Applying behavioural insights to change alcohol-related behaviour among young New Zealanders

September 2018

THE BEHAVIOURAL INSIGHTS TEAM

hpa health promotion agency

Prepared for the Health Promotion Agency by:

Behavioural Insights Team (Veronica (Nicky) Quinn, Veerle Snijders, Nathan Chappell, Alex Gyani, Rebecca Sareff, Karen Tindall and Hugo Harper).

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Health Promotion Agency, PO Box 2142, Wellington 6140, New Zealand

www.hpa.org.nz
enquiries@hpa.org.nz

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INSIGHTS TEAM

Applying Behavioural Insights to Change Alcohol-Related Behaviour among Young New Zealanders

Final report

September 2018

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Applying Behavioural Insights to Change Alcohol-Related Behaviour among Young New Zealanders

Contents

Executive summary

This project, commissioned by the Health Promotion Agency (HPA), aimed to determine which types of public health interventions change self-reported drinking levels in a young, and socio-economically disadvantaged, population of New Zealanders. The main outcomes of the project were:

- To identify which type of public health message is most effective at reducing the drinks consumed by this population.
- To better understand the way in which this population responds to behavioural tools and other alcohol risk information.

To achieve these aims The Behavioural Insights Team (BIT) first conducted a literature review of the current evidence about the efficacy of different behavioural interventions. Then, we used these findings to inform the design of a trial. This trial was a randomised controlled trial using a pre-post questionnaire with participants recruited with the help of a government agency, Facebook advertisements, and posters on university campuses. Participants, between 18 and 25 years old, were randomly allocated into four groups. All groups were presented with a set of behavioural tools to motivate behaviour change. Three of the groups received additional messaging that presented the consequences of long term alcohol consumption. These three sets of consequence messages were themed around either health, physical appearance, or social norms.

Due to a lower than projected sample size, the trial was underpowered to observe differences between the different consequence message groups. From the available data the findings provide more support for using health-based messages that stress the present (rather than long term future) health impacts of drinking, and social norm messages that try to correct misconceptions about the normality of binge drinking in New Zealand. However, this is based on non-significant mean differences, and qualitative findings, and should be assessed in a larger sample before being rolled out.

There was evidence that the behavioural tools prompted a reduction in drinks consumed per week, and binge drinks consumed over the month. However, this finding was limited by relying on before- and after- comparisons rather than comparisons between the randomly allocated groups, and may be due to other unobserved factors. This suggests that using a combination of personalised feedback, rules of thumb, and behaviour plans, could reduce alcohol consumption in young New Zealanders aged 18-25.

Both intentions to change behaviour and knowledge about safe levels of drinking were poor predictors of behaviour change. This finding contributes to the evidence that the intention-action gap in reducing alcohol consumption is large, and suggests that public health evaluations should focus on behaviour change, not shifts in attitudes or intentions to change.

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Consolidated recommendations for HPA

Which consequence messages should HPA use?

Recommendation: Use messages that combine both health impact and social norm messages

Health or social messages were non-significantly better than controls for some outcomes. Within health messages, we suggest using messages that bring forward harms to the present, to reduce temporal discounting i.e. stressing the short-term health impacts such as a risk of injury. For social norms messages, we would suggest finding ways to make the reference groups used more relevant than just 'young people from New Zealand'. Including a reference to specific localities or ethnicities may be more effective. For example, based on the data we collected here, we could advertise that 'most young Māori people don't drink more than 4 drinks per week'.

Recommendation: Avoid appearance impact messages

We would suggest against using messages that highlight alcohol's impact on physical appearance. We had evidence that, in line with our previous trial, appearance-messaging increased engagement but not behaviour change. In our view, the mixed evidence for the efficacy of appearance messages, combined with the possibility of stigmatising individuals, means that we would not advocate for using these messages routinely.

Prioritise changing behaviour above changing knowledge or attitudes

Recommendation: De-emphasise knowledge and intentions

The trial findings supported the conclusions from the literature review: while public health messaging often aims to improve knowledge and increase intentions to change behaviour, this is unlikely to be the most effective route to behaviour change. Any evaluations should also seek to go beyond intentions and knowledge retention, as they were not good predictors of a change in drinking behaviour.

Recommendation: Implement behavioural tools to support behaviour change

The combination of personalised feedback, rules of thumb, and making a plan did seem to lead to a reduction in both overall drinking consumption, and binge drinking. This can be delivered in a relatively low-cost online format, although some additional help in making *good* plans would be useful for some participants.

Project background

This project tests the efficacy of messages aiming to decrease alcohol consumption among young people by increasing their health literacy level. Risky drinking is a big problem in New Zealand, especially for Māori and people aged 18-25. Between 600 and 800 people in New Zealand die each year from alcohol-related causes,[1] and around 1/3 of offences recorded by Police involve alcohol in some capacity.[2]

The project aimed to determine which types of public health interventions change self-reported drinking levels in a young and socio-economically disadvantaged population of New Zealanders, aged 18-25 years old. The main outcomes of the project were:

- To identify which type of online public health message is most effective at reducing the drinks consumed by this population.
- To better understand the way in which this population respond to behavioural tools and other alcohol risk information.

The project "using information to reach and help change the behaviour of risky drinkers" was commissioned by the Health Promotion Agency (HPA). HPA, a Crown entity established on 1 July 2012, has an overall function to lead and support health promotion initiatives to: promote health and wellbeing and encourage healthy lifestyles; prevent disease, illness and injury; enable environments which support health, wellbeing and healthy lifestyles; and reduce personal, social and economic harm.

Recognising that public health research is often undertaken on well-educated university students of European ethnicity, BIT sought upon commencement of the project a second partnership with another government agency to help recruit a diverse set of individuals.

This report is presented in two parts. Firstly, we undertook a review of the behavioural insights literature on what works in reducing alcohol consumption, which we have provided in part one. Secondly, we conducted a randomised controlled trial of consequence messages, detailed in part two.

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[1] Connor, J., Kydd, R., Shield, K., & Rehm, J. (2013). Alcohol-attributable burden of disease and injury in New Zealand: 2004 and 2007. Research report commissioned by the Health Promotion Agency. Wellington: Health Promotion Agency. http://www.alcohol.org.nz/sites/default/files/research-publications/pdfs/Attributable%20fractions%20Final.pdf

[2] New Zealand Police. (2010). Framework for preventing and reducing alcohol-related offending and victimisation 2010-2014. Wellington: New Zealand Police. http://www.police.govt.nz/about-us/publication/online-version/framework-preventing-and-reducing-alcohol-related-offending-and-victimisation

Part one: the literature

Background

Harmful drinking and the New Zealand context

According to the Ministry of Health, 20% of all New Zealanders above the age of 15 have a potentially hazardous drinking pattern.[3] Overall, 14% of the population is expected to meet the criteria for a substance use disorder at some time in their lives.[4] Between 600 and 800 people die each year in New Zealand from alcohol-related causes.[5] Harmful alcohol use also uses up police resources,[6] and increases recidivism of non-violent and violent offenders.[7]

Drinking harms certain populations disproportionately

Already-disadvantaged groups such as Māori and Pasifika people are at an increased risk of harmful alcohol related behaviour. This means that in New Zealand, problematic drinking worsens existing inequalities. One in three Māori people above the age of 15 has a potentially hazardous drinking pattern, which is significantly higher than the national average of 20%.[8] Among drinkers, Pacific people have a significantly higher hazardous drinking rate than the national average (39% versus 25%). A 2015 study also found that the age-standardised death rate attributable to alcohol for Māori people was 2.5 times higher than the rate for the non-Māori population.[9]

Internationally, there is a strong relationship between socioeconomic status and problematic drinking. For example, although moderate alcohol use tends to increase with more education, heavy alcohol use and dangerous alcohol-related behaviours like binge drinking are more common among people with less education.[10] A review of four longitudinal studies

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[3] Ministry of Health. (2017). Annual Update of Key Results 2016/17: New Zealand Health Survey. Wellington: Ministry of Health

[4] Wells, J. E., Baxter, J., & Schaaf, D. (Eds.). (2006). Substance use disorders in Te Rau Hinengaro: The New Zealand Mental Health Survey. Wellington: Alcohol Advisory Council of New Zealand

[5] Connor, J., Kydd, R., Shield, K., & Rehm, J. (2013). Alcohol-attributable burden of disease and injury in New Zealand: 2004 and 2007. Research report commissioned by the Health Promotion Agency. Wellington: Health Promotion Agency. http://www.alcohol.org.nz/sites/default/files/research-publications/pdfs/Attributable%20fractions%20Final.pdf

[6] New Zealand Police. (2010). Framework for preventing and reducing alcohol-related offending and victimisation 2010-2014. Wellington: New Zealand Police. http://www.police.govt.nz/about-us/publication/online-version/framework-preventing-and-reducing-alcohol-related-offending-and

[7] Hamberger, L.K., & Hastings, J.E. (1990). Recidivism following spouse abuse abatement counseling: Treatment program implications. *Violence and Victims, 5*(3), 157-170; Gendreau, P., Little, T., & Goggin, C. (1996). A meta-analysis of the predictors of adult offender recidivism: What works! *Criminology, 34*(4), 575-608.

[8] Ministry of Health. (2017). Annual Update of Key Results 2016/17: New Zealand Health Survey. Wellington: Ministry of Health

[9] Connor, J., Kydd, R., Shield, K. & Rehm, J. (2015). The burden of disease and injury attributable to alcohol in New Zealanders under 80 years of age: Marked disparities by ethnicity and sex. *New Zealand Medical Journal, 128*(1409), 15-28.

[10] https://www.ncbi.nlm.nih.gov/books/NBK43744/ and Jones, L., Sumnall, H. (2016). Understanding the relationship between poverty and alcohol abuse. *Centre for Public Health, Faculty of Education, Health and Community.*

in the UK found that the alcohol-related death rate for men working in semi-skilled and unskilled occupations was 3.5 times greater than for men in the highest occupational positions; for women the rate was 5.7 times greater.[11] Cumulative disadvantage over the course of one's life was the strongest predictor of midlife drinking patterns found in that study. In New Zealand, adults in the most deprived areas are around 45% more likely to have a hazardous drinking pattern than those in the least deprived areas.[12]

This means that targeting socioeconomically disadvantaged groups, and targeting them while they are young, is key to reducing lifetime harm caused by alcohol consumption.

The behavioural insights approach

Alcohol consumption is a complex behaviour with social, environmental and individual forces acting to prevent behaviour change. The behavioural insights literature offers us many insights about what might work in this context to reduce harmful drinking. Behavioural insights is the application of behavioural science – the study of what makes people take action and why – to public policy changes. The behavioural sciences (e.g. cognitive and social psychology, behavioural economics, sociology and other disciplines focused on human behaviour) together form a more realistic model of human behaviour than traditional rational-choice models of behaviour.

The behavioural insights (BI) approach differs from traditional public health approaches in three main ways:

1. **Providing alcohol consumption education**: First, the BI approach uses behavioural science to guide the content of any messages that aim to communicate the harms of alcohol. We have labelled these 'consequence messages' throughout this report. This includes presenting a clear 'call to action' rather than just raising awareness of the harms.

2. **Supplementing education with behavioural tools**: Second, the BI approach doesn't stop at providing education and raising awareness of the problem. We go one step further and provide other behavioural tools to help individuals overcome any gap between their intentions and action, after good intentions are formed.

3. **Robustly evaluating interventions**: We usually think that an intervention will work, before we roll it out. However, without rigorous evaluations we can't determine whether this is true. A last value-add of the behavioural insights approach is to introduce robust evaluations in the form of randomised controlled trials.

[11] Siegler et al 2011 in Jones, L., Sumnall, H. (2016). Understanding the relationship between poverty and alcohol abuse. *Centre for Public Health, Faculty of Education, Health and Community.*
[12] Ministry of Health. (2017). Annual Update of Key Results 2016/17: New Zealand Health Survey. Wellington: Ministry of Health

In the sections below, we have outlined what the behavioural sciences literature tells us about each of these three areas, and how we have used this in designing the trial outlined in Part Two of the report.

1. Providing alcohol consumption education

A primary aim of most public health organisations globally is to educate their population about the harms of drug and alcohol behaviour. There is a growing literature in the behavioural sciences about what *doesn't* work, and what *does,* in the design of these consequence messages.

PSA messages can backfire

Some Public Service Announcements (PSAs) can backfire and actually *encourage* drug or alcohol use. In a meta-analysis of 11 studies across 22,832 participants, only one randomised controlled trial (RCT) showed a statistically significant benefit of PSAs on the intention to use illicit drugs, two RCTs showed harmful effects, and observational studies revealed both harmful and beneficial effects.[13] Another study found that anti-drinking posters displayed as part of a UK national health campaign *increased* alcohol consumption among non-problem drinking female viewers.[14]

When do messages backfire?

- The eye-tracking data from the above-mentioned poster campaign revealed that viewers were ignoring the poster's health information and looking at the young people drinking in them. It is likely that these alcohol related messages primed drinking, or **normalised** the occurrence of heavy drinking behaviours.

- There is also an emerging literature suggesting that PSAs can backfire if they invoke **fear** or other negative emotions but fail to build self-efficacy, or a person's belief that they can change their actions.[15] Invoking fear can be effective when the message also builds self-efficacy.

- PSAs can also backfire if they **overwhelm** a person's mental resources. One study tested participants' physiological responses to anti-smoking PSAs, and those receiving both a health threat and a disgusting image had worse memory and

[13] Werb, D., Mills, E.J., DeBeck, K., Kerr, T., Montaner, J.S.G., & Wood, E. (2011). The effectiveness of anti-illicit-drug public-service announcements: A systematic review and analysis. *Journal of Epidemiology & Community Health, 65*(10).
[14] Moss, A.C., Albery, I.P., et al. (2015). The effects of responsible drinking messages on attentional allocation and drinking behaviour. *Addictive Behaviours, 44*, 94-101.
[15] Witte, K., & Allen, M. (2000). A Meta-Analysis of Fear Appeals: Implications for Effective Public Health Campaigns. *Health Education & Behavior, 27*(5), 591–615.

emotional responses than those receiving only one element. Receiving both appeared to be overwhelming and limited cognitive resources to respond.[16]

- PSAs can backfire if they are **incompatible** with a person's self-identity.[17] For example, one study found that 10th-12th graders were 12% more likely to smoke for each advert they had seen in the last 30 days that aimed to get parents to stop their kids from smoking; this type of message can conflict with many teenagers' independent and authority-defiant self-image.[18]

- Rigorous trials have shown how important **clear calls to action** are for encouraging behaviour change. In one trial in New South Wales, a red '*Pay Now'* stamp was placed prominently on letters sent to those who owing fines, along with a number of other changes to make the letter more salient. This increased the payment rate by 3.1 percentage points.[19]

We therefore need to make sure we design PSAs that don't normalise drinking, don't invoke fear without also building self-confidence, are compatible with the identity of targets, and make clear calls to action. We have used these principles in designing the consequence messages and other materials as detailed in Part Two.

There are also a number of additional insights about how to design consequence messages within each of the three areas we set out to investigate as part of this project: health, appearance-based, and social norms.

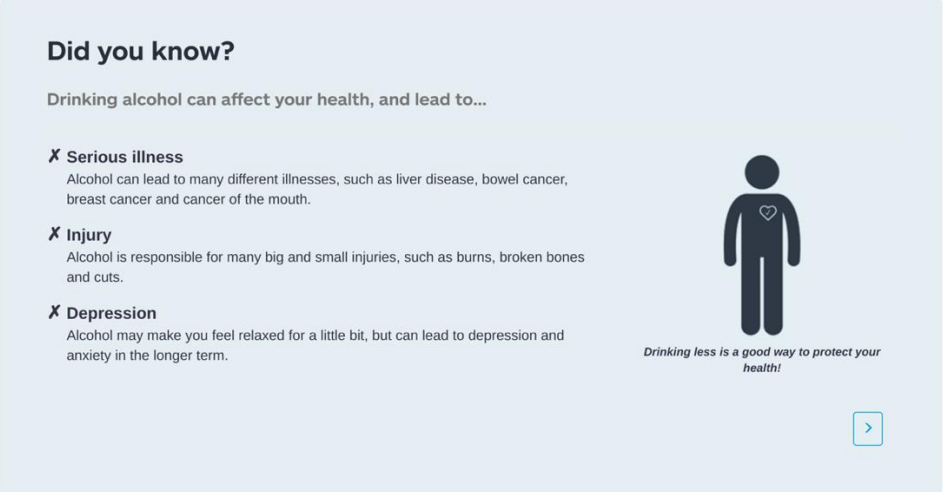
Health consequence messages

Highlighting a behaviour's impact on health can be effective in changing behaviour, though there are two main barriers for this type of intervention. First, people discount the future: we place much more weight on current costs and benefits than on future costs and benefits.[20] This is an issue because some of the serious health risks associated with alcohol consumption are far in the future. For example, it can take 10 years of heavy drinking to develop cirrhosis of the liver.[21] Second, people care more about eliminating a risk rather than just reducing it - the "certainty effect".[22] This is an issue because the risks of many conditions

[16] Leshner, G., Bolls, P., & Wise, K. (2011). Motivated processing of fear appeal and disgust images in televised anti-tobacco ads. *Journal of Media Psychology, 23*(2)*,* 77-89.
[17] Cialdini, R. B., Demaine, L. J., Sagarin, B. J., Barrett, D. W., Rhoads, K., & Winter, P. L. (2006). Managing social norms for persuasive impact. *Social influence, 1*(1), 3-15.
[18] Wakefield, M. et al (2006). Effect of televised, tobacco company-funded smoking prevention advertising on youth smoking-related beliefs, intentions, and behavior. *American Journal of Public Health, 96*(1), 2154-2160.
[19] The Behavioural Insights Team. (2014). EAST: Four Simple Ways to Apply Behavioural Insights. Retrieved July 23, 2018, from https://www.behaviouralinsights.co.uk/publications/east-four-simple-ways-to-apply-behavioural-insights/
[20] Frederick, S., Loewenstein, G., & O'Donoghue, T. (2002). Time Discounting and Time Preference: A Critical Review. *Journal of Economic Literature, 40*(2), 351–401.
[21] Sheron, N., & Gilmore, I. (2016). Effect of policy, economics, and the changing alcohol marketplace on alcohol related deaths in England and Wales. *BMJ: British Medical Journal (Online), 353.*
[22] Tversky, A., & Kahneman, D. (1981). The Framing of Decisions and the Psychology of Choice. *Science, 211* (4481), 453-458.

can be reduced but not eliminated by drinking less, such as hypertension and colon, oral or breast cancer. We may be able to overcome temporal discounting by highlighting short-term health effects, near-certain health effects, or stressing the causality for less-certain health effects.

How did we use this in our intervention? In the trial, we included health messages that stressed short term health consequences (risk of injury, depression and anxiety) combined with a positive call-to-action that drinking less was health protective.



Physical appearance based messages

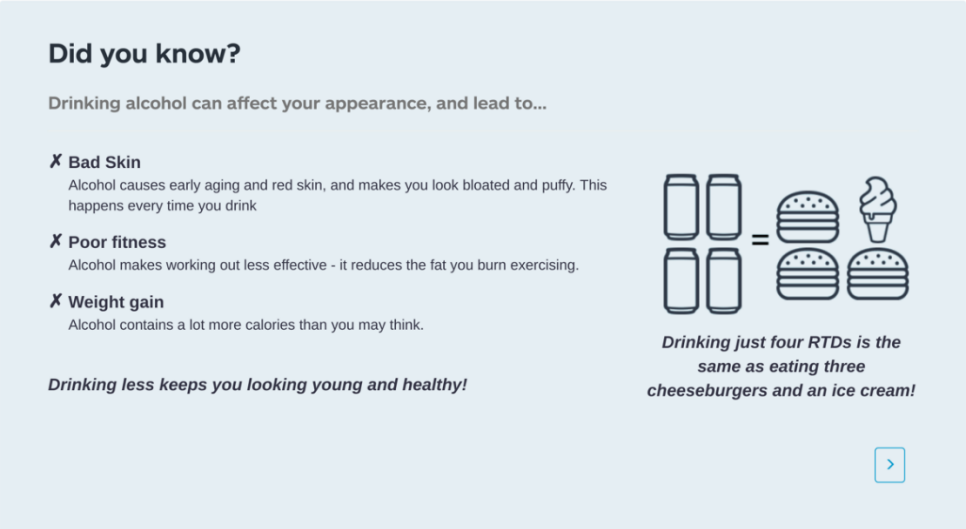
Another option for reducing harmful drinking is to highlight the effect on physical appearance. This is another way of reducing temporal discounting, as young people care about their present physical appearance. This has been used to encourage people to reduce their exposure to the sun,[23] lose weight,[24] and quit smoking.[25]

There is limited work exploring interventions which make salient alcohol's effect on appearance. The exception is an RCT BIT ran in 2014 with Public Health England that aimed to get people to take an online self-assessment of alcohol use. They found that emphasising the effects of alcohol on one's appearance increased completion rates of the assessment by 8%. However, health messaging led to more clicks through to a page with more information about reducing alcohol consumption. This suggests that appearance messaging may be best for piquing people's initial interest in the subject, while health messaging is most useful

[23] Hevey, D., Pertl, M., Thomas, K., Maher, L., Craig, A., & Chuinneagain, S. N. (2010). Body consciousness moderates the effect of message framing on intentions to use sunscreen. *Journal of health psychology, 15(4), 553-559*
[24] Frederick, D. A., Saguy, A. C., Sandhu, G., & Mann, T. (2016). Effects of competing news media frames of weight on antifat stigma, beliefs about weight and support for obesity-related public policies. *International journal of obesity, 40*(3), 543-549.
[25] Flett, K., Clark-Carter, D., Grogan, S., & Davey, R. (2013). How effective are physical appearance interventions in changing smoking perceptions, attitudes and behaviours? A systematic review. *Tobacco control, 22*(2), 74-79

for people already concerned about changing their behaviour. Importantly, the appearance effect was driven almost entirely by women.[26]

How did we use this in our intervention? In the trial, we included information that risky drinking could lead to bad skin, poor fitness and weight gain, as well as the comparison that drinking four RTDs is the same as eating three cheeseburgers and an ice cream!



Social norms consequence messages

Highlighting social norms can be a powerful method of changing behaviour, because we use norms as both guidance as to what we should be doing and markers to judge how we're doing relative to others. Social norms can be communicated in terms of being desirable or good (injunctive norms)[27] or perceived to be common and what others are doing (descriptive norms).[28] Far more nuanced than simply "peer pressure", social norms messages provide individuals with guidance on how they should act in particular situations.

Norms are particularly relevant for drinking, because the availability heuristic[29]— our tendency to judge the frequency of an event by how easily it comes to mind — leads people to believe that heavy drinking is more widespread than it actually is. Instances of drunkenness and alcohol use in general are particularly salient, being loud and attention-

[26] Sanders, M. (in press). Effect of appearance versus health framed messages on engagement with an online brief screening and alcohol reduction intervention: A randomised trial on the Drinkaware website.
[27] Reno, R., Cialdini, R., & Kallgren, C.A. (1993). The transsituational influence of social norms. *Journal of Personality and Social Psychology*, 64, 104–112.
[28] Cialdini, R.B., Kallgren, C.A., & Reno, R.R. (1991). A focus theory of normative conduct. *Advances in Experimental Social Psychology*, 24, 201–234.
[29] Tversky, A., & Kahneman, D. (1973). Availability: A heuristic for judging frequency and probability. *Cognitive psychology, 5*(2), 207–232.

grabbing. Numerous studies have shown that college students overestimate the number of their peers who drink, which in turn can cause them to drink more.[30,31] Perceptions about peer alcohol use have consistently predicted individual alcohol use.[32]
Interventions which communicate social norms can reduce alcohol use, particularly when paired with personalised feedback on where one is relative to the norm. A meta-analysis of eight studies spanning 2,050 participants found that students who received personalised normative feedback (that is, feedback on how their drinking compared with others of their age or social group) reported an average of 3 fewer drinks per week from baseline to follow-up.[33] The feedback usually took the form of bar graphs displaying students' self-reported drinking behaviour, along with their perceptions of drinking norms for a specified reference group, and the actual statistics for that group.

How did we use this in our intervention? In the trial, we used the normative feedback that "8 out of 10 people your age **don't** binge drink regularly", and the injunctive norm that "Most people your age do not think drunkenness is acceptable in any situation."

[30] Borsari, B., & Carey, K.B. (2003). Descriptive and injunctive norms in college drinking: A meta-analytic integration. *Journal of Studies on Alcohol and Drugs, 64*(3), 331-341.
[31] Perkins, H.W. (2002). Social norms and the prevention of alcohol misuse in collegiate contexts. *Journal of Studies on Alcohol and Drugs, s14,* 164-172.
[32] Neighbors, C., Lee, C.M., Lewis, M.A., Fossos, N., & Larimer, M.E. (2007). Are social norms the best predictor of outcomes among heavy-drinking college students? *Journal of Studies on Alcohol and Drugs, 68*(4), 556–565.
[33] Dotson, K.B., Dunn, M.E., & Bowers, C.A. (2015). Stand-alone personalized normative feedback for college student drinkers: A meta-analytic review, 2004 to 2014. *PLOS One.*

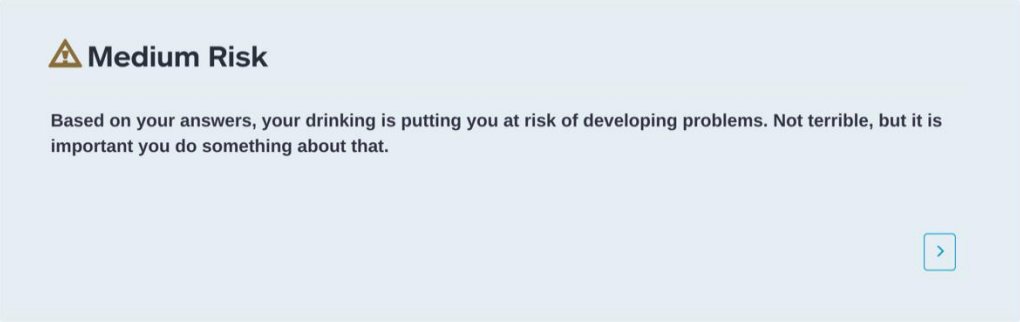
2. Supplementing education with behavioural tools

The following sub-sections outline different behavioural insights strategies that informed the intervention trialled in this project.

Personalised feedback

Personalised feedback -"your drinking puts you at a high risk of suffering health impacts"- on one's drinking behaviour and risk levels can be an effective way of changing drinking behaviour. This is commonly used in primary health care through screening and brief interventions (SBI), where a medical professional will screen for harmful drinking behaviour, give feedback to the patient, and give advice on how to change behaviour.[34] The evidence suggests these interventions can reduce harmful drinking behaviour,[35] though in-person SBIs face the issue that patients may falsely report their drinking habits due to stigma. This is a promising area for online SBIs, which can reach people who rarely visit health care specialists, and where anonymity may encourage more accurate self-reporting of drinking.[36] This principle was incorporated into our current trial design, where we delivered all groups personalised feedback based on their online response.

How did we use this in our intervention? In the trial, we provided all participants with personalised feedback about their level of health risks, based on their current drinking levels. This was combined with a call-to-action for the medium and high risk groups (reduce your drinking now).

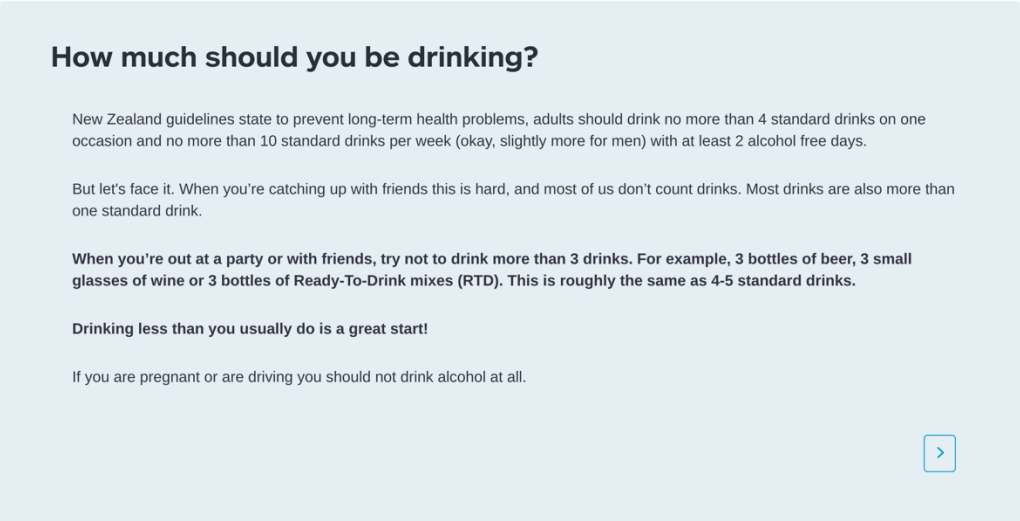


[34] Kaner, E., Bland, M., Cassidy, P., Coulton, S., Dale, V., Deluca, P., & Myles, J. (2013). Effectiveness of screening and brief alcohol intervention in primary care (SIPS trial): pragmatic cluster randomised controlled trial. *Bmj, 346*, e8501.
[35] O'donnell, A., Anderson, P., Newbury-Birch, D., Schulte, B., Schmidt, C., Reimer, J., & Kaner, E. (2014). The impact of brief alcohol interventions in primary healthcare: a systematic review of reviews. *Alcohol and alcoholism, 49*(1), 66-78
[36] Khadjesari, Z., Stevenson, F., Godfrey, C., & Murray, E. (2015). Negotiating the 'grey area between normal social drinking and being a smelly tramp': a qualitative study of people searching for help online to reduce their drinking. *Health expectations : an international journal of public participation in health care and health policy, 18*(6), 2011-20

Rules of thumb

Information about safe drinking levels is often difficult to understand, relying on individuals to understand standard drink ratios, sum drinks across the week, and remember to add non-drinking days. We know from other contexts that providing quick and clear 'rules of thumb' can be more effective at changing behaviour.[37] Whilst they may not capture 100% of the complex rule, the additional behaviour change is worth the loss in specificity. Using rules of thumb in goal setting is also effective, as individuals can determine quickly whether they have broken their rule. This is sometimes referred to as 'bright lines'.[38] The individual can see a bright line that they have drawn, and know exactly when they are stepping over it, rather than require a set of calculations at the end of the night or week.

How did we use this in our intervention? In the trial, we gave all participants a rule of thumb to simplify drinking guidelines: when you're out at a party or with friends, try not to drink more than 3 drinks. For example, 3 bottles of beer, 3 small glasses of wine or 3 bottles of Ready-To-Drink mixes (RTD).



Implementation intentions and planning prompts

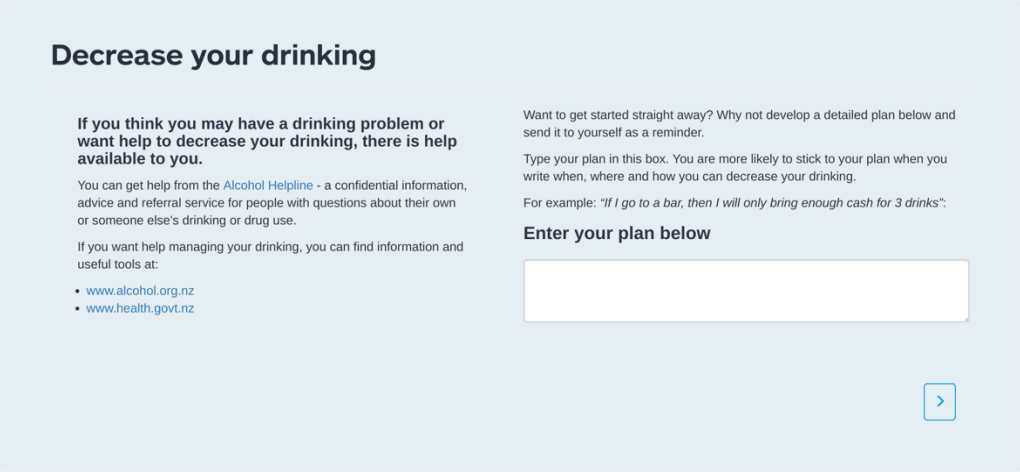
The use of implementation intentions, usually in the form of if-then plans, has helped people achieve their goals across a number of domains.[39] Good intentions unfortunately do not necessarily lead to a change in behaviour. This is known as the intention-action gap and is

[37] Drexler, A., Fischer, G., & Schoar, A. (2014). Keeping it simple: Financial literacy and rules of thumb. *American Economic Journal: Applied Economics, 6*(2), 1-31.
[38] Thompson, S. P. (2017). Bright Line Eating: The Science of Living Happy, Thin & Free. Hay House, Inc.
[39] Gollwitzer, P. M., Fujita, K., & Oettingen, G. (2004). Planning and the implementation of goals (pp. 211-228).

found to exist across a wide range of behavioural domains.[40] It appears to be especially large for drinking, which is often an impulsive act.[41]

One effective way of overcoming this gap is through using "implementation intentions", in which a person considers what they want to achieve and how they will do it. This means that they already have a plan in place when they face a trigger or critical cue.[42] These often take the form of 'if… then…' plans. For example, a person trying to exercise more might have the plan 'if I take the bus home from work, then I will get off two stops earlier and walk the rest of the way'. Developing implementation intentions in the form of plans has been found in one study to be more effective than simply telling people to drink within guidelines.[43]

How did we use this in our intervention? In the trial, we asked all participants whether they would like to make a plan, gave them guidance for doing so, and then sent them this plan using the email they provided.



3. Robustly evaluating interventions

Finally, a key advantage of the BI approach is that we rigorously evaluate our interventions. The evidence on the efficacy of public health campaigns is often not strong. This is because campaigns are rolled out nationally or regionally, and then evaluations rely on outcomes

[40] Sheeran, P. (2002). Intention—behavior relations: A conceptual and empirical review. *European review of social psychology, 12*(1), 1-36.
[41] Mullan, B., Wong, C., Allom, V., & Pack, S. L. (2011). The role of executive function in bridging the intention-behaviour gap for binge-drinking in university students. *Addictive behaviors, 36*(10), 1023-1026.
[42] Gollwitzer, P. M. (1999). Implementation intentions: strong effects of simple plans. *American psychologist, 54*(7), 493.
[43] Armitage, C. J. (2009). Effectiveness of experimenter-provided and self-generated implementation intentions to reduce alcohol consumption in a sample of the general population: a randomized exploratory trial. *Health Psychology, 28*(5), 545.

such as breadth of reach as a marker of success (i.e. measuring success on outputs not outcomes).

Even when campaign evaluations link in data on behavioural outcomes, it is often correlational. This means that any difference observed between before and after the campaign could have been due to a number of causes (such as seasonal variations, change in attitudes over time, or legislative shifts) rather than the campaign itself. For example, a 2004 review of eight campaigns to reduce drinking and driving found that the campaigns were associated with a median decrease in alcohol-related crashes of 13%.[44] However, it is impossible to determine whether this 13% change was caused by the interventions themselves.

One way in which we can isolate cause and effect is through the use of randomised controlled trials (RCTs) (see Box 1 below). Using RCTs, we can first trial campaigns prior to a larger roll out. We can even use randomisation to understand causal changes when rolling out these campaigns nationally. This can be achieved using randomisation of materials (such as A/B testing on websites, or sending out different letters) or by randomising different regions to receive different campaigns (known as cluster randomisation).

How did we use this in our intervention? In the trial, we randomised individuals to each of our different consequence messages. Whilst we would also ideally have randomised participants to receive or not receive the behavioural tools, our recruiting partner wanted all individuals to receive the tools. We therefore used a pre/post design here, whilst examining trends over time to rule out seasonal shifts.

[44] Elder, R.W., Shults, R.A., Sleet, D.A., Nichols, J.L., Thompson, R.S., & Rajab, W. (2004). Effectiveness of mass media campaigns for reducing drinking and driving and alcohol-involved crashes: A systematic review. *American Journal of Preventive Medicine, 27*(1).

Box 1: Randomised Controlled Trials[45]

Why run a randomised controlled trial? The behavioural sciences literature can give us a good indication of what might encourage behaviour change. However, every context and environment is different, and we can't know for sure what will work in different situations. This is why we place such a strong emphasis on randomised controlled trials (RCTs), considered the gold standard in impact evaluation methodology. Compared with other evaluation methods, RCTs provide us with a precise estimate of how much our intervention changed behaviour.

What is a randomised controlled trial? From an initial cohort of people who we would have rolled the intervention out with, we randomly divide them into a control group and treatment group (for a two-arm trial). The control group usually receive 'business as usual' so we know what would happen if they didn't receive the intervention, whereas our treatment group receive the intervention. Then, we compare the outcomes for the two groups. Because they were randomly allocated into either group we know that any difference between our groups is because of our intervention. We can then see exactly what the effect of our intervention is.

[45] See our report, *Test, Learn, Adapt,* for more detail on randomised controlled trials: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/62529/TLA-1906126.pdf.

Part two: the trial

Trial aims

To better understand which types of behaviourally informed messages would be most effective in influencing the drinking behaviour of New Zealanders between the age of 18 and 25, HPA and BIT conducted an RCT. While there is already a large body of literature on reducing alcohol consumption, the sample population is not generally representative of the target population. Social science research tends to focus on educated young people. With our mixture of recruitment methods, we targeted a sample of young people with lower education and with Māori and Pasifika backgrounds more representative of the New Zealand population. The trial aims were:

- To identify which type of public health message is most effective at reducing the drinks consumed by this population.
- To better understand the way in which this population respond to behavioural tools and other alcohol risk information.

Research questions and measures

The trial had two primary research questions and three secondary research questions, as detailed in tables 1 and 2 below.

Primary research questions

Research Question: Did the consequence messaging:	Measure, as tested by the questionnaire
Increase intentions to change drinking behaviour?	Intentions to change behaviour
Reduce reported drinks consumed per week?	Reported change in drinks per week consumed

Table 1. Primary research questions.

Secondary research questions

Research Question: Did the consequence messaging:	Measure, as tested by the questionnaire
Reduce reported binge drinks consumed over the previous month?	Reported change in 'binge' drinks consumed, measured by alcoholic drinks consumed in a session where at least five alcohol drinks are consumed
Increase the likelihood that a participant would make a plan?	Behaviour plan made
Increase knowledge about safe drinking levels?	Knowledge of safe drinking levels

Table 2. Secondary research questions.

Trial design: RCT and pre-post trial design

The intervention was delivered to participants through an online study platform that we purpose built for this project. Participants could complete this on any computer or mobile device, at any point during the trial period.

In this trial, our recruiting partner wanted all participants to receive some benefit of participating, so we used an 'active control'. This means that the control group still gets many of the core intervention components (the 'behavioural tools'), with only a set of 'consequence messages' itself differing between groups. The behavioural tools included personalised feedback, rules of thumb, and a behaviour plan-making prompt.

This trial design allowed us to test the effectiveness of the consequence messages using an RCT design, and test the behavioural tools using a pre-post design which included a baseline questionnaire, post-questionnaire, and follow up questionnaire.

In the four-arm individual-level RCT, one group received no consequence message and three other groups received one of three consequence messages (a set of health consequence messages, a set of appearance consequence messages, or a set of social relationship and comparison messages). See figure 1 below for the trial design.

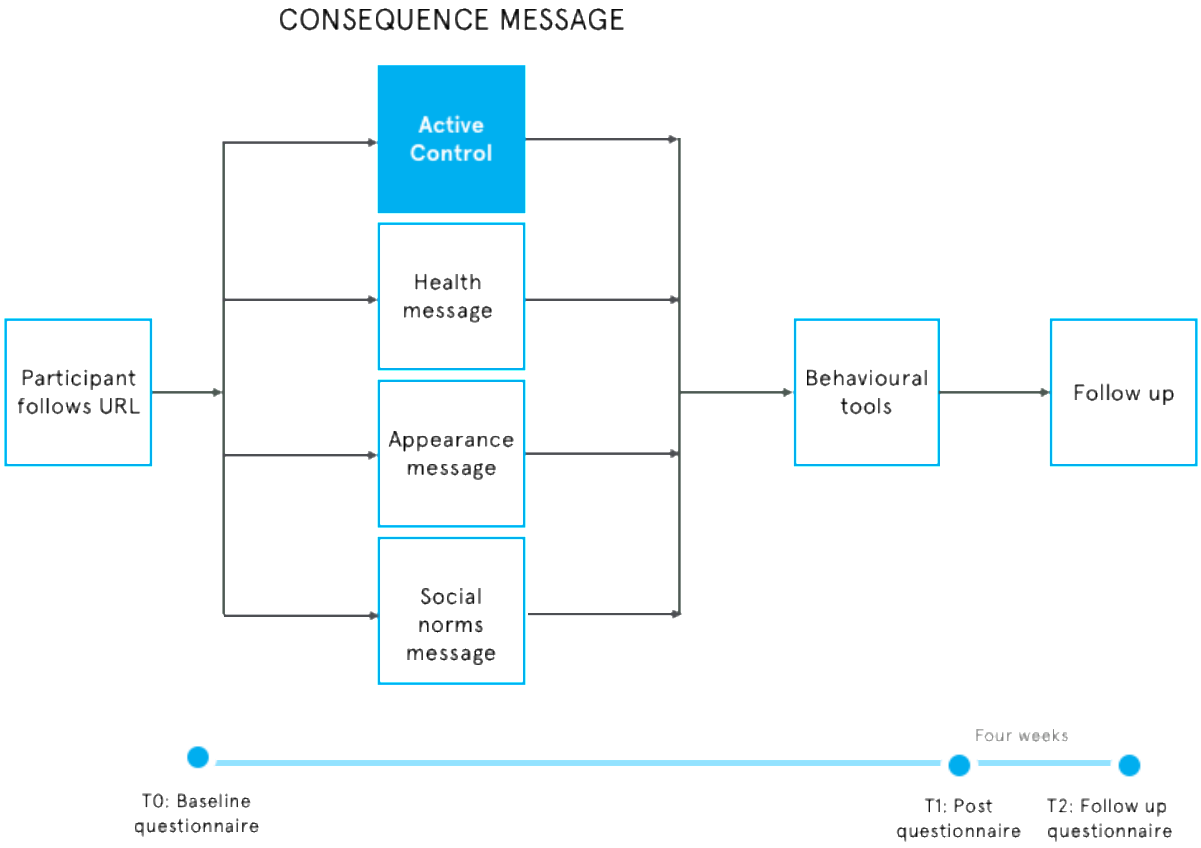


Figure 1. Diagram depicting the design of the trial.

Interventions: behavioural tools and consequence messages

All groups received the following behavioural tools:

- Personalised information about their drinking risk (based on the AUDIT-C[46]):
    - **Low risk:** "Based on your answers, your drinking is not likely to cause you problems if it remains at this level. That is great! But it is important to keep it that way."
    - **Medium risk**: "Based on your answers, your drinking is putting you at risk of developing problems. Not terrible, but it is important you do something about that."

[46] The AUDIT-C is a psychometrically validated brief questionnaire to assess problematic drinking. Bush, Kristen, et al. "The AUDIT alcohol consumption questions (AUDIT-C): an effective brief screening test for problem drinking." Archives of internal medicine 158.16 (1998): 1789-1795.

    - **High risk**: “Based on your answers, your drinking will cause you or may have already caused you problems. It is important you decrease your drinking now.”

- Rules of thumb about keeping drinking under safe limits:

    - “When you’re out at a party or with friends, try not to drink more than 3 drinks. For example, 3 bottles of beer, 3 small glasses of wine or 3 bottles of Ready-To-Drink mixes (RTD)”.

- A prompt (and guidance) for making a behaviour plan to reduce their drinking:

    - Type your plan in this box. You are more likely to stick to your plan when you write when, where and how you can decrease your drinking. For example, *“If I go to a bar, then I will only bring enough cash for 3 drinks”*

The ‘active control’ group received no additional messaging. The other three groups received one of three sets of consequence messages:

- Health: Did you know? Drinking alcohol can affect your health and lead to…

    - **Serious illness:** Alcohol can lead to many different illnesses, such as liver disease, bowel cancer, breast cancer, and cancer of the mouth.

    - **Injury:** Alcohol is responsible for many big and small injuries, such as burns, broken bones and cuts.

    - **Depression:** Alcohol may make you feel relaxed for a little bit, but can lead to depression and anxiety in the longer term.

    - Drinking less is a good way to protect your health!

- Appearance: Did you know? Drinking alcohol can affect your appearance and lead to…

    - **Bad skin:** Alcohol causes early aging and red skin, and makes you look bloated and puffy. This happens every time you drink.

    - **Poor fitness:** Alcohol makes working out less effective - it reduces the fat you burn exercising.

    - **Weight gain:** Alcohol contains a lot more calories than you may think.

    - Drinking just four RTDs is the same as eating three cheeseburgers and an ice cream!

- Social: Did you know? How much you drink can affect your social relationships:

- Alcohol is a common reason for break-ups and is one of the biggest factors in domestic violence.
- Most people your age do not think drunkenness is acceptable in any situation.
- 8 out of 10 people your age **don't** binge drink regularly.

Trial procedure

Participants were recruited into the trial through three different routes:

- Facebook: HPA advertised the study through a Facebook campaign.
- University: Posters were displayed on Victoria and Massey University campuses.
- Government agency: A government agency helped us to recruit other participants.

After clicking on or typing in the study URL participants were taken to a screen that provided information about the study. Participants could then choose to give consent to participate, after which they were presented with the intervention materials.

Participants then entered demographic and drinking information and received feedback as to whether their drinking was low, medium, or high risk. Participants in the three consequence messaging groups then were shown one of three screens displaying either the Health, Appearance, or Social messaging (see interventions, above).

All four groups (active control, and the three consequence messaging groups) then were shown information about safe drinking levels, rules of thumb, were prompted to make a behavioural plan, and had their knowledge retention assessed.

Four weeks following completion of the initial study, all participating individuals were sent the post-questionnaire (T2) link, with an additional prompt two weeks after that if they failed to complete it.

Participation in both the initial study and the post-questionnaire with the chance to win one of several gift vouchers.[47]

Participants in the final sample

As displayed in figure 2 below, 5903 individuals consented to be part of the trial (n=5903). The final sample of individuals with usable data for T1 variables is n=2763, and for T2 is n=899. The power analysis (see Appendix A) had projected that there would be n= 2000 at T2, and that the trial would need between 1200 and 1800 to be powered for statistical

[47] These vouchers could not be used to purchase alcohol

significance. The trial was therefore underpowered, for the key test of a change in drinking, with n=899 at T2. This was caused by a combined impact of:

- Fewer initial responses than expected (the projected estimate for completion of T1 was 5000 but actual was 4241).
- A lower rate of retention from T1 to T2 than anticipated (the projected estimate was 40% but observed 32%).
- A larger than expected rate of alcohol abstinence[48] (29% of our sample reported being abstinent over the previous month, compared with the 16% of 18-24 year olds observed abstinent over the year by HPA[49]).

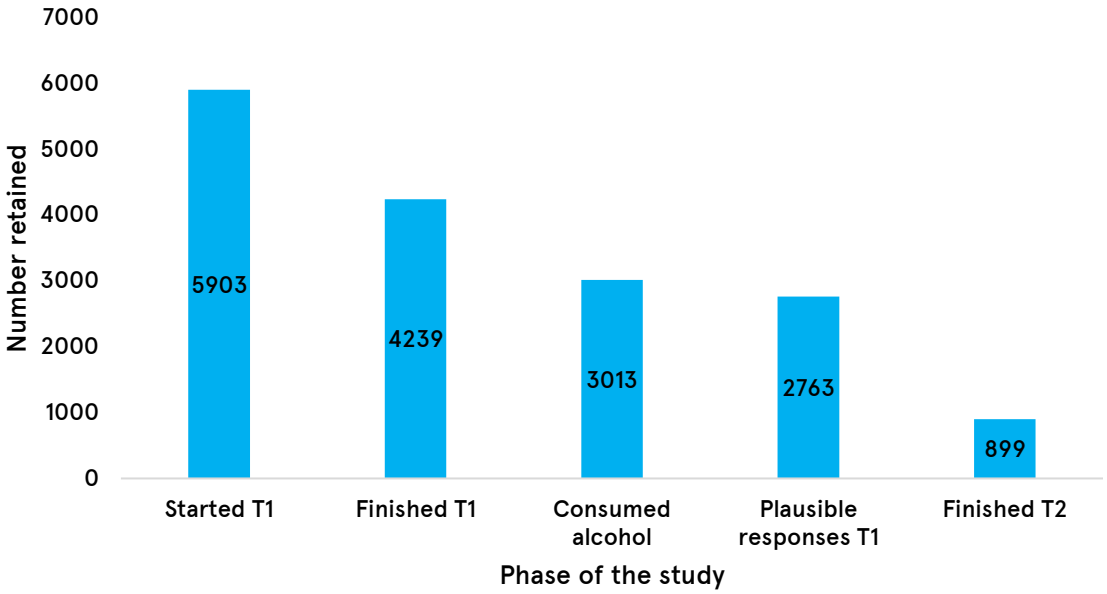


Figure 2. Attrition of participants through the study, from those who began the study (started T1) through to those who completed the follow up (finished T2).

Implication of lower than expected sample size

We did not find statistically significant differences between the three consequence messages and the control group in the trial. However, this does not mean that there wasn't a meaningful difference. Statistical significance is a measure of how confident we can be that any observed differences were caused by our intervention. We were not statistically powered

[48] Many respondents were recruited via an email from a government agency, which may have influenced their answers. Whilst we tried to make clear that all data would be anonymised, some people may have underreported their drinking levels. It is also possible that this young and socioeconomically disadvantaged population does drink less than others, potentially due to a lack of discretionary budget (as reflected in some behaviour plans).
[49] Ministry of Health. (2017). Annual Update of Key Results 2016/17: New Zealand Health Survey. Wellington: Ministry of Health

to detect significant differences based on the size of the effects we expected, and the size of the sample size. If we had a larger sample, we could be more confident.

Without statistical significance by conventional levels, we cannot confidently advise HPA on which of the messages would be most effective in public messaging. However, on page 37 – 38 we have summarised what we *can* confidently make conclusions about.

Who was in our sample?[50]

Table 3 below summarises the gender, age, and ethnicity of those in our sample, and shows important differences from the general New Zealand population. Comparing the first two columns, our sample is strongly over-represented by females (82.1% versus 51.3% for the population) as is common in survey-based research,[51] and positively has a high proportion of Māori/Pasifika respondents (26.1% versus 22.3% for the population).

The final three columns summarise our sample separately for those with low, medium or high risk from drinking. The percentage of males is highest in the high-risk group (22.4% versus 15.5% for the low risk), the median age is similar across the groups, and Māori/Pasifika are especially over-represented in the high-risk group (34.1%). We also collected information from participants on a number of other attributes and attitudes, which is reported in Appendix B in full.

Characteristic	Sample	Population comparison[52]	Low risk	Medium risk	High risk
Gender Male (%) Female (%)	 494 (17.9) 2269 (82.1)	 2,065,900 (48.7) 2,176,200 (51.3)	 211 (15.5) 1148 (84.5)	 115 (17.6) 539 (82.4)	 168 (22.4) 582 (77.6)
Median age	21	-	22	21	21
Ethnicity[53]					

[50] The final sample of individuals with usable T1 data, n= 2763.
[51] The over-representation of women means we can be most confident that our conclusions apply to women.
[52] Source: 2013 New Zealand census. Totals are rounded to the nearest 100.
[53] When a person states multiple ethnicities, we prioritise so only one ethnicity is recorded with the following prioritisation: Māori/Pasifika, Other, Pākehā**.** Population ethnicity shares come from the 2013 New Zealand census and ethnicities are prioritised, so the shares add to more than 100%.

Māori /Pasif. (%)	722 (26.1)	894,500 (22.3)	303 (22.3)	163 (24.9)	256 (34.1)
Pākehā (%)	1867 (67.6)	2,969,400 (74.0)	958 (70.5)	450 (68.8)	459 (61.2)
Other (%)	174 (6.3)	586,400 (14.6)	98 (7.2)	41 (6.3)	35 (4.7)

Table 3. Demographic summary of sample group.

How did we analyse our results?

The analyses were pre-specified in a trial protocol and signed off by senior BIT staff before the trial was implemented. Pre-specification reduces the likelihood of spurious findings because all analyses have to be planned and completed in line with theory (rather than following chance fluctuations and opportunistic analysis).

In the analyses presented below, we removed abstinent individuals (as we were not trying to change their behaviour). We have used logistic regression for binary variables, and linear regression for continuous variables.

Results and discussion: What did we find and what conclusions can we draw?

Primary outcome 1: Intentions to change drinking

There were no differences between our three consequence message groups, and the control group, in terms of intention to change behaviour.

As depicted in figure 3 below, there was a broad range of stated intentions. Some participants (even those categorised as high risk) stated they had no intention to change their behaviour (intention score = 3), others reported weak intentions to change, and others reported being strongly motivated to change.

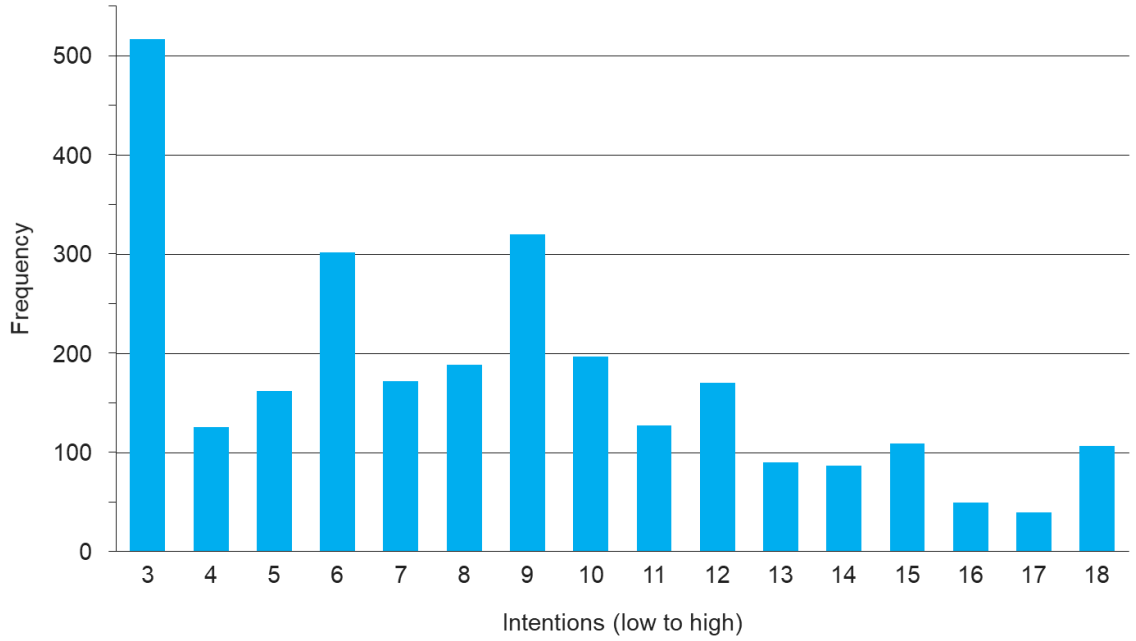


Figure 3. Stated intentions to reduce drinking consumption, where 3 = no intentions, and 18 = strongly motivated.[54]

We found that an individual's stated intention to change their drinking significantly predicted their change in drinking at T2, but only predicted 1% of this change. This aligns with findings in the literature on the intention-action gap (reviewed in Part One), and underscores the importance of not relying on stated intentions as outcome measures to assess efficacy.

Entrenched opposition

We further investigated the responses that people gave to the intention questions and found that there were 133 individuals who despite being told their drinking was at a high risk, reported no intentions to change their drinking whatsoever. Compared with the rest of the high-risk drinking sample, these participants were more likely to be male, and non-Māori/Pasifika. Unpicking why these individuals resist health information is an interesting further area of enquiry.

Primary outcome 2: Change in drinking

Our second primary outcome was the reported drinking levels at follow up. We coded this as a 'drinking change', where negative scores indicate that individuals reduced their drinking.

There were no differences between our three treatment groups, and the control group, in terms of a change in reported drinks consumed per week. However, as depicted in figure 4, all groups (control = 1.1 per week drink reduction, health = 0.7 drink reduction, social = 1.3

[54] As used in: Hagger, M. S., Lonsdale, A., Koka, A., Hein, V., Pasi, H., Lintunen, T., & Chatzisarantis, N. L. (2012). An intervention to reduce alcohol consumption in undergraduate students using implementation intentions and mental simulations: A cross-national study. *International Journal of Behavioral Medicine, 19*(1), 82-96.

drink reduction) other than the appearance group significantly reduced their drinking between baseline and follow up (pre-post analysis). This may indicate that the behavioural tools we gave all groups (including controls) had some effect on drinking behaviour. This was not explained by any seasonal shift over time: we did not observe a decrease in baseline drinking levels over time.[55]

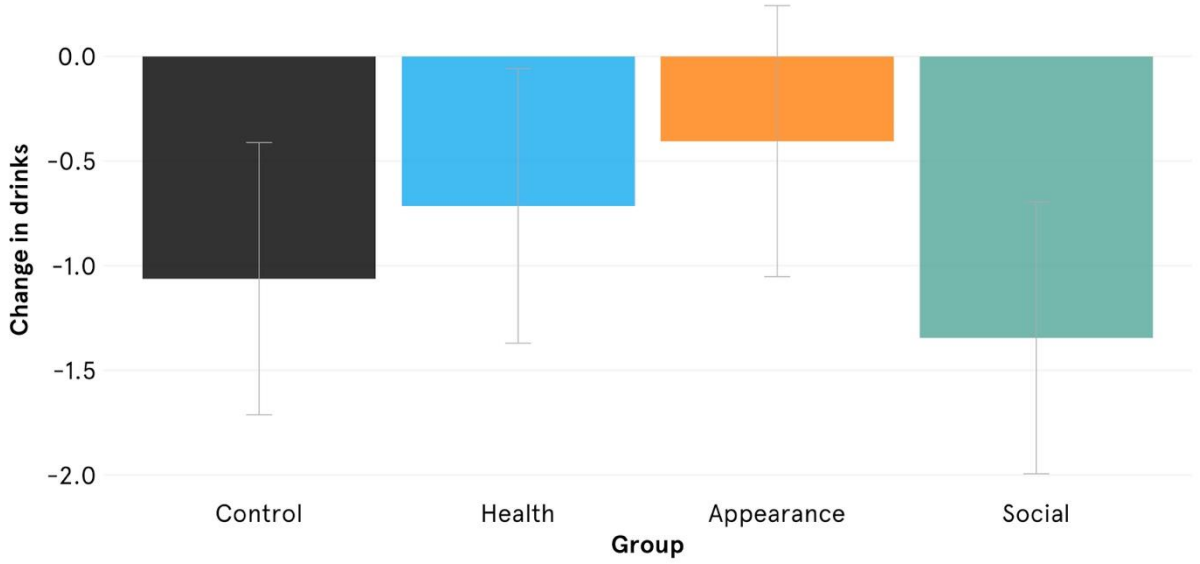


Figure 4. Change in reported drinks consumed per week, by consequence messaging group.

Secondary outcome 1: Change in binge drinking

There was a similar pattern for binge drinking, measured as the number of alcoholic drinks consumed in a session where at least five drinks were consumed. There were no differences between our three treatment groups, and the control group, in terms of a change in reported binge drinks consumed per month. However, as depicted in figure 5, all groups (control = 3.8 per month binge drink reduction, health = 4.7 binge drink reduction, appearance = 3.9, binge drink reduction) other than the social group significantly reduced their binge drinking between baseline and follow up. This may indicate that the behavioural tools we gave all groups (including controls) likely had some effect on binge drinking behaviour.

[55] Three other explanations could be that heavier drinkers dropped out between T1 and T2 (but drinking level did not predict retention, so this is unlikely), that test-retest effects exist whereby you fill out the survey differently when it's the second time, or that participants felt a 'social desirability bias' or 'demand characteristic' where they felt compelled to underreport at T2 given that they were in a study designed to reduce drinking.

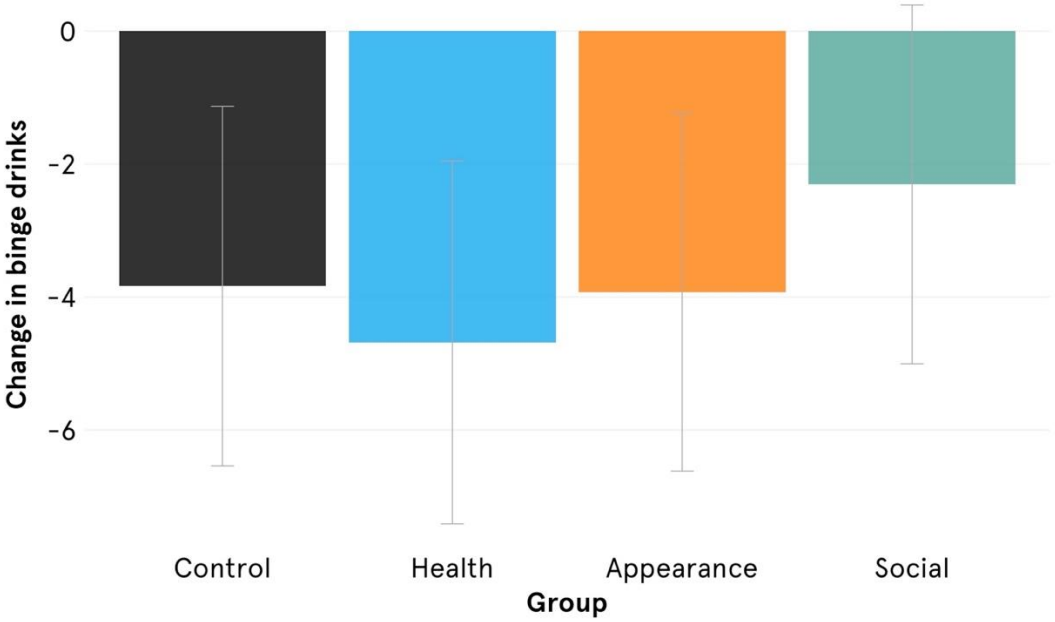


Figure 5. Change in reported binge drinks consumed, by consequence messaging group.

Secondary outcome 2: Behaviour plans

Who made a plan, and what type?

Overall, approximately 25% of our sample chose to make a plan for their drinking.[56] There was no difference between any of our messages and the control group, in terms of the likelihood to make this plan. When we looked at the plans qualitatively, we observed three main types of plan, in table 4:

Plan type	Description	Example
Limiting access to funds while out.	This involved not bringing their bank card, limiting their cash, or only leaving a certain amount of money in their bank account.	"If I go out with friends I will only bring enough money for 3 drinks and food".

[56] A number of other individuals stated their intention to cut down drinking, or used the plan to deliver feedback about the survey, but did not actually make a plan. These individuals were removed from the 'made a plan' analysis, but have been analysed qualitatively elsewhere.

Limiting the drinks they bring to an event/ buy to have at home.	Related to the above, many participants wrote about bringing or purchasing a set number of drinks to prevent over consumption.	"I will only take a four pack with me so I don't drink any more than that".
Creating a social imperative to stay sober.	Some participants elected to stay sober and drive the drinkers home[57].	"Sober: drive people who drink".

Table 4. Type of plans to reduce drinking.

The exemplar 'if-then' plan provided to participants during the module/AUDIT-C was to only bringing enough cash for three drinks, so it appeared that many participants closely followed the recommendations. This shows the importance of providing participants examples and defaults, so that they have a good plan to fall back on if they can't or don't generate their own.

What impact did plans have?

Comparing those who did and did not make a plan, we found that making a plan predicted both reducing drinks per week consumption, and reduced binge drink consumption. It is important to emphasise that it is not possible to draw causal conclusion based up on the pre-post. It is not possible to talk about the plans having *caused* a change in drinking, because participants were not randomised to 'plan' or 'no plan'. Instead, they self-selected whether or not to make plans. This may mean that more motivated or conscientious participants were more likely to make a plan, and also (but unrelated to the plan) more likely to reduce their drinking.

For change in drinks per week consumed, we observed that having a plan was associated with a 1.8 drinks per week reduction in drinks consumed, as depicted in figure 6.

[57] From a public health perspective, we would not recommend the continued use of this as an exemplar plan as there is a risk that these individuals might then succumb to desires to drink, and then drive under the influence. We would not usually encourage this type of plan.

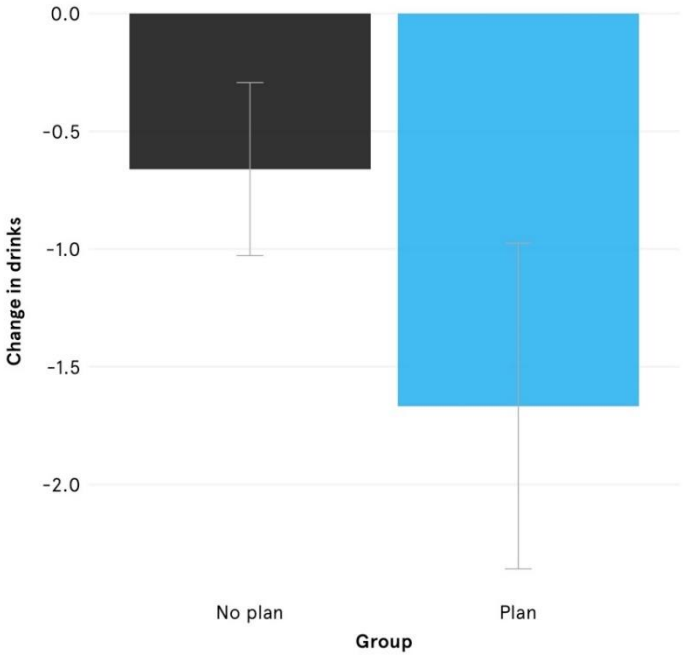


Figure 6. Change in drinks consumption in those who made a plan (n=629), and those who didn't make a plan (n=2139).

For change in drinks per week consumed, we observed that having a plan was associated with a reduction of 3.5 binge drinks across the month, as depicted in figure 7.

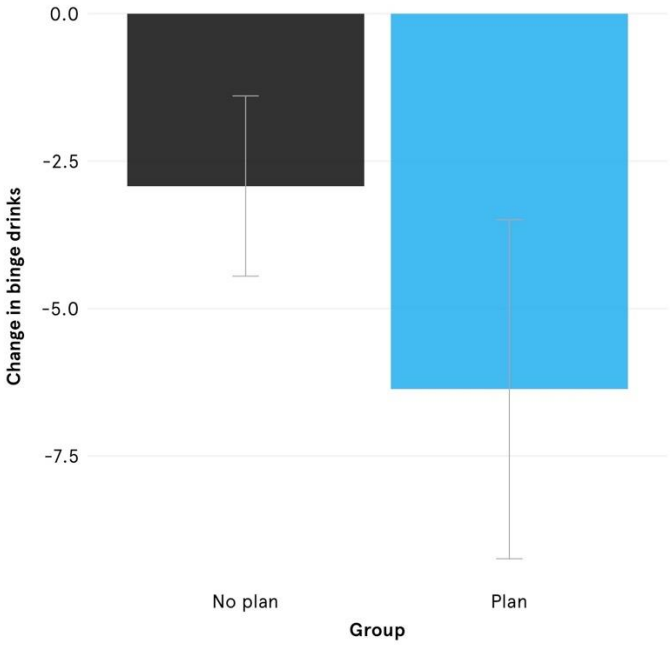


Figure 7. Change in binge drinks consumption in those who made a plan (n=629), and those who didn't make a plan (n=2139).

What did we find from our qualitative analysis of plans?

We engaged BIT's in-house ethnographer to examine and code the plans in detail, to determine whether there were any additional insights that would be helpful for HPA. Several important findings were established, outlined below.

The high rate of non-plans

A number of participants (n = 166) wrote intentions about changing their drinking, but not a real plan (these were not included in the above analysis). We coded responses as plans if they included reference to specific actions they would undertake to reduce their drinking. We coded responses as not plans if conversely they made no mention of reducing their drinking, or if they mentioned an intention to change but with no specific details.

While intentions to reduce drinking are positive, they do not help overcome the intention-action gap that exists. For example, a participant said they would "limit my drinking". Another said they would "Drink less when I do drink." While these indicate an intention to reduce their drinking, without a concrete strategy in place these intentions are unlikely to translate to a reduction in drinking behaviour. This means that if HPA provides tools for individuals to make plans, they will need to provide additional guidance on how to do this. BIT has previously provided templates that ask participants to label their Wish, Outcome, Obstacle and Plan (WOOP)[58], to prompt this thought process.

Messages may induce substitution behaviours

Some participants in the 'appearance' group (who were informed that alcohol can make exercise less effective, and has a high calorie content) said that they would engage in weight-reducing behaviours but not reduce their drinking. For example, a male participant said that "I will start running so I can counteract weight gain". Another male participant said that he had no plan to reduce his drinking as follows: "[my plan is] Nothing because I am a high-level athlete and burn off the calories". This could indicate that the 'appearance' based messaging may result in participants looking to counteract the appearance-based issues coming from binge drinking (like weight gain) without reducing their alcohol consumption.

However, some of these weight-management plans may also help participants reduce their binge drinking. For example, a female participant said that "If I go to a party, I'll only bring 3 drinks with me. This will help me lose weight". She may have been concerned with losing weight, but limiting the alcohol she brings to a party is also a good way to limit her alcohol consumption overall regardless for her reason for doing so.

Another substitution behaviour and mitigation strategy was found in participants from the 'health' group, around the likelihood of alcohol to cause injury. Some participants said that they would instead drink around people they know and trust, their perception being that this

[58] Oettingen, G., & Gollwitzer, P. WOOP (scientific strategy).

would mitigate the risk of their personal safety being compromised. Many of these plans were made by women. For example, one female participant said: “If I decide to drink then I will only do it if I am around family who can look out for me”. Again, this may have an incidental effect on their drinking behaviour, as avoiding clubs and bars could result in a change to the environmental triggers that contribute to binge-drinking, but was not the intended impact of the message.

Social norms messages may need to find a more relevant reference group than ‘young people’.

We know from the behavioural sciences literature that the reference group for a social norm needs to be closely identified with to be effective. In this context, we used ‘young people in New Zealand’ as our reference group. However, some of the participants who received this messaging still used drinking culture as a justification for their habits. Many of these participants were also at a medium or high-risk level. For example, a female participant who received the social message said: “I'm 19 and I live in Dunedin I drink less than normal here”. Another participant in the same treatment group said “...if you’re at a party or in town at night it is acceptable to be drunk!”. Both were at a medium or high risk level. This suggests that the misperception of social norms may not be completely mitigated by the presence of messages that correct the perception of these social norms at the societal level, but need to be more granular to be effective (e.g. ‘Dunedin young people’).

There was some support for the use of a wider social norm like ‘young people’ in responses from individuals in other treatment groups. For example, one participant who received the appearance-based messaging said: “I don’t have a drinking problem I’m a 20 year old young adult wtf”. She was at a high-risk level.

Secondary outcome 3: Knowledge of safe drinking levels

Lastly, we looked at the impact of our messages on knowledge levels. We asked participants what the recommended limit of drinks per night was, what the recommended limit of drinks per week was, and whether an example of drinks consumed was above, the same as, or less than, the recommended limit. The answers to these questions had been provided previously. We coded these responses very generously (allowing for a misunderstanding of drink vs standard drink, and male vs female limits), and scored individuals from 0 to 3 based on the number they got correct.

We observed that both the appearance and social groups showed significantly higher retention of the knowledge about safe drinking levels compared with the control group, as demonstrated in figure 8 below.

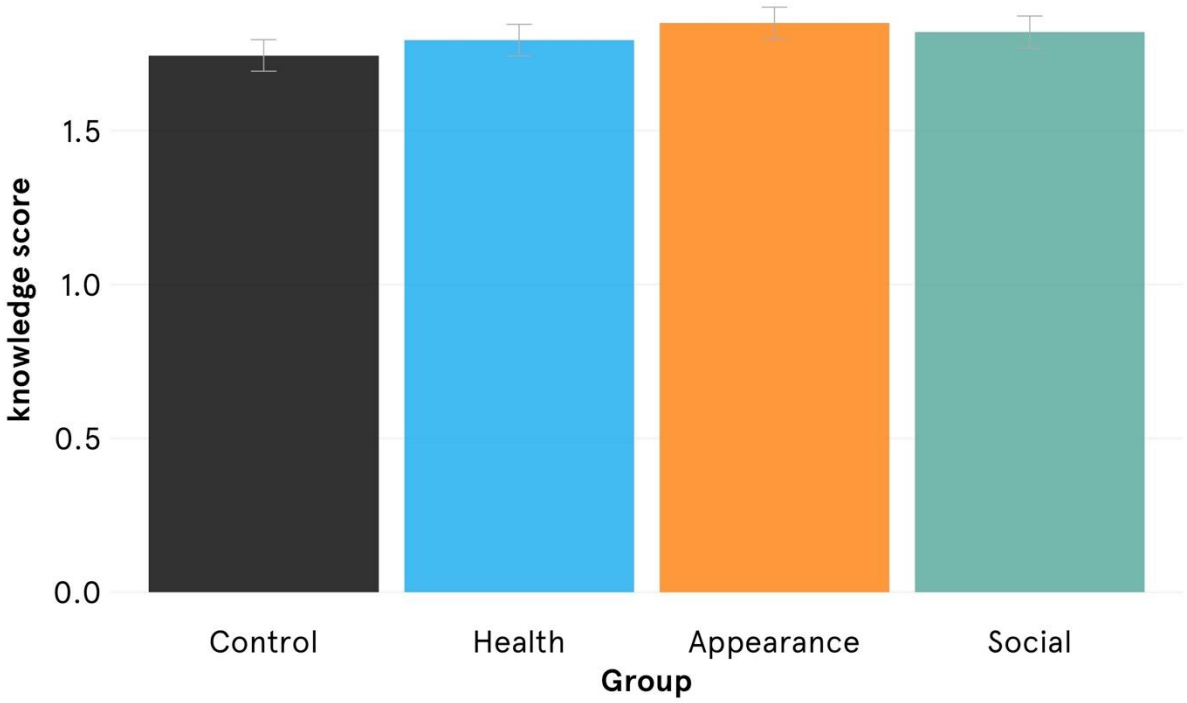


Figure 8. Retention of knowledge immediately after the intervention, by consequence messaging group.

However, this effect was not present after four weeks at the follow-up survey, at which point there were no differences between any of the consequence message groups and the control group. In addition, initial knowledge was *not* predictive of a change in drinking, or change in binge drinking, habits.

We looked at which of the three knowledge questions in the initial survey participants correctly answered, and how this varied with their level of risk. As illustrated in table 5 below, high risk drinkers were generally lower scoring on knowledge about safe levels, and participants across the board struggled to identify the safe limit per session.[59]

Category	Q1: per session	Q2: per week	Q3: judgement
Low risk	380 (28%)	1330 (98%)	877 (65%)
Medium risk	126 (19.2%)	637 (97%)	392 (60%)
High risk	98 (13%)	715 (95.3%)	423 (56%)

Table 5. Number and proportion obtaining correct responses to the three knowledge questions, Q1 (recommended limit per session), Q2 (recommended limit per week) and Q3 (whether an example we provided was above, the same, or below the recommended limit).

[59] Note that any responses that were *under the safe limit* were also coded as correct.

Sub group analyses

We undertook a series of machine learning analyses to identify whether or not certain sub groups responded to the messages differently. These were used, as they reduce the likelihood of finding spurious results. We conservatively set the algorithm to find a sub group that was a) 10% of the sample size, and b) responded to the interventions differently. This removed the likelihood of findings spurious results in small groups. For example, traditional sub group analysis may find that Māori women in rural areas are more likely reduce their drinking when they are shown the appearance message compared to the control group. However, this could be because there are only 20 members of this group in the sample and those 20 have shown a drop in drinking by chance. By setting a conservative group size when using the machine learning algorithm, we have limited the likelihood of finding spurious results.

We investigated the differences between the three consequence messages and the control group when looking at individuals' a) change in drinking, b) change in binge drinking, c) intention to change drinking, and d) likelihood of making a plan. In all instances, we compared a single intervention group (i.e. the social norms message) against those in the control group.

In all of the analyses, we investigated differences between individuals, based on their level of risk, whether or not they identified as Māori, their age, and their gender. In only one of the analyses did we find a meaningful difference between sub groups.

We found that among people who were 21 years old and younger, those who received the health message were more likely to make a plan than those in the control group, on average. This difference was very small. This is shown in figure 9 below. Most surprising was the fact that the change in drinking did not differ by levels of risk.

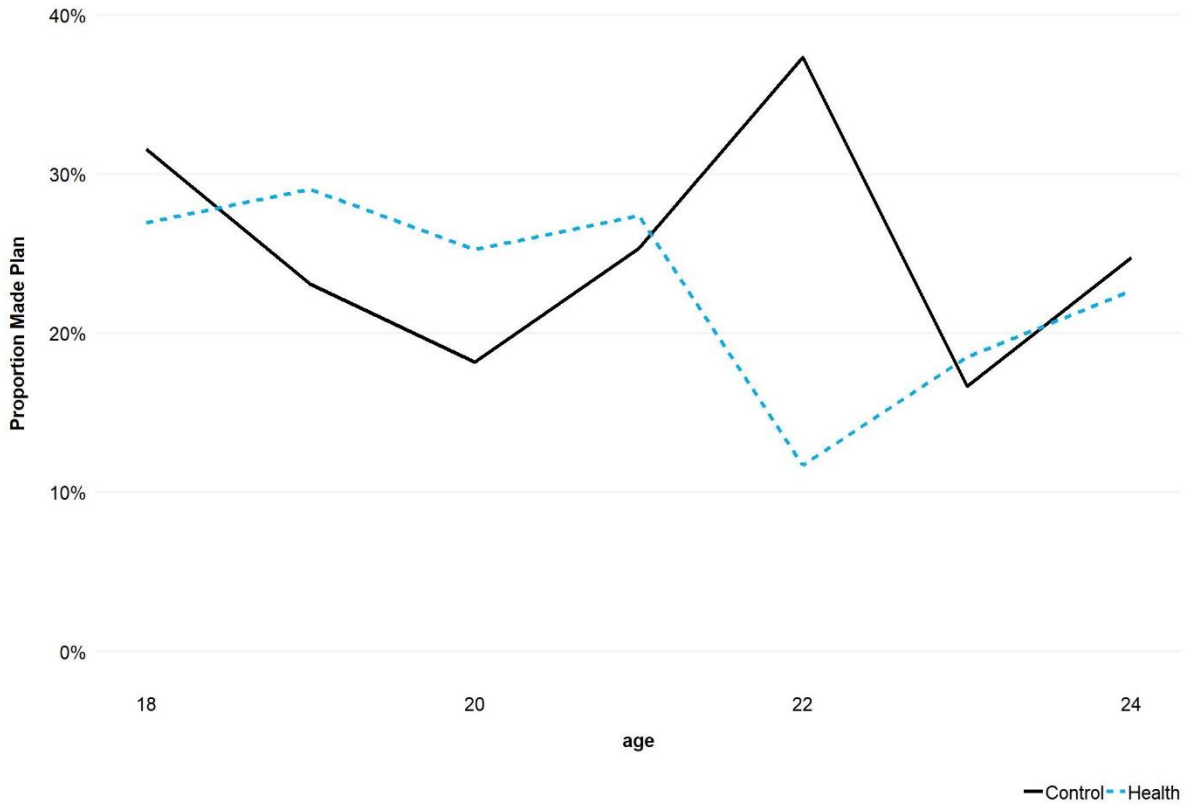


Figure 9. The proportion of people who made a plan by age.

Conclusion

The trial aims were:

- To identify which type of consequence message is most effective at reducing the drinks consumed by this population.
    - We did not meet this aim based on the sample size issues we encountered. Whilst we are able to provide some advice around which messages to take forward, we cannot be conclusive about which consequence messages were more effective. The conclusions we can draw are likely to be most accurate for young women, because our sample was disproportionately female (82%).
- To better understand the way in which this population respond to behavioural tools and other alcohol risk information.
    - Although limited by the absence of a 'true control', our findings are suggestive that our behavioural tools reduced both absolute drinks consumption, and binge drinks consumption. We also found that increased knowledge did not lead to reduced drinks consumption.

Recommendations for HPA

With these caveats in mind, below we present a set of recommendations based on the findings.

Which consequence messages should HPA pursue?

Recommendation: use messages that combine both health and social norm messages

In some of our outcomes, either health or social messages were non-significantly better than controls. Within health messages, we suggest using consequence messages that bring forward harms to the present, to reduce temporal discounting. For social norms messages, we would suggest finding ways to make the reference groups used more relevant than just 'young people from New Zealand'. Targeting localities or ethnicities may be more effective. This could be achieved geographically, for example, one method of doing this could be in advertising on bus stops to display locally sourced social norms: "8 out of 10 young people in Dunedin don't binge drink regularly". Or, as was sourced from our currently collected data: "most young Māori people don't drink more than 4 drinks per week".[60]

Recommendation: avoid appearance-based messages

We would suggest against using appearance-based messaging. Whilst it led to an increase in knowledge of safe drinking levels immediately after the intervention, this increased knowledge was not predictive of a change in drinking or binge drinking behaviour. This is in

[60] Based on the median of the 'drinks per week' data we collected.

line with the drinkaware findings, where appearance messages increased engagement but not behaviour change. In addition, our qualitative analysis observed that many individuals focused on other weight-reducing behaviours rather than specifically reducing their alcohol consumption. Whilst this might have flow on effects to alcohol consumption, it was not the intended route of action. Young people may also suffer negatively from the stigmatising effect of appearance messages on their weight.[61] In our view, the mixed efficacy of appearance messages, combined with the possibility of stigmatising overweight individuals, means that we would not advocate for using these messages routinely.

Behavioural interventions should be prioritised above education

Recommendation: de-emphasise knowledge and intentions

The trial findings supported the conclusions from the literature review: while public health messaging often aims to improve knowledge and increase intentions to change behaviour, this is unlikely to be the most effective route to behaviour change. Any evaluations of campaign efficacy should also seek to go beyond intentions and knowledge retention, as they did not seem to be substantively predictive of a change in drinking behaviour.[62]

Recommendation: implement behavioural tools to support behaviour change

The combination of personalised feedback, rules of thumb, and making a plan did seem to lead to a reduction in both overall drinking consumption and binge drinking. This can be delivered in a relatively low-cost online format, although some additional help in making *good* plans would be useful for some participants. We would recommend trialling alternative methods of displaying information and tools around planning, such as those recommended in the implementations literature,[63] to determine the best method of providing this support.

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[61] Puhl, R. M., & Heuer, C. A. (2010). Obesity stigma: important considerations for public health. *American journal of public health*, *100*(6), 1019-1028.

[62] Our data do show that high-risk drinkers know the least about safe levels of drinking. But as our results emphasise, this does not imply that increasing knowledge will lead to behaviour change, because of the gap between intentions/knowledge and action.

[63] Oettingen, G., Hönig, G., & Gollwitzer, P. M. (2000). Effective self-regulation of goal attainment. *International journal of educational research, 33*(7-8), 705-732. See also Gollwitzer, P. M. (1999). Implementation intentions: strong effects of simple plans. *American Psychologist, 54*(7), 493 **and** Ajzen, I., Czasch, C., & Flood, M. G. (2009). From Intentions to Behavior: Implementation Intention, Commitment, and Conscientiousness. *Journal of Applied Social Psychology, 39*(6), 1356–1372.

Appendices

Appendix A - Power analysis

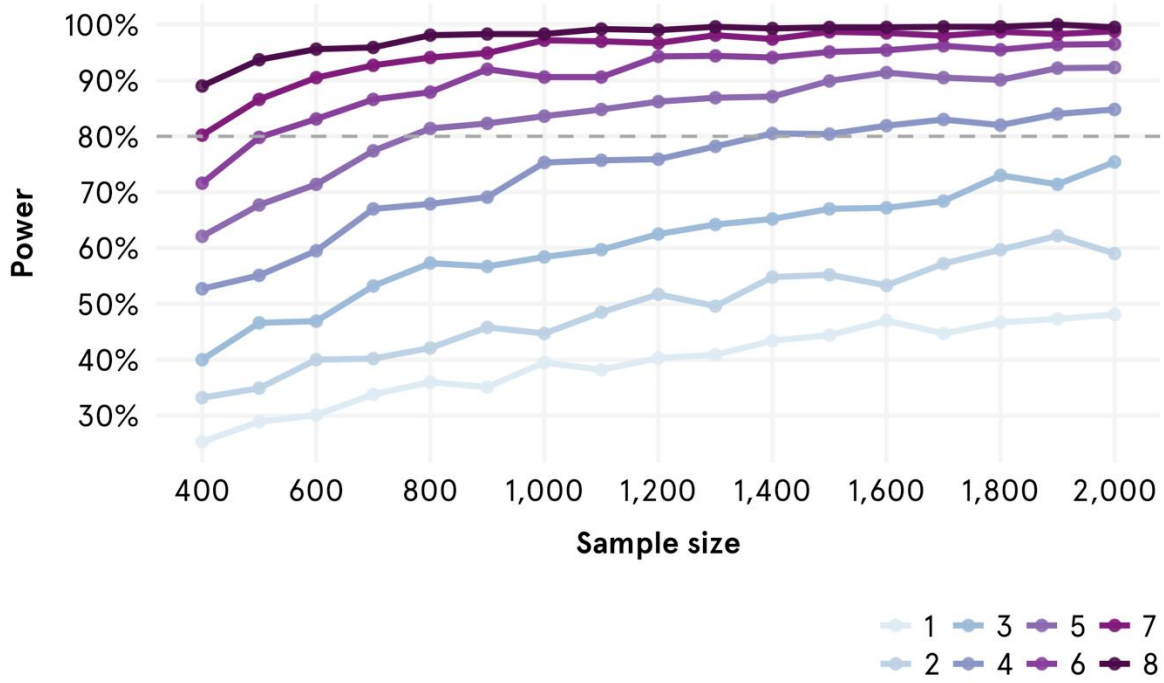
The exact number of participants available was difficult to anticipate ahead of time. Among potential participants that the government agency helped us recruit, we conservatively estimated that only 80% had a valid email address. We also estimated that approximately 10 percent of invitees would open the email, click on the link, and begin the study.

We assumed that roughly 60% of those that started the survey would finish the survey, leave their email address, and then go on to complete the 4 week follow up survey. This would leave us with a sample of roughly 2000 (or 5% of the eligible sample). Based on other surveys conducted with similar populations, we believed this to be a low estimate of the number that would eventually participate.

We calculated power for one of our primary outcome variables only: alcohol consumption behaviour. We do not have any historical data from this cohort. For this reason, we formed estimates using a cohort of the same age, and with an intervention which used a comparable method of intervention and evaluation.[64] This analysis revealed that the trial can detect an effect size of between 4 and 5 fewer drinks over a one month period for our cohort.

We calculated our power for this trial based on the analysis plan specified below. The x-axis shows the number of people in the trial, the y-axis shows the power we would reach, and the key shows the number of drinks-reduction we would be able to observe. This shows that to achieve 80% power, we would need to reduce the number of drinks consumed by 4-5 and have 1200 participants (300 in each group) and 1800 participants (450 in each group). Our projected sample of 2000 should have covered this

[64] Hagger, M. S., Lonsdale, A., & Chatzisarantis, N. L. (2012). A theory-based intervention to reduce alcohol drinking in excess of guideline limits among undergraduate students. *British journal of health psychology*, 17(1), 18-43.



As discussed in Part two of this report, our study was underpowered. We expected 2000 useable responses from the follow-up survey, but had only 899 due to a combination of three factors:

- Fewer initial responses than expected (the projected estimate for completion of the first survey was 5000 but actual was 4241).
- A lower rate of retention from the first to second survey than anticipated (the projected estimate was 40% but observed 32%).
- A larger than expected rate of alcohol abstinence (29% of our sample reported being abstinent over the previous month, compared with the 16% of 18-24 year olds observed abstinent over the year by HPA).[65]

It was unfortunate that all three factors led to fewer rather than more responses than expected. The combination led to a substantially smaller sample size than expected. In retrospect, having one fewer treatment arm would have helped with power issues.

There are a number of strategies we can use to increase statistical power, if HPA were to run a similar trial in the future:

- Reduce the number of treatment arms.

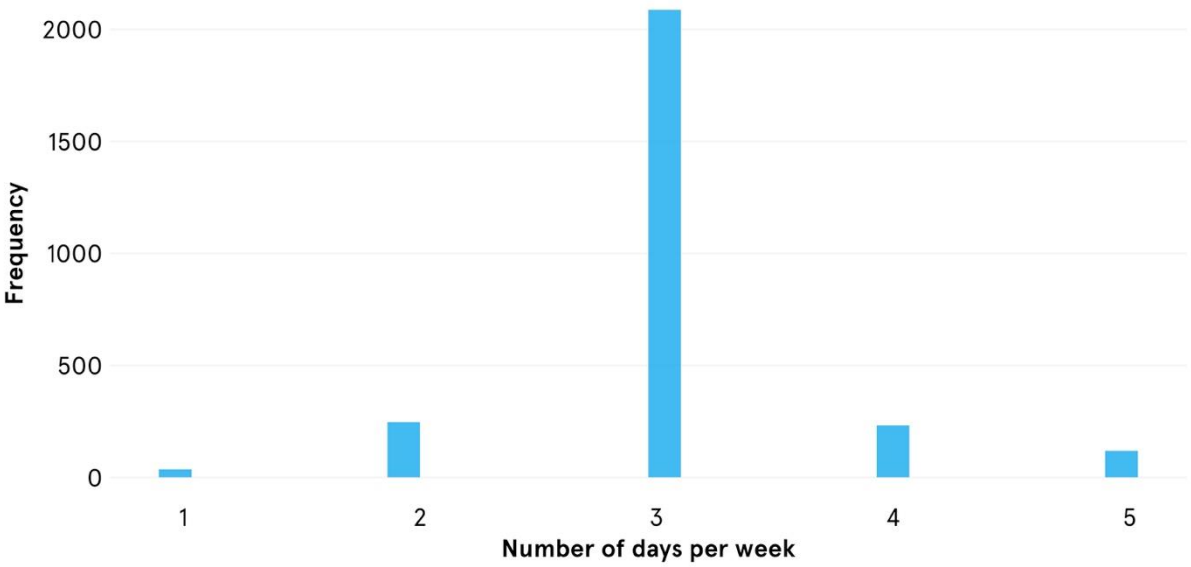
[65] Ministry of Health. (2017). Annual Update of Key Results 2016/17: New Zealand Health Survey. Wellington: Ministry of Health

- Collect data for longer, to increase the overall sample size.
- Find more sensitive measures of change, such as using daily drink diaries rather than one-month recollection.
- Include repeated observations of participants.

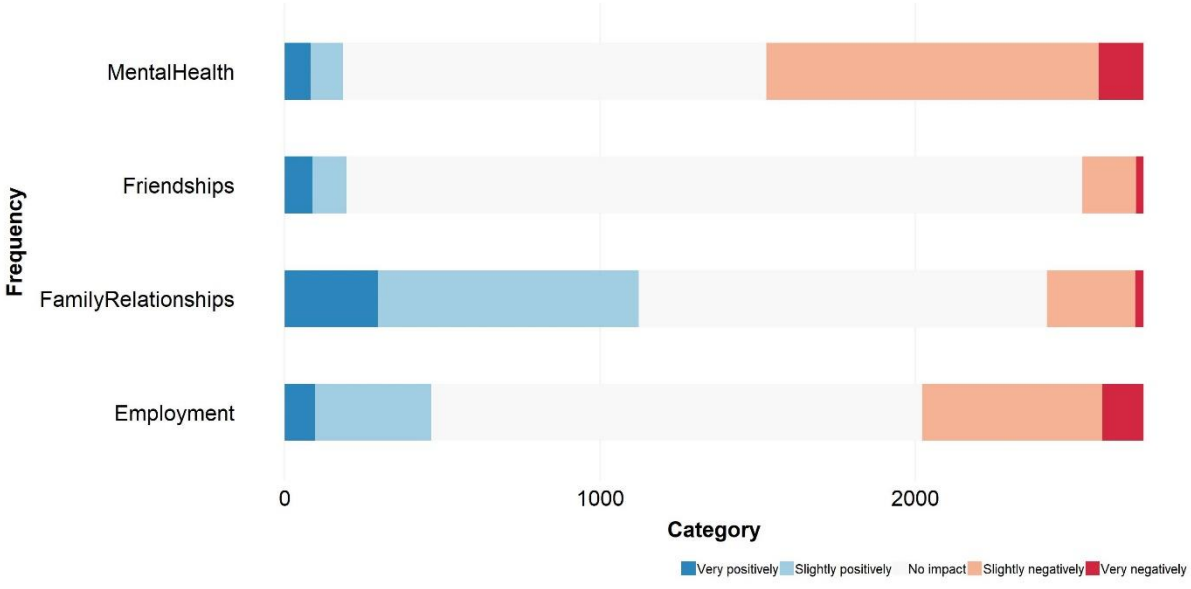
Appendix B - Survey data not reported in the main report

In addition to the data collected for primary and secondary outcomes, we included a number of additional questions to provide HPA with more information from this hard-to-reach sample. This is presented below.

How often (days per week) do you think **other people** your age drank 5 or more alcoholic drinks per occasion?

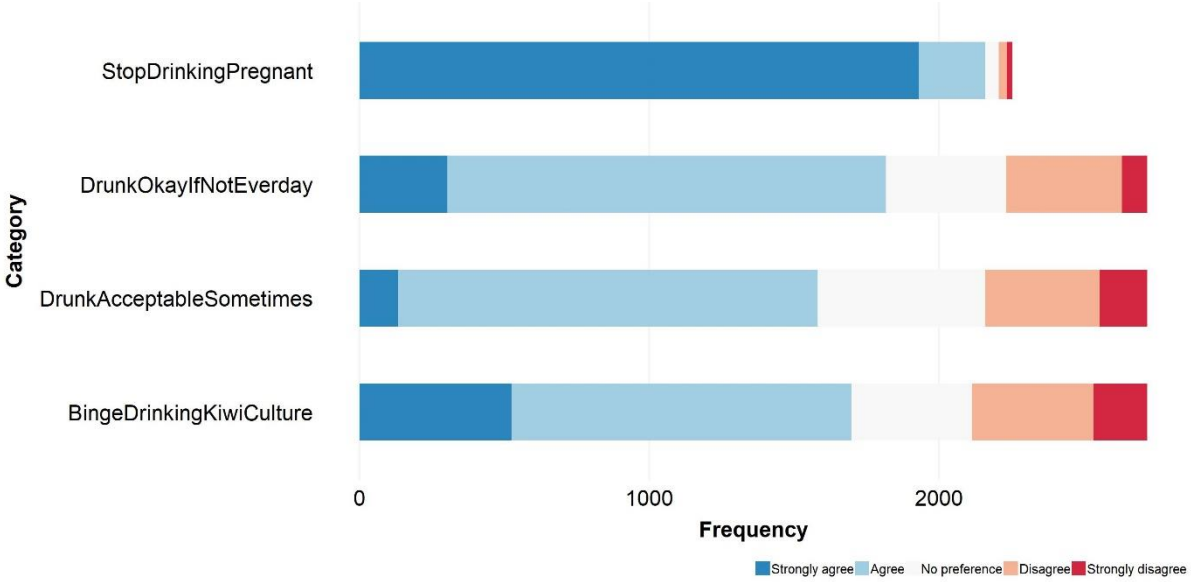


How much has drinking alcohol, or not drinking alcohol, impacted any of the following? Think about the last 4 weeks.



For each statement, please tell us how strongly you agree or disagree:

- I would stop drinking completely if I knew I was pregnant [female only]
- It's OK to get drunk as long as it's not every day
- Drunkenness is acceptable in some situations
- Binge drinking is part of the kiwi culture



Appendix C – Questionnaires

Consent page

What is it about?

Thank you for clicking on the link. This survey focuses on the alcohol use of New Zealanders aged 18-25. We would like to ask you a few questions about your drinking in the past 4 weeks. The survey will take around 10-15 minutes. We will email you again in 4 weeks' time with a few more questions, which will take 5 minutes to answer.

Who is it for?

This study is being conducted by the Behavioural Insights Team, an independent research organisation, on behalf of the Health Promotion Agency (HPA). HPA is a government agency tasked with promoting healthy living for all New Zealanders. By taking part, you will help ensure accurate information is used to develop practical ways to benefit all New Zealanders.

What will you do with my information?

Participating is voluntary and anonymous. We will not ask you for your name or any identifiable details during the study and nobody who takes part will be identified in any reporting.

Why participate?

- You can find out if your drinking puts you at risk of developing problems.
- You'll get information on drinking guidelines and advice on how to reduce your drinking.
- As a thank you, you will have a chance to win 1 of 40 Warehouse vouchers worth $50. If you also complete the 5-minute survey in 4 weeks, you get another chance to win 1 of 20 Warehouse vouchers worth $100.

By selecting **'Yes'** to the question below, you are indicating you understand the information above, and are consenting to be in the study. If you select **'No'** that's absolutely fine too. You can also stop at any time.

If you have any questions or concerns about the study you can contact us at admin@alcoholstudy.co.nz

Yes - No

T0 – Pre-intervention questionnaire

Demographics

Thank you for agreeing to take part. We'll start with a few questions about who you are.

D1. What is your gender?

1. Male
2. Female
3. Other [specify]

D2. How old are you?

years old

D3. Which ethnic group or groups do you belong to? One or several groups may apply to you.

1. New Zealand European or Pākehā
2. Māori
3. Samoan
4. Cook Island Māori
5. Tongan
6. Niuean
7. Other Pacific Island (i.e. Tokelauan, Fijian)
8. Chinese
9. Indian
10. Other Asian (i.e. Japanese, Korean)
11. Other [Specify]

Alcohol consumption

The following questions are about your drinking habits. Think about the last 4 weeks.

A1. Did you drink any alcohol?

1. Yes
2. No [will skip A2 – A6]

A2. On how many days did you have an alcoholic drink of any kind?

days in the last 4 weeks

A3. How many drinks did you have **per week** on average?

drinks per week

A4. On how many days did you have 5 or more alcoholic drinks on one occasion?

days in the last 4 weeks (if 0 skip A5)

A5. When you have 5 or more alcoholic drinks on one occasion, how many drinks would you normally have?

drinks

A6 How often do you think **other people** your age drank 5 or more alcoholic drinks per occasion?

days in the last 4 weeks

	How much has drinking alcohol, or not drinking alcohol, impacted any of the following? Think about the last 4 weeks	Very negatively impacted	Slightly negatively impacted	No impact	Slightly positively impacted	Very positively impacted
A7	Your relationship with your family					
A8	Your relationship with your friends					
A9	Your employment or job search activities					
A10	Your mental health					
A11	Your physical health					

	For each statement, please tell me how strongly you agree or disagree	Strongly disagree	Disagree	No preference	Agree	Strongly agree
A12	It's OK to get drunk as long as it's not every day					
A13	Drunkenness is acceptable in some situations					
A14	Binge drinking is part of the kiwi culture					
A15	I would stop drinking completely if I knew I was pregnant [female only]					

Audit-C

We will now ask you questions about your alcohol consumption in general. Your answers to these questions will help you find out more about your level of risk from your drinking.

	Question	0	1	2	3	4
AU1	How often do you have a drink containing alcohol?	Never (skip AU2 & AU3)	Monthly or less	2-4 times a month	2-3 times a week	4 or more times a week
AU2	How many drinks containing alcohol do you have on a typical day when you are drinking?	1 or 2	3 or 4	5 or 6	7 to 9	10 or more
AU3	How often do you have six or more drinks on one occasion?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily

[Risk calculation: 0-3 Low-risk drinking, 4-5 Moderate-risk drinking, 6+High-risk drinking]

Intervention and general information

T1 – Post intervention questionnaire

Knowledge and understanding

Hang in there, we're nearly there.

K1. What is the recommended number of drinks per night? A drink is a bottle of beer, small glass of wine, or a bottle of RTD.

drinks

K2. What is the recommended maximum number of drinks per week?

units

K3. Is 1 RTD and 2 large glasses of wine in one night above, below, or the same as the maximum recommended amount per night?

1. Below
2. Same
3. Above

Motivation

The following questions are about the next 4 weeks

M1. How **motivated** are you to reduce your drinking?

Not at all motivated	Not very motivated	A little motivated	Quite motivated	Very motivated	Extremely motivated

M2. How much **effort** are you prepared to put in to reducing your drinking?

No effort at all	Very little effort	A little effort	A bit of effort	A lot of effort	All my effort

M3. How motivated are you to **try hard** to reduce your drinking?

Not at all motivated	Not very motivated	A little motivated	Quite motivated	Very motivated	Extremely motivated

Health literacy

	How easy would you say it is to…	Very Difficult	Fairly Difficult	Fairly Easy	Very Easy	Don't Know
H1	understand health warnings about behaviour such as smoking, low physical activity, and drinking too much?					
H2	judge if the information on health risks in the media is reliable?					
H3	understand information in the media on how to get healthier?					
H4	judge which everyday behaviour is related to your health?					

Demographics part 2

A few last demographic questions.

D4. Which of these best describes where you live?

1. A rural area or small town (under 10,000 people)
2. A medium-sized town, large city, or major city (more than 10,000 people)

D5. In which of the following areas do you live?

1. Northland
2. Auckland
3. Waikato
4. Bay of Plenty

5. Gisborne
6. Hawke's Bay
7. Taranaki
8. Manawatu-Whanganui
9. Wellington-Wairarapa
10. Tasman
11. Nelson
12. Marlborough
13. West Coast
14. Canterbury
15. Otago
16. Southland

D7. Are you pregnant? [female only]

1. Yes
2. No
3. Don't know

D8. What is the highest qualification you have?

1. No formal qualifications
2. NCEA level 1 or 2 or equivalent
3. NCEA level 3 or equivalent
4. Trade or technical certificate
5. Tertiary (undergraduate or postgraduate)
6. Other [specify]
7. Prefer not to answer

D9. Do you currently suffer from a health condition?

1. Yes, physical health
2. Yes, mental health
3. Yes, both physical and mental health conditions
4. No
5. Prefer not to answer

Completion

We have now come to the end of the study. Thank you for taking part and we hope you have enjoyed doing it.

For your chance to win $50 in Warehouse Vouchers, please enter you email address below:

Your email address will not be linked to any of your answers. **It will only be used to contact you if you win and to invite you back in 4 weeks.**

We would like to ask you a few follow up questions in 4 weeks. This second part of the study will take about 5 minutes and if you complete it you will be entered in another lottery with a chance to win $100 in Warehouse Vouchers.

Remember, if you think you may have a drinking problem or want help to decrease your drinking, there is help available to you.

You can get help from the Alcohol Helpline - a confidential information, advice, and referral service for people with questions about their own or someone else's drinking or drug use.

If you want help managing your drinking, you can find information and useful tools at:

- www.alcohol.org.nz
- www.health.govt.nz/your-health/healthy-living/addictions/alcohol-and-drugs

If you have any questions or concerns about the study you can contact us at admin@alcoholstudy.co.nz