

**Alcohol warning labels: unlikely to affect alcohol-related beliefs and behaviours in adolescents**

**Kirsty E. Scholes-Balog, PhD**

School of Psychology, Australian Catholic University

**Jessica A. Heerde, BAppSci(Hons)**

School of Psychology, Australian Catholic University

**Sheryl A. Hemphill, PhD**

School of Psychology, Australian Catholic University

**Corresponding Author**

Kirsty E. Scholes-Balog

School of Psychology

Australian Catholic University

115 Victoria Pde, Fitzroy, VIC, 3065

Ph. 03 9953 3117

Fax. 03 9417 2734

Email. [Kirsty.balog@acu.edu.au](mailto:Kirsty.balog@acu.edu.au)

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## Abstract

**Objective.** In Australia, many health researchers and policy makers are advocating for mandated warning labels on alcoholic beverages. Alcohol-related harms are of particular concern among adolescents. Therefore, the aim of this article was to review the available literature and evaluate the impact of alcohol warning labels on adolescent drinking knowledge and behaviour.

**Approach.** A systematic review of the literature was conducted. Scholarly databases were searched for relevant research articles. Broad inclusion criteria were applied due to the relative paucity of literature.

**Conclusion.** The introduction of alcohol warning labels was shown to be associated with initial increased awareness of alcohol warning label law, exposure to the labels, and increased recognition of the warning label messages. Conversely, little change was observed in terms of beliefs about the risks of alcohol use or participation in risky alcohol-related behaviours. These findings are similar to those reported among adult samples. However, the vast majority of the literature originated from the same group of authors, with samples drawn from a single geographical region. This may greatly limit the generalisability of these findings.

**Implications.** Introduction of alcohol warning labels in Australia may increase awareness about the risks of alcohol consumption among adolescents; however, these labels appear unlikely to change adolescent drinking behaviours or beliefs about alcohol-related risks. Further research in multiple cultural contexts is required to confirm these findings. Alcohol warning labels should be considered as only one aspect of a range of other proven strategies to change knowledge, attitudes and behaviour.

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In Australia, there is a culture amongst young people to drink to levels far in excess of those recommended.<sup>1</sup> In 2008, the Australian Secondary Students Alcohol and Drug Survey found that 60% of students aged 12-17 had consumed alcohol in their lifetime, while almost 30% were classified as risky drinkers.<sup>1</sup> There are a multitude of short- and long-term health problems and injuries that are recognised to be causally related to alcohol use, these include: cancers (specifically, breast, liver, oesophageal, lip, oral and pharyngeal cancers), alcohol addiction or dependence, hypertensive disease, ischemic heart disease, strokes, cirrhosis of the liver, birth defects and foetal alcohol syndrome, road traffic accidents, alcohol poisoning, falls, drowning, suicide and violence against others.<sup>1</sup> Research suggests that young people have a different alcohol-related risk profile relative to older alcohol users, with adolescents more likely to experience harms such as alcohol-related violence and injuries.<sup>1</sup> It is clear that a range of preventive health policies must be implemented, particularly targeting adolescents and young adults, in order to address the morbidities and mortality associated with alcohol misuse.

In Australia, there are state and national policies currently in place which aim to reduce the harms associated with alcohol misuse. For example, it is illegal for minors (individuals under 18 years of age) to purchase or consume alcohol in licensed premises (e.g.<sup>3</sup>). Further, most liquor licensees and their staff who serve alcohol are required to complete a Responsible Service of Alcohol (RSA) training course which educates about the legal responsibilities associated with the service of alcohol.<sup>3</sup> Finally, mandatory labelling of alcoholic beverages with information about the number of standard drinks contained in the product has been introduced.<sup>4</sup>

In an attempt to further reduce alcohol related harms, many health and policy researchers are currently urging for the implementation of mandated health and safety warning labels on alcoholic beverages. The premise underlying the introduction of such

labels is that these warnings would provide a significant symbolic message about the dangerous quality of the product.<sup>5</sup> Such warnings aim to increase consumer awareness about the harmful effects of alcohol, thereby modifying harmful drinking behaviours and reducing or preventing associated adverse outcomes.<sup>6</sup> Warning labels have been present on tobacco products for many years, both in Australia and internationally, with evidence suggesting that these labels are effective at increasing health knowledge and perceptions of risks associated with tobacco use, as well as promoting smoking cessation.<sup>7</sup> Further, among young people, comprehensive warnings on tobacco products are perceived as effective and may prevent smoking initiation.<sup>7</sup>

Government mandated warning labels on alcoholic beverages were introduced in the United States (US) in 1989.<sup>6</sup> Since this time, many other countries have followed suit, including Argentina, Brazil, France, Mexico and South Africa.<sup>8</sup> Examples of these mandatory labels include: “GOVERNMENT WARNING: According to the Surgeon General, women should not drink alcoholic beverages during pregnancy because of the risk of birth defects” (US) and “Alcohol abuse is dangerous to your health” (South Africa). These warning labels on alcoholic beverages are typically small, narrow, and appear vertically along the label. The use of such labels, and various characteristics of these labels (including what type of information should be conveyed and how), is based on a number of social psychological principles and theories of behaviour change (such as the theory of reasoned action/planned behaviour) (for a review see<sup>9</sup>).

In Australia, research examining the potential impact of the proposed introduction of alcohol warning labels is limited, and thus has had little influence in guiding efforts for policy development. To the knowledge of the authors, there has been only one Australian study examining the potential impact of alcohol warning labels should such a policy be introduced. Jones and Gregory<sup>10</sup> examined Australian university students’ perspectives on health

warning labels on alcohol products. This study reported that warning labels and messages similar to those currently employed in the US would have little effect on young adult's beliefs about the harmful effects of alcohol consumption.<sup>10</sup> In this study, alcohol warning labels were thought to be ineffective because participants did not perceive themselves to be personally vulnerable to the long-term consequences of alcohol use or did not perceive these consequences to be relevant to them at this point in their life.<sup>10</sup> In another study by these authors investigating the impact of visible standard drink labelling on youth alcohol consumption it was found that currently mandated standard drink information on alcoholic beverages in Australia is used by young adults to augment or maximise their alcohol consumption, rather than reduce their alcohol consumption as intended.<sup>11</sup>

There has been a large body of international literature (primarily originating from the US) examining the impact of the introduction of alcohol warning labels on adult knowledge and behaviour, including, beliefs about alcohol-related risks and engagement in drink-driving. In a recent review of the literature, Stockwell<sup>12</sup> concluded that warning labels are noticed by most adult drinkers and can promote informal discussion about the health consequences of consumption of alcohol, at least initially. Reviews of the literature suggest that alcohol warning labels may improve knowledge and attitudes regarding the harmful consequences of alcohol use among adults, but there is little evidence to suggest that warning labels have any effect on harmful levels of alcohol consumption or specific alcohol-related risky behaviours such as drink driving.<sup>5,12</sup> It has been suggested that alcohol warning labels have the potential to positively contribute to reducing harmful levels of alcohol consumption when implemented in conjunction with a variety of other more established policies (e.g. public and school-based education campaigns and legislation governing alcohol service and provision), particularly if they are more salient, varied and occupy a large section of the alcohol package.<sup>5,12</sup>

While these reviews of the literature suggest that alcohol warning labels may have some beneficial impact for adults with respect to knowledge and attitudes, it is also important to understand the influence of these labels amongst adolescents. This is particularly relevant in Australia given the harmful drinking culture among young people.<sup>1, 13</sup> Adolescence is recognised as a period in which health knowledge and behaviours become established and experimentation with alcohol and other drugs first occurs.<sup>14</sup> Attitudes regarding alcohol use are also established during this period.<sup>15</sup> Although the legal drinking age in Australia is 18 years, adolescents under this age still access alcohol, engage in risky drinking behaviours and are at risk of short- and long-term alcohol-related harms.<sup>13</sup> Therefore, evaluation of the impact of alcohol warning labels among this vulnerable group is crucial. It may be that adolescents have different perceptions of, and attitudes towards, alcohol warning labels, relative to adults. As such, it is necessary to consider potential differences between adolescents and adults in the development of preventive health policy which incorporates alcohol warning labels. In light of this, the aim of the current article was to review and evaluate the published literature examining the impact of alcohol warning labels among adolescent samples. Specifically, this paper will investigate the reported effects of alcohol warning labels on adolescent attitudes, beliefs and knowledge of alcohol-related harms and behaviours such as binge drinking and drink-driving.

## Methods

The scholarly databases PsychInfo, Medline, Social Sciences Citation Index, Scopus, Ebscohost, Web of Knowledge and Proquest were searched using the term “adolesce\*” together with variations of the terms “warning label/alcohol warning/alcohol warning label/beverage warning”. Systematic search and review procedures were as recommended by the Centre for Reviews and Dissemination<sup>16</sup> to ensure a quality and thorough review process.

Titles and abstracts (and if necessary, full text articles) retrieved in these searches were then inspected to ascertain their relevance. The full-text articles of potentially relevant papers were then screened to confirm whether they satisfied the inclusion criteria. Articles were included if (1) they involved an adolescent sample (aged between 11-18 years) and (2) the study examined the influence of alcohol warning labels or their health messages on outcomes such as knowledge, behaviour, attitudes or beliefs. These broad inclusion criteria were required due to the relative paucity of literature on this topic among adolescent samples. These searches yielded 35 original, non-duplicate, research articles. From this, 10 original articles, which satisfied the inclusion criteria, were included for review searches. Additionally, the reference lists from these retrieved articles were examined for further relevant research papers, and citation searches of these retrieved articles were conducted in an attempt to identify additional relevant research. No further papers were identified by these methods.

## Results

Table 1 presents a summary of the articles included in this review. All of the studies identified for inclusion used survey methods for data collection, and the majority of studies (90%) were cross-sectional in design. Further, the majority (70%) of studies were conducted by a single group of authors, with the samples drawn from a single geographic region within the US. All of the studies utilised late adolescent samples (in grades 10-12 high school). Across the studies, there were no standardised measurement instruments used to evaluate the impact of alcohol warning labels. Each reviewed study used purpose designed questionnaires for data collection, and there was significant variability across studies in terms of what outcomes were examined, and the items used to assess each outcome. The most commonly examined outcomes were awareness of the alcohol warning labelling law, beliefs about the messages stated in the labels, exposure to the labels and recognition memory of the labels and

their warnings. Other questions administered less frequently included attitudes toward alcohol warning labels and their health risk messages, and knowledge of alcohol-related harms which are the content of warning label messages.

Insert Table 1 here

### *Impact of warning labels on exposure, awareness, beliefs and memory*

Of the studies identified, the most commonly examined impact of alcohol warning labels was whether the introduction of warning labels increased exposure to these labels and their health risk messages. Of the studies which examined these outcomes, increased exposure to the alcohol warning labels after their implementation was consistently reported.<sup>17-19</sup> Similarly, increased awareness of the warning labelling law following their implementation,<sup>17-19</sup> and increased recognition of the health risks stated in the labels<sup>17-19</sup> were also consistently reported. However, significant change in beliefs about the health risks of alcohol following implementation of the alcohol warning labels was not reported within any of the reviewed studies.<sup>17-19</sup> Only one identified study examined the impact of alcohol warning labels on alcohol-related behaviours, this study reported little change in drinking behaviour or drink-driving (the study was conducted in the US where the legal driving age is 16 years of age) following the introduction of alcohol warning labels.<sup>19</sup>

Each of the afore-mentioned reviewed studies was cross-sectional in design. The only longitudinal study identified in this review followed up students prospectively from 1989/1990 to 1991/1992 and examined exposure to alcohol warning labels and the relationship between exposure and alcohol consumption. The authors reported that early alcohol consumption was prospectively associated with more exposure to the alcohol warning labels.<sup>20</sup> Further, it was reported that earlier exposure to alcohol warning labels had no effect



on alcohol consumption, suggesting neither a beneficial nor harmful impact of the warning labels on adolescent drinking behaviours.<sup>20</sup>

While many of the studies identified for review found at least some beneficial impact of the alcohol warning labels, the only study which examined the impact of the warning labels up to five years after their introduction suggested that these positive effects may not be sustained in the population over time. In this study, MacKinnon, Nohre, Pentz and Stacy<sup>19</sup> surveyed grade 10 and 12 students each year from 1989/1990 to 1994/1995 (that is, new grade 10 and 12 classes were surveyed annually). The findings indicated that adolescents had increased awareness of labelling laws, exposure to labels, and recognition memory of the alcohol warning labels following their introduction; however, these positive effects were found to level off 3-4 years after the warning label introduction.<sup>19</sup> Finally, individual characteristics of adolescents exposed to alcohol warning labels may also moderate the impact of alcohol warning labels on alcohol-related knowledge and drinking behaviour. In their study examining the association between adolescents' characteristics and exposure to the alcohol warning label, Nohre and colleagues<sup>18</sup> reported that gender, ethnicity, familiarity with alcohol, socio-economic status and individual school grades all influenced the impact of alcohol warning labels on adolescents' awareness and memory of the alcohol warning label and the associated warning message. For example, students with lower school grades were more aware of the labelling law and had more exposure to the warning labels, but had lower belief in the risks presented on the warnings, than students with higher school grades.<sup>18</sup>

#### *Negative expectancies associated with alcohol use*

Outcome expectancies refer to an individual's estimation that a given behaviour will lead to a particular outcome.<sup>21</sup> One study identified for this review examined whether outcome expectancies have an impact on alcohol-related behaviour.<sup>22</sup> The premise behind this study was that alcohol warning labels contain messages about negative outcomes

associated with alcohol use, and hence the aim was to examine whether expectancies of such negative outcomes associated with alcohol use impact upon alcohol consumption and drink-driving behaviours. The authors reported that both positive and negative alcohol-related outcome expectancies predicted alcohol use and drink-driving within the adolescent sample.

<sup>22</sup> However, in their study examining the longer-term effect of alcohol warning labels MacKinnon and colleagues <sup>19</sup> reported the introduction of alcohol warning labels had no impact on outcome expectancies in their adolescent sample.

#### *Alcohol warning labels and avoidance responses*

In one reviewed study, conducted in the US, alcohol avoidance tendencies associated with a range of alcohol warning messages was investigated. <sup>23</sup> The authors examined avoidance responses (that is, the tendency to choose an alcoholic beverage not containing a warning label, rather than an alcoholic beverage that does contain a warning label) to one message that was currently present on the government mandated alcohol warning labels, and three alternative warnings, each with differing emotional content but equivalent layout and presentation to the government mandated warnings. The authors reported that avoidance responses were evident for the three alternate warnings (i.e. warnings containing the words ‘poison’, ‘cancer’ and ‘health problems’), but not for the government mandated warning. <sup>23</sup> Further, warnings which elicited the strongest avoidance responses appeared to be those that evoked emotional reactions on their own. <sup>23</sup>

#### *Attitudes and knowledge about alcohol-related risks*

A number of reviewed studies examined adolescent knowledge of the risks that are stated in alcohol warning labels and attitudes towards these labels. One study conducted in the US examined student beliefs about a specific warning label message regarding the risks of alcohol consumption to pregnant women. <sup>24</sup> The results of this study showed that most respondents believed, as stated in the message, that drinking alcohol whilst pregnant was

potentially harmful to the foetus, that avoiding all alcohol during pregnancy was beneficial and that foetal alcohol syndrome could be avoided.<sup>24</sup> Similarly, in a later study of adolescents in Israel it was reported that students generally had high knowledge of alcohol-related risks associated with pregnancy, drink-driving, alcohol-related health problems and the risk of consuming alcohol and drugs together.<sup>25</sup> However, adolescents demonstrated lower levels of knowledge for hazards such as operating machinery when having consumed alcohol, and other health risks such as cancer, liver disease and high blood pressure that are associated with harmful alcohol consumption.<sup>25</sup>

In relation to attitudes towards the warning labels, the reviewed research suggests that adolescents generally support warning labels being present on alcoholic beverage containers<sup>25</sup> and are more supportive of warning labels as a source of information, relative to older individuals.<sup>26</sup> Further, it has been reported that relative to young adults, adolescents have better attitudes toward alcohol warning label messages and perceive higher believability of these messages.<sup>27</sup> Additionally, adolescents within the secondary school environment have been reported to show less favourable attitudes toward alcohol and perceive more overall risks associated with alcohol consumption and drink-driving, as compared to young adults within a university setting.<sup>27</sup>

### Discussion and Implications

The current study aimed to investigate the impact of alcohol warning labels among adolescents in terms of outcomes such as attitudes toward warning labels, knowledge of alcohol-related risks, beliefs about alcohol-related risks, and change in alcohol-related behaviours such as drink-driving. Searches of the literature revealed that there is a paucity of empirical studies examining the impact of alcohol warning labels among this age group. The vast majority of the studies identified in this review utilised a cross-sectional design, were

conducted by a single research group, and examined samples drawn from a single geographical region within the US. Further, the reviewed studies generally only examined late adolescent samples. The studies identified were somewhat heterogeneous in their focus and the outcomes investigated. These constraints limit the generalisability of the findings reported in this review.

There is a paucity of published studies which have examined the perceptions of adolescents with respect to alcohol warning labels. Based on the available literature, it appears that adolescents support the presence of alcohol warning labels on beverage containers.<sup>25,26</sup> In fact, adolescents may be a particularly good audience for such warning labels as they appear to be more supportive of, and perceive the warning messages as more believable, in comparison to adult populations.<sup>26,27</sup> The studies reviewed show that adolescents generally have good knowledge about alcohol-related risks such as the risk to pregnant women who consume alcohol.<sup>24,25</sup> Such findings are consistent with those reported in the adult literature, both internationally<sup>5,12</sup> and in Australia.<sup>10,28</sup> Of note, one study examined in the current review suggested that adolescents were much less aware of alcohol associated risks such as high blood pressure, liver disease and cancer.<sup>25</sup> Similarly, the adult literature is in support of this finding, with a number of studies showing that adults have reduced awareness of the alcohol-related cancer risks as compared to awareness about the risks to pregnant women who consume alcohol (e.g.<sup>28,29</sup>). Therefore, alcohol warning labels that address this knowledge gap may be associated with a greater impact than other warnings which are more widely acknowledged, such as the risks during pregnancy.

Of the studies identified through this review, the most commonly examined outcomes were awareness of the warning labelling law, exposure to the labels, recognition of the health warnings the labels conveyed, belief about the risk stated on the label, and behaviours such as level of alcohol consumption and drink-driving. These studies suggested that, among

adolescents, the introduction of alcohol warning labels increased awareness of the warning label law<sup>17-19</sup> and exposure to the warning label,<sup>17-20</sup> and increased recognition of the health risks that appear on the labels,<sup>17-20</sup> but did little to change individuals' beliefs regarding the risks of alcohol use<sup>17, 18</sup> or alcohol-related behaviours such as drink-driving and alcohol consumption.<sup>19, 20</sup> These findings are consistent with the adult literature which has also reported increased awareness of the alcohol warning labels and their health messages following the introduction of these labels in the US.<sup>5, 12</sup> Among adults, the presence of alcohol warning labels has also been shown to promote discussion regarding the health risks associated with alcohol use, particularly those dangers of consuming alcohol during pregnancy. However, consistent with the afore-mentioned adolescent studies, little impact on alcohol-related behaviours has been reported among adults.<sup>5, 12</sup> It should be noted that one study identified in this review reported that the impact of alcohol warning labels on adolescent awareness, exposure and recognition levelled off over time, suggesting that the initial novelty of the warning label had some positive effects to begin with; however, these were not sustained over time.<sup>19</sup>

There are a number of limitations to the conclusions that can be drawn from this review of the literature. Most obviously, the vast majority of the studies identified here were conducted by a single research group, with samples drawn from a single geographical region in the US over a relatively restricted time period. Similarly, the majority of the literature examining the impact of alcohol warning labels amongst adult populations has also originated from the US. It remains to be seen whether the introduction of alcohol warning labels in other countries has similar impacts to those reported in the current literature. Cultural differences, in terms of attitudes towards alcohol and alcohol-related behaviours, may mean that alcohol warning labels could have differential effects in diverse cultures. Future research in multiple cultural contexts is required to more comprehensively evaluate the impact of alcohol warning

labels and their associated health warnings on beliefs and attitudes, as well as alcohol consumption and associated behaviours (e.g. drink driving). Likewise, the reviewed studies utilised primarily older adolescent samples; this is most likely due to the studies being conducted in the US, where the legal drinking age is 21 years. The impact of alcohol warning labels among younger adolescents remains to be investigated. Finally, the vast majority of the studies among adolescent samples have been cross-sectional in design. Longitudinal studies are required to examine more reliably the long-term consequences and impact of alcohol warning label introduction.

With many health researchers and policy makers currently urging the Australian government to mandate warning labels on alcohol beverages, it is timely to consider the possible impact of such measures, particularly among those most vulnerable to alcohol-related harm, such as adolescents. The fundamental aim of alcohol warning labels is to increase consumer awareness about the harmful effects of alcohol consumption, thereby modifying harmful drinking behaviours and preventing or reducing associated adverse outcomes.<sup>6</sup> Based on the available literature, it appears that among adolescents (and adults; see<sup>12</sup> for a review), the introduction of such warning labels would be expected to partially meet this aim by increasing awareness about the harmful effects of alcohol, at least initially. However, both the adolescent literature reviewed here, and the existing adult literature,<sup>5, 12</sup> suggest that the introduction of such warning labels would have little effect on drinking behaviours and associated adverse outcomes. These conclusions should be considered in light of the identified limitations of this review.<sup>23</sup> Among the alcohol warning label literature, suggestions to improve the impact of alcohol warning labels have been put forth, including the use of salient labels with rotating messages, and the use of labels that are tailored to be relevant to the characteristics and age of the consumer (e.g.<sup>10</sup>). However, matching alcohol warning labels that target adolescents to alcoholic beverages that are most likely to be

consumed by adolescents may be somewhat difficult given that adolescents are less likely to self-purchase alcohol; instead they may be provided with it by others who can legally purchase it. Of course, alcohol warning labels should be considered as only one aspect of a large range of other strategies which have been shown to be effective at modifying attitudes, knowledge and behaviour.<sup>12</sup>

## References

1. National Health and Medical Research Council. Australian guidelines to reduce health risks from drinking alcohol. Canberra: Commonwealth of Australia; 2009.
2. White V, Smith G. Australian secondary school students' use of tobacco, alcohol, and over-the-counter and illicit substances in 2008. Melbourne: Centre for Behavioural Research in Cancer, Cancer Council Research Institute, The Cancer Council Victoria; 2009.
3. Liquor Control Reform Act. 1998.
4. Food Standards Australia and New Zealand (FSANZ). Australia and New Zealand Food Standards Code (Standard 2.7.1- Labelling of alcoholic beverages and food containing alcohol, Standard 1.2.9 Legibility requirements).
5. Wilkinson C, Room R. Warnings on alcohol containers and advertisements: International experience and evidence on effects. *Drug and Alcohol Review*. 2009; 28: 426-35.
6. Stockley CS. The effectiveness of strategies such as health warning labels to reduce alcohol-related harms- An Australian perspective. *International Journal of Drug Policy*. 2001; 12: 153-66.
7. Hammond D. Health warning messages on tobacco products: A review. *Tobacco Control*. 2011; Doi: 10.1136/tc.2010.037630.
8. International Centre for Alcohol Policies. Health Warning Labels. 2010; Available from: <http://www.icap.org/Table/HealthWarningLabels/tabid/249/Default.aspx>.
9. Strahan EJ, White K, Fong GT, Fabringar LR, Zanna MP, Cameron R. Enhancing the effectiveness of tobacco package warning labels: A social psychological perspective. *Tobacco Control*. 2002; 11:183-90.



10. Jones SC, Gregory P. Health warning labels on alcohol products- The views of Australian university students. *Contemporary Drug Problems*. 2010; 37:109-37.
11. Jones SC, Gregory P. The impact of more visible standard drink labelling on youth alcohol consumption: Helping young people drink (ir)responsibly? *Drug and Alcohol Review*. 2009; 28(3):230-4.
12. Stockwell T. A review of research into the impacts of alcohol warning labels on attitudes and behaviour. British Columbia, Canada: Centre for Addictions Research of BC; 2006.
13. Australian Institute of Health and Welfare. National Drug Strategy Household Survey report. Canberra: AIHW; 2010.
14. Hawkins JD, Catalano RF, Miller JY. Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: Implications for substance abuse prevention. *Psychological Bulletin*. 1992;112:64-105.
15. Newcomb MD, Maddahian E, Bentler P. Risk factors for drug use among adolescents: Concurrent and longitudinal analyses. *American Journal of Public Health*. 1986;76:525-31.
16. Centre for Reviews and Dissemination. Systematic reviews: CRD's guidance for undertaking reviews in health care. York: Centre for Reviews and Dissemination, University of York; 2008.
17. MacKinnon DP, Pentz AM, Stacy AW. The alcohol warning label and adolescents: The first year. *American Journal of Public Health*. 1993;83(4):585-7.
18. Nohre L, MacKinnon DP, Stacy AW, Pentz AM. The association between adolescents' receiver characteristics and exposure to alcohol warning labels. *Psychology and Marketing*. 1999;16(3):245-59.

19. MacKinnon DP, Nohre L, Pentz AM, Stacy AW. The alcohol warning and adolescents: 5-year effects. *American Journal of Public Health*. 2000;90(10):1589-94.
20. MacKinnon DP, Nohre L, Cheong J, Stacy AW, Pentz AM. Longitudinal relationship between the alcohol warning label and alcohol consumption. *Journal of Studies on Alcohol*. 2001;62:221-7.
21. Bandura A. Self-efficacy: Toward a unifying theory of behavioural change. *Psychological Review*. 1977;84:191-215.
22. Stacy AW, MacKinnon DP, Pentz AM. Generality and specificity in health behaviour: Application to warning-label and social influence expectancies. *Journal of Applied Psychology*. 1993;78(4):611-27.
23. MacKinnon DP, Nemeroff C, Nohre L. Avoidance responses to alternative alcohol warning labels. *Journal of Applied Psychology*. 1994;24(8):733-53.
24. MacKinnon DP, Williams-Avery R, Pentz AM. Youth beliefs and knowledge about the risks of drinking while pregnant. *Public Health Reports*. 1995;110:754-63.
25. Weiss S. Israeli arab and jewish youth knowledge and opinion about alcohol warning labels: Pre-intervention data. *Alcohol & Alcoholism*. 1997;32(3):251-7.
26. Parackal SM, Parackal MK, Harraway JA. Warning labels on alcohol containers as a source of information on alcohol consumption in pregnancy among New Zealand women. *International Journal of Drug Policy*. 2010;21:302-5.
27. Garretson JA, Burton S. Alcohol beverage sales promotion: An initial investigation of the role of warning messages and brand characters among consumers over and under the legal drinking age. *Journal of Public Policy & Marketing*. 1998;17(1):35-47.
28. Roy Morgan Research. Alcohol awareness survey 2006. Melbourne: The Salvation Army; 2006.

29. Thomson LM, Vanderberg B, Fitzgerald JL. An exploratory study of drinkers views of health information and warning labels on alcohol containers. *Drug and Alcohol Review*. 2011; Doi:10.1111/j.1465-3362.2011.00343.x.

Table 1.

Summary of articles included in review which examine the impact of alcohol warning labels among adolescents

<b>Authors</b>	<b>Location</b>	<b>Sample</b>	<b>Method</b>	<b>Outcomes Examined</b>	<b>Findings</b>
MacKinnon, Pentz & Stacy (1993)	Indiana, U.S	1,211 12 <sup>th</sup> grade students in 1989 and 2,006 12 <sup>th</sup> grade students in 1990	Questionnaire- Cross sectional	1) Awareness of labelling law 2) Beliefs about messages 3) Exposure to labels 4) Recognition memory of labels	1) Increased awareness of warning 2) No change in beliefs about risk messages 3) Increased exposure to warning labels 4) Increased recognition of risks
Stacy, MacKinnon & Pentz (1993)	Indiana, U.S	813 12 <sup>th</sup> grade students in 1990/1991	Questionnaire- Cross sectional	1) Negative outcome expectancies associated with alcohol use 2) Positive outcome expectancies associated with alcohol use 3) alcohol use, drink-driving behaviour, drink-driving prevention	1) Negative expectancies predicted alcohol use and drink-driving 2) Positive outcome expectancies were predictive of alcohol use and drink-driving
MacKinnon, Nemeroff & Nohre (1994)	Indiana, U.S.	328 10 <sup>th</sup> grade students and 485 12 <sup>th</sup> grade students in 1991/1992	Questionnaire- Cross sectional	1) Alcohol avoidance tendencies associated with govt. mandated warning and 3 alternative warnings, each with differing emotional content	1) Avoidance responses found for the three alternate warnings, but not for the govt. mandated warning 2) Warnings that elicited the strongest responses appeared to be those that evoke emotional reactions

MacKinnon, Williams-Avery& Pentz (1995)	Indiana, Kansas City, Arizona and Los Angeles, U.S.	27,544 high school students and first year university students	Questionnaire- Cross sectional	1) Beliefs about a specific warning label message (i.e. whether drinking alcohol while pregnant can cause birth defects)	1) Most respondents believed that drinking while pregnant is potentially harmful to the foetus, that avoiding all alcohol during pregnancy is beneficial, and that foetal alcohol syndrome can be avoided 2) Younger people and males were less likely to believe that drinking alcohol while pregnant is harmful and that pregnant women should completely abstain from alcohol
Weiss (1997)	Israel	3,065 high school students	Questionnaire- Cross sectional	1) Knowledge (strength of belief) of alcohol-related hazards 2) Opinion on whether alcohol beverage containers should have warning labels	2) Low knowledge about alcohol-related hazards such as operating machinery when drinking alcohol, and health risks such as cancer, liver disease and high blood pressure; high knowledge about alcohol-related risks associated with pregnancy, driving, health problems and alcohol plus drugs together 2) Majority of respondents supported warning labels on alcohol containers,
Garretson & Burton (1998)	South East U.S.	133 high school students (under-age drinkers) and 134 university students (over-age drinkers)	Questionnaire- Cross sectional	1) Attitudes towards alcohol 2) Warning message believability 2) Attitude towards the message	1) Adolescents (under-age drinkers) had less favourable attitudes toward alcohol and perceived more overall risk associated with alcohol consumptions and more risk of driving after drinking 2) Under-age drinkers had higher believability for

					warning messages 3) under-age drinkers had better attitudes toward the warning messages
Nohre, MacKinnon, Stacy & Pentz (1999)	Indiana, U.S.	1,211 12 <sup>th</sup> grade students in 1989, 2,006 12 <sup>th</sup> grade students in 1990/1991 and 3,174 12 <sup>th</sup> grade students in 1991/1992	Questionnaire- Cross sectional	1) Awareness of warning label law 2) Exposure to warning labels 3) Memory for warning label messages 4) Beliefs about warning labels	After introduction of alcohol warning labels: 1) Increased awareness of the alcohol warning labels 2) Increased exposure to the warning 3) Increased memory for the risks on the warning labels 4) Beliefs about the risks stated in the warning were unaffected 5) Gender, ethnicity, familiarity with alcohol, socio-economic status and student grades also affected beliefs, awareness and memory of alcohol risk warnings
MacKinnon, Nohre, Pentz & Stacy (2000)	Indiana, U.S.	16,661 10 <sup>th</sup> grade students and 15,856 12 <sup>th</sup> grade students surveyed each school year from 1989/1990-1994/1995	Questionnaire- Cross sectional	Pre and post introduction of warning labels: 1) Awareness of labelling law 2) Beliefs about messages 3) Exposure to labels 4) Recognition memory of labels 5) Alcohol expectancies	1) Initial linear increase in awareness after introduction of warnings then levelled off 3-4 years post introduction 2) No change in beliefs about messages 3) Initial positive effects of exposure which levelled off 3-4 years post introduction of warning 4) Initial positive effect on recognition memory

				6) Alcohol use and drink-driving	5) No effect of warning label on expectancies 6) Little effect of warning label on drinking behaviour and drink-driving
MacKinnon, Nohre, Cheong, Stacy & Pentz (2001)	Indiana, U.S.	3,165 students surveyed in 1989/1990 and resurveyed in 1990/1991 and 1991/1992	Questionnaire-longitudinal	1) Exposure to alcohol warning labels	1) Earlier exposure to alcohol warning labels did not significantly reduce or increase alcohol consumption, suggesting no beneficial or harmful effect of the warning on behaviour. Earlier alcohol consumption resulted in more exposure to the warning label
Parackal, Parackal & Harraway (2010)	New Zealand	1,256 randomly sampled women aged 16-40	Interviewer administered questionnaire-Cross sectional	1) Preference ratings for warning labels as a source of information for risks of alcohol consumption in pregnancy	1) Adolescents (aged 16-19) were more likely than 35-40 year old women to be favourable towards a warning label as a source of information