportunities for girls and their caregivers to build skills simultaneously and spend positive time together can be particularly effective.

Building connections with other supportive adults such as teachers and engaging adult allies may be especially important in situations where family relationships are challenging or non-existent. Such adult allies can model safer alcohol use, be sources of education and information, and provide helpful strategies to reduce stressors associated with risky alcohol use.

Strategies targeting female youth should consider their gender-specific identity and needs, and should be age, stage, context, and culturally appropriate (e.g., strategies which target girls who have not yet used alcohol should include different components to those targeting girls already engaged in risky drinking). Additionally, interventions should address motivations for drinking among adolescent girls and provide alternative ways of achieving the perceived effects of alcohol.

Female youth who have experienced negative consequences from alcohol use personally or within their family need different approaches than those who have yet to try alcohol. Interventions for these youth and older girls in general should also include information about how to help peers who are intoxicated, how to identify when use is problematic, and where to get help if a problem is recognized.

Integrating alcohol-related curriculum across different grades is more likely to be successful than offering information and skills training only in one or two grades, in an isolated program.

Working through realistic scenarios in which girls might find themselves can build transferable decision-making and communication skills, when done in a non-judgemental way.

Based on the evidence reviewed, it is recommended that (*continued*):

Policies that increase inclusivity and address alcohol availability (through age restrictions, retail restrictions, etc.) can be helpful. As young people and those who binge drink tend to choose cheaper drinks, pricing policies could also potentially impact them. These policies could be targeted at products favoured by underage girls (e.g., coolers and spirit-based drinks).

Restrictions also need to be placed on the marketing that underage girls are exposed to. These restrictions should address both the content of the marketing to reduce products targeted specifically at girls and young women, as well as the sexualized content of alcohol advertising. Furthermore, restrictions should be aimed at reducing exposure to alcohol marketing, and policies put in place to enforce such restrictions.

Media messaging targeting female youth should reflect the lessons learned about the effectiveness of various interventions, and the ineffectiveness of focusing solely on increasing knowledge about risky alcohol use and its associated harms. It would appear that messaging which models effective strategies in realistic scenarios where young women may find themselves at risk of harmful alcohol use are more likely to be effective.

The challenges encountered in finding strategies with strong evidence of their effectiveness for underage girls shows the need for more research in this area. More research is also needed with different populations of girls, particularly those who may be at high risk for alcohol-related harms. If every study in this review had gender-specific or gender-disaggregated results, a much clearer understanding of interventions and policies that were effective for girls would result. This goes beyond simply 'controlling' for gender in the analytical approach as this does not necessarily provide sufficient detail about the specific impact of an intervention or policy on girls.

Finally, it is important to engage female youth in developing and reviewing strategies for addressing risky and harmful underage girls' alcohol use to ensure their relevance and acceptability.

Youth Research Academy's recommendations



Female members of McCreary's Youth Research Academy reviewed a draft of the report and confirmed the recommendations emphasized in this report for effectively reducing risky alcohol

use in underage girls. However, they thought it was important to emphasize that the evidence and their own experiences indicated that family interventions are only effective if they focus on building healthy, supportive relationships and are not heavily rule based or so lenient as to set no reasonable boundaries for youth.

Members of the Youth Research Academy felt that focusing on building positive communication skills with peers, creating stronger connections to community, and offering different interventions for young women from different cultures were strategies they had not seen implemented but felt could be effective. For example, a school-based program such as the Fourth R teaches relationship and communication skills in situations where youth may face peer pressure around alcohol and other substances, dating, and sex (Wolfe et al., 2012).

They also felt that educational interventions that taught young women about the effects alcohol had on their body, and how these differed for males, as well as interventions that taught gender-specific low risk guidelines would be particularly effective in BC. They suggested this could be particularly effective when paired with interventions to promote a positive self-image.

They added some recommendations based on their own experiences. These included developing strategies to help young women learn to understand and manage their stress, and having more school counsellors who are trained to talk about risky alcohol use.

They reflected on working through various game apps that taught them different skills. They felt that apps that focused on decision making in realistic scenarios where young people were drinking alcohol would be an effective way of reaching young women, particularly those who may not have positive family relationships.

Finally, the young women in the Youth Academy suggested having an interactive online platform similar to the '7 Cups' model which is very popular with young people in BC. 7 Cups is a website which provides free support to people experiencing emotional distress by connecting them with trained listeners. An alcohol focused version of this website would help young women who accessed it when they were drinking alcohol to work through a safety plan which might include prompts like "Have you had a glass of water?"; "Why don't you wait 30 minutes before you have another drink and see how you feel?"; and "Do you have a safe ride home?" Additionally, if the young women did not have a safe ride home, this could be arranged through the site.

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References marked ** are the 27 rigorously evaluated intervention studies which provided female specific data, and those marked *** are the 9 policy studies with female specific data.

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APPENDIX A: Interventions to reduce risky underage female alcohol use

Author(s)	Project name (country)	Intervention type	Content	Key findings
D'Amico et al., 2006	Project Options (United States)	School based	Voluntary program offered either in group, individual or online format covering normative education, alcohol expectations, coping strategies, consequences of excessive alcohol use and alternative recreational activities.	No significant differences between intervention and non-participating girls who both reduced their frequency of recent heavy sessional drinking.
Fang & Schinke, 2013	(United States)	Online / family based	Nine 35 to 45-minute intervention sessions via website for Asian American mothers and daughters to complete together at home. Interactive lessons emphasize strengthening mother-daughter bond and communication, body image, mood management, problem solving and peer resistance skills.	Girls in intervention group had lower alcohol use in previous 30 days in comparison to girls in control group.
Graham, Johnson, Hansen, Flay, & Gee, 1990	Project SMART (United States)	School based	Two separate curricula, 12 sessions each, that compared the efficacy of a social skills program for resisting drug offers with an affect management program that focused on decision making and stress management.	Program effects were seen for alcohol use, and there were no differences between males and females.
Hallgren & Andreasson 2013	Swedish Six-Communities Trial (Sweden)	Community based	Participating communities were given a menu of programs options to choose from. Most popular were increased local media coverage of alcohol issues, a police training program to strengthen enforcement, a responsible beverage service program for bars and restaurants as well as a skills based program for youth and promotion of restrictive attitudes around alcohol use among parents.	Larger reduction of binge drinking in trial communities compared to control communities among Year 9 females. No effect on Year 11 females. Overall, all young people reported reductions in binge drinking over time, with no differences between the trial and control communities. (A specific binge drinking definition was not provided.)

Author(s)	Project name (country)	Intervention type	Content	Key findings
Jansen et al., 2016	Alcohol moderation among adolescents in the Achterhoek (Netherlands)	Community based	A range of community based health education, regulation and enforcement activities to promote alcohol moderation among adolescents. Initiatives included mass media campaign, beverage service training, as well as raising awareness among parents and stricter regulations at school.	Younger youth aged 13-14 had a stronger reduction in heavy sessional drinking compared to their peers in the reference region. No effects on youth age 15-16 at baseline and no effect of gender.
LaBrie, Feres, Kenney, & Lac, 2009	(United States)	Brief intervention	A single 90-minute motivational interviewing session supporting self-efficacy for change. The program addressed female specific reasons for drinking.	Among women with a family history of alcohol abuse, there was a significant reduction in binge drinking (four or more drinks) in the previous 3 months in comparison to control group. No significant effects for participants without family history of alcohol abuse.
Longshore, Ellickson, McCaffrey, & St. Clair, 2007	Project ALERT Plus (United States)	School based	A knowledge and skill based program in Grade 7 and 8 extended to Grade 9 with five extra booster sessions which covered exposure to more regular use in high school, getting a drivers' licence, advertising and increased stress. Parents were also educated on adolescent substance use and encouraged to plan substance-free parties with their children.	Project ALERT Plus significantly reduced girls' risky alcohol use. No significant effects without Grade 9 extension and no effects on boys with or without program extension.
Mason et al., 2009	Preparing for the Drug Free Years (PDFY) (United States)	Family based	Entering the program while children were in Grade 6, parents participated in four weekly sessions which taught parent-child interaction skills, rule setting, parental monitoring and conflict management. The final 5 th session included both parents and children and involved youth learning peer resistance skills.	Females in the intervention group had significantly lower rates of alcohol abuse at age 22 than women in control group. This effect was not seen in males.
O'Donnell, Myint, Duran, & Stueve, 2010	Especially for Daughters (United States)	Audio tape/ family based	Four dramatic role-model stories of fictional families (reflecting the ethnic diversity of participants) delivered through CDs over a 6-month period, which aimed to strengthen mother-daughter bond and encourage proactive communication including about alcohol, rule setting and parental monitoring.	Girls in CD intervention group were less likely to report alcohol use in the past year, compared to control group.

Author(s)	Project name (country)	Intervention type	Content	Key findings
Schinke, Cole, & Fang, 2009	(United States)	Online / family based	Fourteen modules over three weeks delivered online or via CD-ROM for mother and daughter to complete together at home. Interactive lessons emphasized strengthening mother-daughter bond and communication, mood management, problem solving and peer resistance skills.	Girls in intervention group had lower alcohol use in previous 30 days and in the previous 7 days in comparison to girls in control group.
Schinke, Fang, & Cole, 2009	(United States)	Online/ family based	Nine weekly, 45-minute sessions delivered online for mother and daughter to complete together at home. Interactive lessons emphasize strengthening mother-daughter bond and communication, body image, mood management, problem solving and peer resistance skills.	Girls in intervention group had lower alcohol use in previous 30 days in comparison to girls in control group.
Schinke., Fang, Cole, & Cohen-Cutler, 2011	(United States)	Online/ family based	Ten session program via CD-ROM or website for mothers and daughters to complete together at home. Interactive lessons emphasize strengthening mother-daughter bond and communication, body image, mood management, problem solving and peer resistance skills.	Girls in intervention group had lower alcohol use in previous 30 days in comparison to girls in control group.
Schinke, Tepavac, & Cole, 2000	(United States)	Cultural knowledge and skills/ School based	A culturally adapted program incorporating Native American values, legends and stories. The 15 50-minute session program covered consequences, and perceived benefits of alcohol and skills training. A second intervention condition combined the skills based training with distribution of flyers, informational meetings, poster-making exercises, mural painting and skits. Both intervention conditions were compared to a non-intervention control group.	Youth in the cultural knowledge and skills based intervention group were less likely to consume 4 or more drinks in the previous week than control group youth. The additional components did not appear to add any extra benefits over the impact of the skills intervention alone.
Schwinn, Schinke, & Di Noia, 2010	Real Teen (United States)	Online / skill based	Online personalizable homepage for each participant and 12 25-minute intervention sessions over 6 weeks to build social competence and peer resistance skills. Interactive lessons with options to share with assigned pen-pal, homepage blog, public chat or private diary.	Girls who had participated in intervention group had lower alcohol use in previous 30 days in comparison to girls in control group.

Author(s)	Project name (country)	Intervention type	Content	Key findings
Shope Copeland, Maharg, & Dielman, 1996	Alcohol misuse prevention study (AMPS) (United States)	School based	Five 45-minute session program led by teachers focusing on refusal skills. Program incorporated audio-visual material, role plays and handouts.	Significantly lower rates of risky alcohol use in past 12 months among intervention group compared to control group. No significant effect of gender.
Sloboda et al., 2009	Take Charge of Your Life (TCYL) (United States)	School based	Ten sessions in Grade 7 followed by seven sessions in Grade 9 led by D.A.R.E police. Lessons focused on knowledge, normative beliefs, substance use consequences, decision making and resistance skills	Girls in the intervention group were more likely to engage in heavy sessional drinking in previous 14 days than girls in control group.
Smit, Cuijpers, Lemmers, Jonkers, & De Weerd, 2003	Healthy Schools and Drugs (HSD) (Netherlands)	School-based	Three sessions a year in the first, second and third year of high school based on social influences approach (knowledge, attitudes and refusal skills).	No significant difference in lifetime alcohol use rates among girls in the intervention by the third year of high school compared to control group peers.
Smith et al., 2004	Adoption of Drug Abuse Prevention Training (ADAPT) (United States)	School based	Two intervention conditions, which was a life skills training program (LST) taught with a set schedule of 30 to 32 lessons from Grade 7 to 9 and an integrated life skills training program where lessons were incorporated into existing school curriculum, compared to control group without any intervention activities.	Grade 7 girls in both intervention conditions significantly reduced heavy sessional drinking in comparison to control group peers. No long term effect in Grade 8.
Smith et al., 2008	Healthwise (South Africa)	School based	Two intervention conditions, which was a life skills training program (LST) taught with a set schedule of 30 to 32 lessons from Grade 7 to 9 and an integrated life skills training program where lessons were incorporated into existing school curriculum, compared to control group without any intervention activities.	Significant decrease in heavy alcohol use for both boys and girls compared to control group and significantly lower past month alcohol use for baseline non-drinking girls only.
Spijkerman et al., 2010	(Netherlands)	Brief/ online intervention	A 15-minute intervention with a questionnaire and personalized feedback on health risk status and advice for moderate drinking. Intervention was conducted with or without normative feedback, which compared personal drinking patterns to prevalence rates among peers of similar age.	Among females, the intervention without normative feedback resulted in less moderate drinking compared to control group. No significant effects for the intervention with normative feedback. Both intervention conditions increased moderate drinking in men.

Author(s)	Project name (country)	Intervention type	Content	Key findings
Stafström & Ostergren, 2008	Trelleborg Project (Sweden)	Community based	36-month community mobilization initiative with five local action groups of community stakeholders. Main initiatives included community and school drug management policies and action plans, police enforcement and store inspections for black market liquor, mass media coverage of local drug and alcohol use and new youth clubhouse.	Among youth who used alcohol, there was a significant reduction in alcohol-related accidents and self-reported alcohol-related violence when compared to baseline. No significant effects of gender.
Vigna-Taglianti et al., 2009; Caria, Faggiano, Bellocco, & Galanti, 2011	EU-Dap "Unplugged" (Austria, Belgium, Germany, Greece, Italy, Spain, Sweden)	School based	Twelve 1-hour sessions taught by teachers over three months emphasizing building life skills (communication, relationship skills, self-awareness, refusal skills, assertiveness, critical thinking, coping, goal setting, decision making and problem solving)	Decreased risk for alcohol-related problems among girls ≤ 12 years old at baseline, no effect on older girls. No significant decrease in any substance use indicators for girls (including alcohol; almost all indicators significantly reduced for boys).
Vogl et al., 2009	CLIMATE Alcohol Program (Australia)	School based	Six 40-minute session program following social influence approach (knowledge, normative education and drug refusal skills) with an emphasis on harm minimization. Half of each session taught through a computer-based cartoon drama and the other half included interactive classroom activities (e.g. role-plays, discussions, problem-solving activities.)	Girls in control group significantly increased their rate of heavy sessional drinking more than girls in the intervention group. No effect on boys.
Watt, Stewart, Birch, & Bernier, 2006	(Canada)	Brief intervention / Personality targeted	Brief, small group based intervention targeted at young women with high anxiety sensitivity. Program consisted of three 50-minute sessions over three consecutive days featuring physical exercise and cognitive behavioural therapy to address anxiety, cognitive restructuring training (changing unhelpful thought patterns, emotional management, and coping strategies).	Small but significant reductions for drinking for conformity and emotional relief expectancies.

Author(s)	Project name (country)	Intervention type	Content	Key findings
Weiss & Nicholson, 1998	Friendly PEER-suasion (United States)	After school program / skill and leadership based	Core curriculum consisting of 14 1-hour sessions on leadership development, social competence and peer resistance skills. After core curriculum completion, girls planned and implemented prevention program for middle school girls.	Moderate effectiveness of the intervention with younger girls in comparison to control group. Younger girls in the intervention were less likely to start drinking or associate themselves with substance using peers in comparison with control group girls. There was no effect with older girls.
West et al., 2008	Project Northlands Croatia (Croatia)	Multi-component—School, family and community based	Multi-year program for students including the “Slick Tracy Home Team” program in Grade 6 (family communication about alcohol issues), “Amazing Alternatives” in Grade 7 (peer-led resistance skills training) and “Power-Lines” in Grade 8 (community influences).	Females significantly reduced tendency to use alcohol in comparison with control group. No significant effects on males.
Wurdak, Wolstein, & Kunt-sche, 2016	HaLT (Germany)	Brief intervention/ hospital based	Motivational interviewing by social worker the day after hospital intake due to intoxication. Discussed alcohol effects, context of risky drinking and drinking motives. Computerized lessons taught 10 minute exercises to fulfill perceived role of alcohol in safer, alternative ways. One computerized session at hospital with unlimited booster sessions via website from home.	The intervention had a large effect on drinking frequency, heavy sessional drinking and drunkenness for girls in comparison to the control group. Intervention was more effective for females than males.

APPENDIX B: Policies to reduce risky underage female alcohol use

Author(s)	Policy (country)	Key findings
Callaghan, Sanches, & Gatley, 2013	Minimum legal drinking age (Canada)	Hospitalizations for alcohol use disorder/poisoning significantly rose for both males and females at the minimum legal drinking age (MLDA) when compared to hospitalization rates just prior to the MLDA.
Callaghan, Sanches, Gatley, & Stockwell, 2014	Minimum legal drinking age (Canada)	Non-significant increases in mortality rates following the MLDA when compared to before the MLDA among females. Significant increases among males.
Callaghan, Gatley, Sanches, Asbridge & Stockwell, 2016	Minimum legal drinking age (Canada)	Alcohol impaired driving rates significantly increased among females at the minimum legal drinking age compared to before the MLDA in provinces where the legal drinking age is 18 years old and nationally. No significant changes among females in provinces where the MLDA was 19 years old. Significant increases among males nationally and in provinces with MLDA ages 18 or 19 years old.
Callaghan, Gatley, Sanches, Benny & Asbridge, 2016	Minimum legal drinking age (BC, Canada)	For females in British Columbia, reaching the MLDA had no significant effect on alcohol-related motor vehicle accident rates but did increase for males when they were over MLDA.
Carpenter, 2004	Zero tolerance drunk driving laws (United States)	Zero tolerance drunk driving laws did not significantly reduce heavy episodic drinking among underage females but were associated with a significant decrease among underage males.
Chaloupka & Wechsler, 1996	Alcohol pricing (United States)	Suggest doubling the current tax would result in a small reduction in alcohol use in the past year among underage women. Alcohol pricing had no significant effect on binge drinking (four or more drinks) in the previous two weeks. No effects on males.
Kypri et al., 2006	Minimum legal drinking age (MLDA) (New Zealand)	Significantly increased rates of alcohol involved motor vehicle crashes among both males and females after MLDA was lowered from 20 years old to 18 years old.
Lindo, Siminski & Yerokhin, 2016	Minimum legal drinking age (MLDA) (Australia)	Significant increases in hospitalization for alcohol intoxication/poisoning for both male and female youth at MLDA when compared to younger youth. No effects of gender. No significant increase at MLDA for motor vehicle accidents.
Milam, Johnson, Furr-Holden, & Bradshaw, 2016	Alcohol outlet density (United States)	Among female youth, higher alcohol outlet density was associated with increased perceived availability of alcohol but not with use.

APPENDIX C: Addressing risk factors for risky alcohol use

Risk factor	Strategy to address
Genetic processing of alcohol	Discussing how the same amount of alcohol can have a more negative effect on girls than boys was reported to reduce the pressure for girls to drink at the same rate as boys (Vogl et al., 2009).
Transitions to high school	<p>Knowledge and skill based programs which built social competence and refusal skills were most effective when offered to students prior to transitioning to a new environment (Vigna-Taglianti et al., 2009).</p> <p>Programs delivered within high schools were more successful when they acknowledged students may have experimented with alcohol, used heavily and experienced negative consequences as a result of use (Longshore et al., 2007; Vogl et al., 2009; Schwinn et al., 2010).</p>
Mental health challenges	Teaching alternative ways to cope with stress and anxiety, and helping girls understand their motivation for drinking could be effective for girls who were drinking at risky levels (Longshore et al., 2007; Watt et al., 2006; Wurdak et al., 2016).
A history of trauma and abuse	Promising strategies included youth leadership and assertiveness training which provided a sense of control (Schwinn et al., 2010; Schinke et al., 2011; Fang & Schinke 2013; Weiss & Nicholson, 1998).
Family relationships	Strategies used in effective interventions for enhancing family relationships included increasing quality time spent with each other, parental monitoring, building effective communication and conflict resolution skills (Schinke, Cole, & Fang, 2009; Schinke et al., 2011; Mason et al., 2009).
Peer relationships	Teaching skills to reduce the negative effects of peer pressure and create respectful relationships with peers showed some success for girls (Longshore et al., 2007).
Poor body image and low-self-esteem	Effective strategies included building positive relationships with parents to increase self-esteem (Vigna-Taglianti et al., 2009) and improving body image, and knowledge about changes that occur during puberty (Schinke et al., 2011; Schwinn et al., 2010).

APPENDIX D: Media messaging sources from Youth Research Academy analysis

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