Changes and influences on adolescent drinking in New Zealand

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Changes and influences on adolescent drinking in New Zealand

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Contents

Acknowledgements

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Executive summary

Key messages

- **Longitudinal survey data were used to track drinking patterns among adolescents (16 to 17-year-olds) and the wider population (16 to 65-year-olds) from 2011 to 2015.**
- **By the time they were 20 to 21-years-old, adolescents had decreased the quantity of alcohol they drank on a typical occasion compared to when they were 16 to 17-years-old (but still drank at a high risk level).**
- **The decrease was largely driven by a decline in drinking among heavier drinkers, rather than a population level shift.**
- **While certain measures (eg, tobacco smoking and cannabis use) were associated with heavier drinking, change over time in these measures did not explain the decrease in adolescent drinking.**

The study

Adolescent drinking has declined in many high-income countries since the 2000s, mainly among adolescents under 18-years-old. There is currently no consensus as to why declines have occurred. Little is known about whether adolescent levels of consumption have declined due to wider collective changes in drinking (Pape, Rossow, & Brunborg, 2018). Further, there is a range of factors that may specifically influence adolescents' consumption.

This study used three waves of longitudinal data covering the period 2011 through 2015 to understand what factors may have been influencing change in adolescent drinking in New Zealand.

It assessed if adolescents' drinking behaviour has changed similarly/differently from adults. Both average drinking patterns and drinking trajectory analysis were used to do so. The study also explored specific factors that may be related to declines in drinking trajectories.

Results

When average drinking patterns were assessed, the quantity of alcohol consumed on a typical drinking occasion decreased over the three survey waves, with younger age groups decreasing more than the older age groups.

Those who were heavy drinkers at survey wave 1 decreased the most over the three survey data points.

Among the 16 to 17-year-olds (at wave 1), this meant that the decline in heavier drinking translated through to emergent adulthood (at wave 3: 20 to 21-years-old).

This finding denotes a departure from previous New Zealand longitudinal trajectories where the quantities of alcohol consumed have increased in transition from adolescence through to emergent adulthood.

Although declines were found in the heavier drinking trajectories, most drinkers still consumed alcohol at levels of around six drinks or above by wave 3, placing them at high risk of experiencing the harmful effects of alcohol.

It appears that adolescent changes in consumption are not simply reflecting those found among the wider population. Changes over time differed among 16 to 17-year-olds relative to those aged 16 to 65-years-old. Further, the changes over time among 16 to 17-year-olds did not appear to be explained by a collective shift in consumption (defined here as different consumption levels moving in the same direction).

The analysis looked at a range of measures to understand drinking trajectory membership, including policy, social and behavioural factors. The analysis also considered whether change in these variables predicted membership to the trajectory with the greatest decrease.

- For 16 to 17-year-olds, being socially supplied by a friend and using cannabis or smoking tobacco were among the measures that predicted membership to the heavier drinking trajectory.
- In addition to using cannabis or smoking tobacco, for the 16 to 65-year-olds, late-night purchasing, ethnicity and liking alcohol adverts were also important in predicting membership to the heavier drinking trajectory.
- No clear patterns were found when changes in these measures were modelled to try and explain membership to the trajectory with the greatest decrease.

Implications

This study raises broad and important questions of what measures research needs to look at in order to understand declines in adolescent drinking. The findings from this study may provide some support for a culture of early alcohol maturity. Heavy drinking declined as 16 to 17-year-olds reached 20 to 21-years-old which is earlier than generally found previously. Going beyond alcohol-specific factors may also be useful, for example, considering the effects of broader societal changes such as investigating lifestyle changes, a more in-depth assessment of the effects of social media, or a better understanding of generational differences and influences.

Introduction

Adolescent drinking has declined in many high-income countries since the 2000s, mainly among adolescents under 18-years-old (Pape et al., 2018). Heavier drinking is now less likely and average levels of consumption have declined. Such trends have been found in numerous European countries, in the US, Australia and New Zealand (Pape et al., 2018; Raninen & Livingston, 2018). In New Zealand, comparable cross-sectional surveys have documented a significant decline in heavier drinking. The New Zealand Health Survey found the prevalence of hazardous drinking (AUDIT score 8+) among adolescents aged 15 to 17 declined from 19.5% in 2006/07 to 11.5% by 2015/16 (however there was variation in between these years) (Alcohol Healthwatch, 2018). A national school-based survey found a decline in binge drinking[1] in the last four weeks among 15 to 16-year-olds, from 34% in 2007 to 23% in 2012 (Clark et al., 2013).

There is currently no consensus as to why declines have occurred in high-income countries including New Zealand. While some studies have assessed possible factors that might be affecting declines among adolescents, no conclusions have been drawn. Little is known about whether adolescent levels of consumption have declined due to wider collective changes in drinking (Pape et al., 2018). Further, there are a range of factors that may specifically influence teenagers' consumption. Therefore, developing evidence and extending our understanding as to the mechanisms driving this change would be useful to inform governments' and policy makers' efforts to support and maintain it.

Collective declines in drinking?

The theory of drinking collectivity states that when total consumption (per capita) increases or decreases, all groups of drinkers change their alcohol consumption in the same direction, via social diffusion processes (Oldham et al., 2019; Pape et al., 2018). In New Zealand, per capita consumption has generally been declining (Alcohol Available for Consumption, from Stats NZ, 2019). It is possible that this wider context has influenced adolescent declines in consumption in New Zealand.

Most studies that have assessed declining adolescent consumption have not included respondents who were aged 18+ (Pape et al., 2018). As such, little is known about whether or not adolescent declines are simply reflective of patterns in the wider population. One study, from England, analysed if declines in the number of drinks in the past week among 11 to 15-year-olds were in line with changes in total consumption. It found that declines in consumption in all percentiles among the 11 to 15-year-olds were in line with mean decreases in population consumption, although the relationship was more pronounced in moderate drinkers (Oldham et al., 2019). A study from Australia assessed age-specific trends among both adults and adolescents. It found that declines in mean average

[1] Defined as five or more drinks in one 4-hr session.

consumption[2] were concentrated among adolescents and young adults and that this was likely to be a driver of the decline in total consumption (Livingston, Callinan, Raninen, Pennay, & Dietze, 2018).

Some studies have looked at whether there have been collective shifts in drinking among adolescents across the consumption distribution ie, if different levels of consumption (heavy versus light drinkers) have all been changing in the same direction. A study from England among those aged 11 to 15 between 2001 and 2016 found that the number of drinks in the past week declined across the consumption distribution, suggesting a collective shift, but that the magnitude of decline decreased proportionally less among the lightest, moderate and very heaviest youth drinkers (Oldham et al., 2019). Other studies, from Scandinavia (Norway and Sweden) have also found evidence of a collective shift in drinking declines among adolescents (Brunborg, Bye, & Rossow, 2014; Norström & Svensson, 2014; Raninen, Livingston, & Leifman, 2014). On the other hand, different studies from Sweden have not (Hallgren, Leifman, & Andréasson, 2012; Zeebari, Lundin, Dickman, & Hallgren, 2017). One study found that the heaviest 5-10% of drinkers aged 15 to 16 and 18 to 19 did not reduce their average consumption or binge drinking relative to other consumption levels (Hallgren et al., 2012). A literature review from 2018 reported that currently there are too few studies to draw conclusions about collective shifts either way (Pape et al., 2018).

Specific factors contributing to declines

It is also possible that there are factors specifically operating on adolescents to reduce their drinking levels. Changes in alcohol policy including decreased affordability (eg, Baška, Madarasová-Gecková, Bašková, & Krajčovič, 2016; Bhattacharya, 2016), increased purchase age (eg, Andersen, Rasmussen, Bendtsen, Due, & Holstein, 2014) or shorter trading hours (White et al., 2018) have all been found to contribute to decreases in some adolescent drinking patterns. However, policy changes have not necessarily occurred in all jurisdictions where adolescent drinking has declined therefore do not wholly explain the cross-national nature of the declines (Pape et al., 2018).

In Australia and England, there is some evidence that adolescents are becoming less approving of binge drinking (Fuller & Hawkins, 2013; Livingston & Callinan, 2017). A qualitative study published in 2019 found that a culture change may have occurred among young people where drinking and intoxication have lost their symbolic power as a rite of passage into adulthood. The study also suggested that there was less peer pressure to drink and more room for competing activities (Törrönen, Roumeliotis, Samuelsson, Kraus, & Room, 2019).

Changes to permissive parental and/or social environment/friends' attitudes or behaviours may also be related to declining adolescent drinking trends. In Finland, a decline in heavy

[2] Defined as the average volume of pure alcohol consumed by drinkers in the week before responding to the survey.

episodic drinking[3] among 15 to 16-year-olds between 1999–2015, was best explained by increased difficulty in obtaining alcohol, an increase in parents knowing where the young person was on Friday nights and a decrease in risk associated with going out with friends to drink (Raitasalo, Simonen, Tigerstedt, Mäkelä, & Tapanainen, 2018). A study from Australia found that reductions in parent favourable attitudes and availability of substances (alcohol, tobacco and cannabis) were related to declines in lifetime use but not past month alcohol use from 1995 to 2015 (Toumbourou et al., 2018).

There are indications that the decline in drinking could be part of a wider trend in health consciousness among adolescents. A New Zealand study found cannabis use (ever) decreased between 2001 and 2012 (as did the proportions who never used other illegal psychoactive drugs) (Ball et al., 2019). Tobacco smoking has also been declining among adolescents in many high-income countries (World Health Organization, 2014) and health-oriented adolescents have been found to drink much less (Pennay et al., 2018). A qualitative study from Sweden found that adolescents may also be more concerned with putting public health risk messages into practice (Törrönen et al., 2019).

Longitudinal data versus cross-sectional data

Most studies conducted, including those reviewed above, have assessed adolescent declines in consumption using cross-sectional data. There is a lack of recent longitudinal studies, that can be used to shed light on alcohol consumption through developmental stages among adolescents and young people.

Studies analysing longitudinal drinking trajectories from New Zealand, although limited in number, have been conducted. These studies were, however, undertaken using data prior to the trend of declining adolescent consumption during the 2000s. A study using data from the Christchurch Health and Developmental Study found that all adolescents, across different trajectories, increased their consumption as they aged from 14 through to 16-years-old (Boden, Newton-Howes, Foulds, Spittlehouse, & Cook, 2019). Another study, among older adolescents and young adults, found that quantity consumed on a typical drinking occasion increased up until 21-years-old, after which most trajectories declined (Casswell, Pledger, & Pratap, 2002).

The study

Adolescent drinking behaviour is changing and there is a need for more research to understand why drinking levels are declining among adolescents. Most studies conducted in this area have used cross-sectional data and there is a lack of longitudinal studies.

[3] Defined as the number of times 6+ drinks were consumed during the past 30 days.

This study used three waves of longitudinal data, collected between 2011 to 2015, to understand what factors may have influenced change in adolescent drinking in New Zealand. It assessed whether adolescents' drinking behaviour has changed differently from adults and if change has occurred at different drinking levels. The study used both average drinking patterns and drinking trajectory analysis. The study also explored specific factors that may be related to declines in drinking.

Aims

1. To determine if, and what, changes in drinking behaviour have occurred from 2011 to 2015, by age group in New Zealand.
2. To determine if adolescents' drinking behaviour has changed differently from adults.
3. To determine trajectories of drinking patterns among adolescents (16 to 17-year-olds) and the general population (16 to 65-years-old) and to explore measures that predict a) trajectory membership and b) how changes in underlying factors predict membership to the trajectory with the greatest rate of decrease.

Methodology

Sample

Recruitment

This research used data previously collected as part of the International Alcohol Control (IAC) Study[4]. A cohort design with random replenishment samples was used. Survey samples of drinkers aged 16 to 65 were collected in 2011, 2013 and 2015. Independent samples of adolescents aged 16 to 19 were also collected in 2012, 2013 and 2015 (and 16 to 17-year-olds were used from these samples, to reflect adolescent underage drinkers).

For the 16 to 65-year-old sample, a national stratified sample of residential landline numbers comprised the sample frame, including published and unpublished landline numbers in 2011. All respondents were followed-up in 2013 and 2015 and those lost to follow-up were replenished randomly (in 2013 and 2015 the random replenishment samples also included randomly generated cell phone numbers). The process was the same for the samples of 16 to 19-year-olds collected in 2012, 2013 and 2015.

Once a household was recognised as residential, numerous call backs were made at different times of the day and days of the week in order to attempt to reach the household. Once a household was contacted, eligible individuals were enumerated, and one respondent was selected at random by the computer/tablet. A screening interview established eligibility for participation in the study (drinking in the last six months and 16 to 65-years-old). To acknowledge the time respondents gave to the study, respondents were given koha at each wave.

Baseline response rates

Considerable effort was put into minimising refusals in the baseline data collection and thereby maximising the response rate. Baseline response rates were 70% (2012) for the adolescent sample and 60% for the 16 to 65-year-old sample (2011).

Longitudinal follow-up and attrition

Baseline respondents were followed-up in two subsequent waves in 2013 and 2015. This meant for the adolescent survey, follow-up waves were one year and then two years apart. For the 16 to 65-year-old sample, the follow-up waves were each two years apart. Respondents were also contacted in-between waves to try to minimise attrition.

Attrition for the adolescent sample was 23% at 2013 and 46% by 2015. Attrition for the 16 to 65-year-old sample was 33% at 2013 and 45% by 2015. A greater number of heavier

[4] https://www.iacstudy.org/

drinkers (defined as 6+ drinks of 12.7 ml ethanol) were lost to follow-up, as compared to lighter drinkers, however, the difference was not significant. Heavier drinkers were lost in relatively similar proportions across age, gender and ethnicity groups.

Multiple imputation

Multiple imputation via chained equations was used to control for any bias due to attrition (Deng, Hillygus, Reiter, Si, & Zheng, 2013). This was done separately for the 16 to 19-year-old sample and the 16 to 65-year-old sample. Respondents who completed a survey at wave 1 were imputed for any future waves, if they had missing data, to allow for a complete longitudinal sample 2011 through 2015 (or 2012 through 2015 in the case of the adolescent sample). All data, including replenishment samples, were used to inform the imputation (replenishment samples were not included directly in the analysis, only to inform the imputation).

One hundred imputed datasets were used for each sample (aged 16 to 17 and 16 to 65). For a full description of how the multiple imputation was undertaken see Appendix 1.

Sample sizes

The sample sizes at baseline were n = 412 for the 16 to 17-year-olds and n = 1,996 for the 16 to 65-year-olds.

How the survey data relate to the study aims

We analysed longitudinal survey data from two separate samples: a) 16 to 17-year-olds (from an adolescent only sample) and b) 16 to 65-year-olds, to provide a comparison for the 16 to 17-year-olds.

For aim 1 & 2 (average drinking patterns)

- We used the 16 to 65-year-old sample to determine if, and what, changes in drinking behaviour occurred from 2011 to 2015 by age group in New Zealand and if average patterns of adolescents' drinking behaviour changed differently from adults.

For aim 3 (trajectories)

- We used the 16 to 17-year-olds from the adolescent-specific sample and the 16 to 65-year-old sample separately to determine trajectories of quantity of alcohol consumed on a typical drinking occasion.

Measures

Outcome measures

Frequency of drinking and the quantity of alcohol consumed on a typical drinking occasion were collected using a within-location beverage-specific framework developed for National New Zealand Alcohol Surveys (Casswell, Huckle, & Pledger, 2002). This measure has also been used internationally as part of the IAC Study (Huckle et al., 2018).

The measure first asks about typical frequency of drinking in all locations in which drinking occurs. The locations need to be linked to a physical setting and be mutually exclusive. The measure next asks beverage-specific questions for each location in which respondents drink. Respondents report their consumption of different beverages in their own terms and interviewers code these by using containers and glass sizes in which alcohol is commonly served and sold. In this way, respondents do not have to 'calculate' and report their consumption in terms of standard drinks which is likely to introduce error. Calculation of the quantity of millilitres of ethanol can be made using the appropriate assumptions regarding alcohol content for each beverage and container size (based on best available data) (Huckle et al., 2018). These measures have been shown to account for around 90% of the alcohol available in New Zealand (Casswell, Huckle et al., 2002; Huckle et al., 2018).

Quantity of alcohol consumed on a typical drinking occasion: the quantity of ethanol in millilitres (mls) consumed on a typical drinking occasion in the past six months.

Frequency of drinking: the number of drinking occasions in the past six months.

Explanatory measures

Policy measures

Underage access to alcohol

Respondents under 18-years-old reported how often they were asked to show age identification when purchasing alcohol. This variable was measured on a scale of 1: none of the time, to 10: all of the time. For the analysis, if frequency of being asked for identification was 6 or above then this was coded 1 (most/all of the time), otherwise coded as 0.

Physical availability

Respondents were asked to report how much time it took them to travel to the usual place where they purchased or obtained alcohol. Time to access alcohol was coded as '1' if five minutes or less, or '0' if more than five minutes.

Marketing exposure and liking

Respondents were asked to rate, on a scale from 1-10, how often they had noticed things that promoted alcohol in the last six months and how they felt about alcohol adverts on the

whole; if they liked or disliked them. For both of these measures, if respondents reported 6-10 their response was coded as yes (1) (noticed or liked alcohol adverts) and if their response was 1-5, this was coded as no (0).

Late purchasing

Respondents reported the times at which they had purchased alcohol from on and off-licensed premises. If respondents purchased from on-premises after 3am their response was coded as yes (late purchaser), otherwise coded as no. If respondents purchased after 11pm from off-premises their response was coded as yes (1) (late purchaser), otherwise coded as no (0). In some instances, late purchasing from on and off-premises was combined to maximise numbers for analysis (and where this occurred is denoted later in the report).

Affordability

Respondents were asked to rate, on a scale from 1-10, how affordable alcohol was to them currently, with 1 being very unaffordable and 10 being very affordable. If respondents reported 6-10 their response were coded as yes (1) (perceived alcohol to be affordable) and if 1-5 was coded as no (0).

Social mechanisms

Permissive parental and/or social environment/friends

Measures of social supply of alcohol were used as an indicator to measure permissive parental and or social environment/friends. Respondents under 18-years-old, the legal purchase age, were asked if they were supplied alcohol socially by parent/caregiver (yes/no), supplied alcohol socially by a friend (yes/no), and supplied alcohol socially by another relative (yes/no). These measures were included in the analysis for 2012 only. As the analysis was longitudinal, in the follow-up surveys, the 16 to 17-year-olds became legally permitted to purchase, making social supply less relevant.

Indicators of health consciousness - other health behaviours

Tobacco use

Respondent reports of tobacco smoking were assessed by asking respondents if they “had ever smoked cigarettes or tobacco at all, even just a few puffs?”, and if so, “how often do you now smoke?” (response options: you don't smoke now, at least once a day, at least once a week, at least once a month, less often than once a month). Respondent responses were then re-coded as yes (1) (current smoker at any frequency) otherwise no (0).

Cannabis use

Respondents were asked “Have you ever tried marijuana?” and if yes, “How often in the last six months have you used marijuana?” (response options ranged from never to daily). Responses were re-coded as yes (1) (current user at any frequency) otherwise no (0).

Satisfaction with health

Respondents were asked to rate, on a scale from 0-10 (an 11 point scale), how satisfied they were with their health, with 0 being completely dissatisfied and 10 being completely satisfied. Respondent responses of 6-10 were coded as satisfied and 0-5 coded as unsatisfied.

Other measures

Respondents were also asked if they had received help to reduce their level of drinking in the last six months. Reponses options were coded as yes (1) and no (0).

Demographics

Demographic variables collected included age, gender, ethnicity (multi-response but prioritised for analysis) and education (categorised as <10 years (Low); 11-12 years (Medium); 13+ years (High)).

Analysis

Average consumption patterns (Aim 1 and 2)

Generalised linear models were used for analysing the longitudinal responses of the drinkers (quantity of alcohol consumed on a typical drinking occasion, frequency of drinking). Correlation among the longitudinal responses was undertaken considering a Generalised Estimating Equation (GEE) approach in the models. This analysis was undertaken using SAS 9.4.

Trajectory analysis (Aim 3)

The trajectory analysis focused on the quantity of alcohol consumed on a typical drinking occasion given this measure is related to acute harm. Further, the only increase in frequency of drinking found in Aim 1 & 2 was for the 16 to 17-year-olds and this was most likely because they became legally able to purchase by the second and third surveys.

A trajectory analysis of the quantity of alcohol consumed on a typical drinking occasion was implemented using the method of Jones, Nagin and Roeder (2001) considering a censored normal distribution for the outcome. Trajectory parameters are estimated, and individuals are assigned to a trajectory group on a probability basis. Trajectory groups are not pre-specified. Trajectory analysis was conducted for males and females separately to understand if trajectories differed between these groups. Point estimates, standard errors, confidence intervals and *p* values were obtained using PROC MIANALYSE in SAS 9.4, after adapting the output generated by the estimation of the trajectory groups. Trajectory analysis was undertaken in SAS 9.4 by implementing the Proc Traj SAS macro (see Jones et al., 2001).

All the analyses were carried out by combining the model results over approximately 100 imputed datasets.

Once the respondents had been assigned to a trajectory group, ordinal logistic regression models were used to find variables to predict group membership. As the assumption of proportionality did not hold, adjacent-category logit regression models were used when modelling more than two groups. Socio-demographic variables, policy measures, social mechanisms and other health behaviours observed at the first wave were used to predict whether a respondent belonged to a trajectory group with heavier consumption. Additionally, some interactions were tested among the socio-demographic covariates, but they were not significant. A second set of logistic regression models was used for assessing if the changes in these measures were related to trajectory membership (specifically the trajectory that showed the greatest rate of decrease). The estimated trajectory membership (groups) was treated as the outcome. For a full description of the trajectory analysis see Appendix 1.

Results

Composition of the samples by age group, prioritised ethnicity, gender and education are reported in Table 1 (see Appendix 2).

Average drinking patterns (Aim 1 & 2)

The following section presents results from the 16 to 65-year-old sample only and reports if, and what, changes in average drinking patterns occurred over the waves 2011, 2013 and 2015, by age group. It also explores if average patterns of adolescents' drinking behaviour changed differently from adults. All measures refer to the past six months.

Quantity of alcohol consumed on a typical drinking occasion over the survey waves

The average quantity of alcohol consumed on a typical drinking occasion in the past six months declined significantly over the survey waves among 16 to 65-year-olds. In terms of number of drinks, the decline was from 4.7 drinks at wave 1, to 4.2 drinks at wave 2 to 3.5 drinks at wave 3. A drink was defined here as 12.7 millilitres of ethanol.

Average quantity[5] by age group

The figures below report age group "at wave 1". For example, as the data are longitudinal, the 16 to 17-year-olds in 2011 were 20 or 21-years-old by 2015.

The average quantity of alcohol consumed on a typical drinking occasion was higher among the younger age groups relative to the older age groups. Significant decreases in the average quantity consumed were found between 2011 and 2015 for drinkers in all age groups in the past six months, except the 55+ group. The size of the decrease was greater for adolescents and young people (16 to 17, 18 to 19 and 20 to 24-years-old) relative to the older age groups (Figure 1).

Average quantity by age group and gender

Male drinkers aged 20 to 24 and 25 to 44 showed a significant decrease in the average quantity of alcohol consumed on a typical drinking occasion in the past six months in 2011 compared with 2015 (Figure 2). There were no statistically significant differences for female drinkers.

[5] Average quantity refers to the average quantity consumed on a typical drinking occasion.

Figure 1: Average quantity of alcohol consumed on a typical drinking occasion by age group over the survey waves.

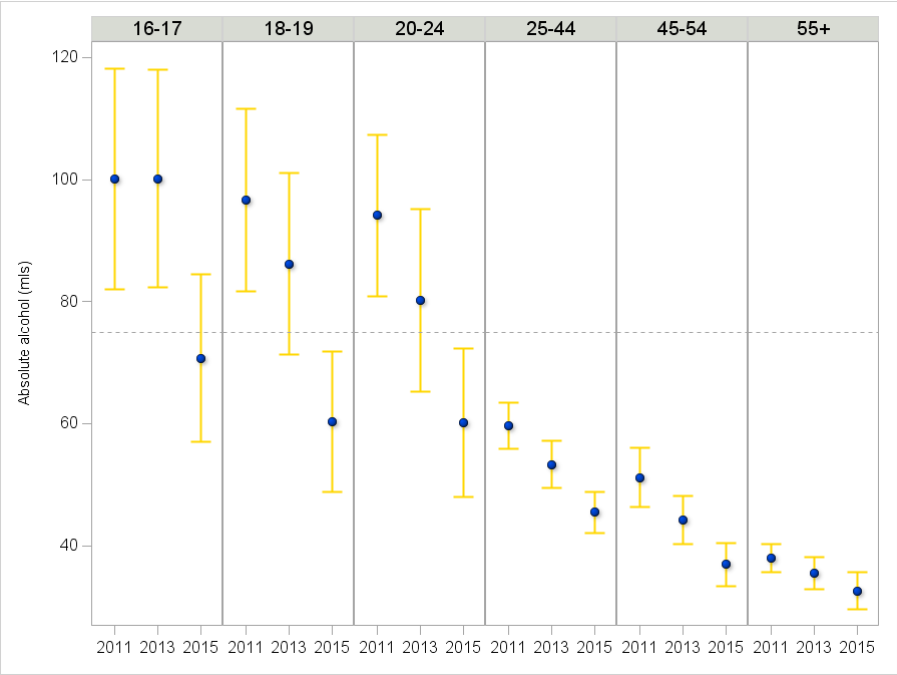
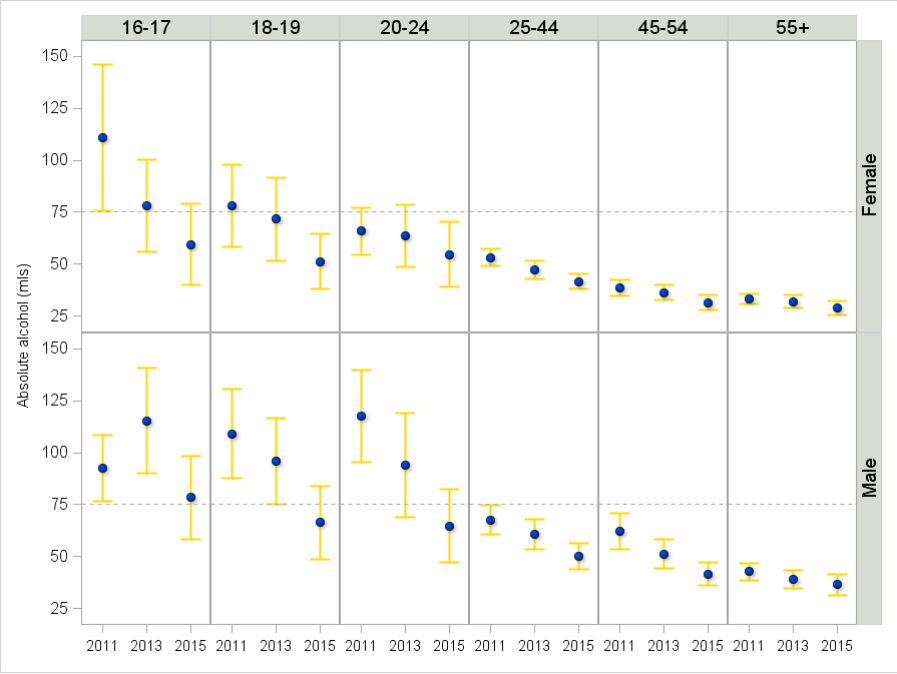


Figure 2: Average quantity of alcohol consumed on a typical drinking occasion by age group and gender over the survey waves.

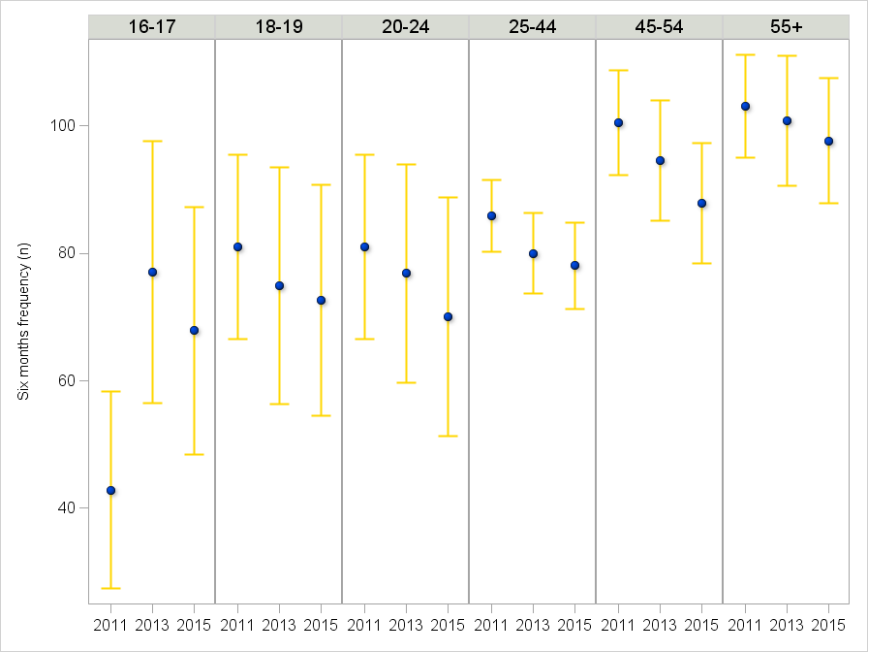


Frequency of drinking over the survey waves

There was no significant change in frequency of drinking in the past six months among 16 to 65-year-olds. Drinking frequency was around three times a week at each survey wave. Average frequency was higher among the older age groups, in particular those aged 45 to

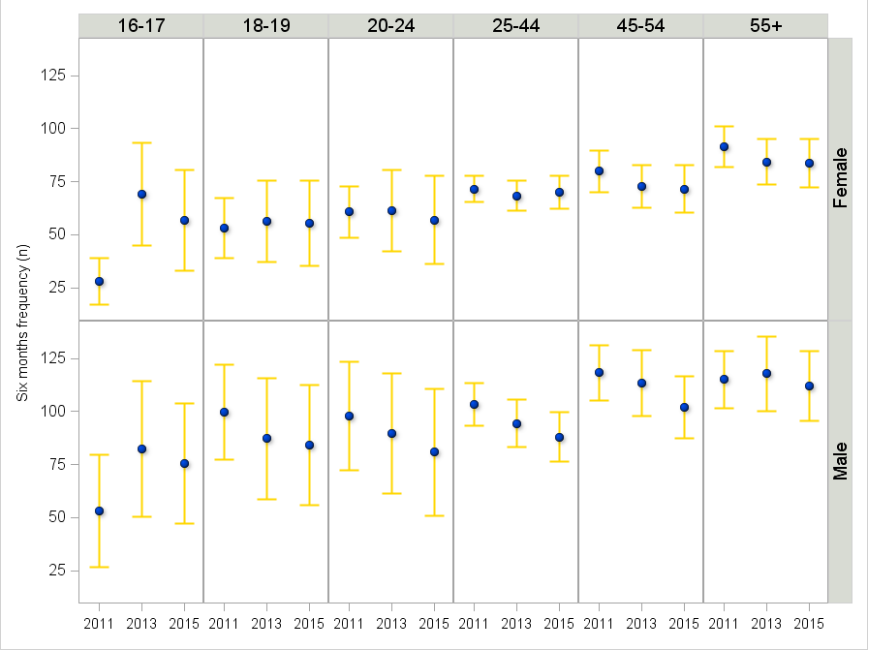
54 and 55+, relative to the younger age groups. For drinkers aged 16 to 17, an increase in frequency was found between 2011 and 2013. No other significant changes were found for any other age groups (Figure 3).

Figure 3: Average frequency of drinking by age group over the survey waves.



The average frequency of drinking among females of all age groups was observed to be lower than their male counterparts. Female drinkers aged 16 to 17 significantly increased their frequency between 2011 and 2013, whereas male drinkers aged 16 to 17 did not. No other significant changes in frequency were found (Figure 4).

Figure 4: Average frequency of drinking by age group and gender over the survey waves.



Trajectories (Aim 3)

The following section presents trajectories of drinking patterns using separate samples of 16 to 17-year-old drinkers and 16 to 65-year-old drinkers and the factors that predicted trajectory membership.

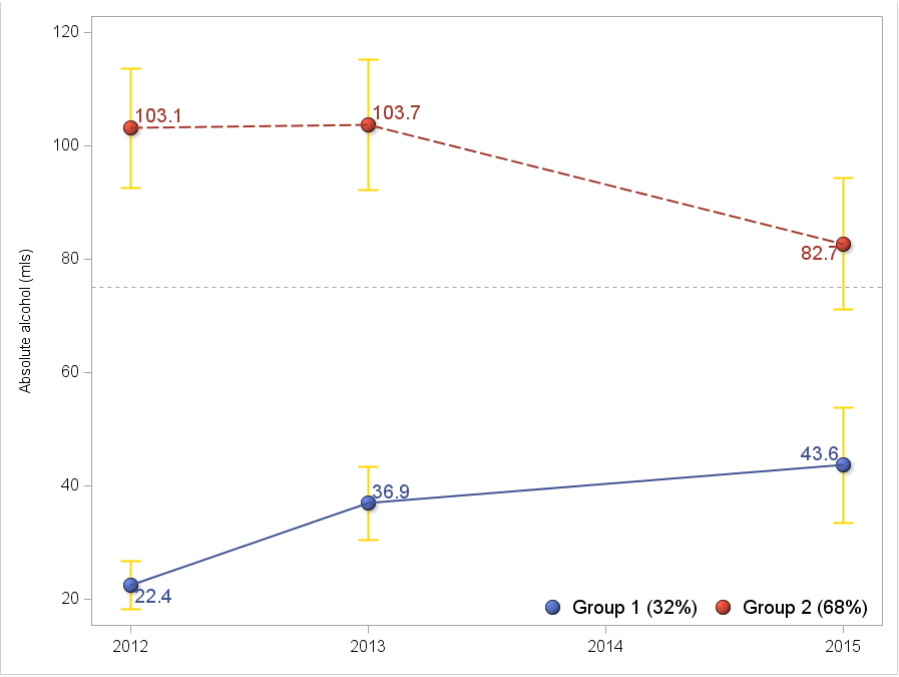
The trajectory analysis focused on the quantity of alcohol consumed on a typical drinking occasion given this measure is related to acute harm. Further, the only increase in frequency of drinking found in Aim 1 & 2 was for the 16 to 17-year-olds (at first measurement) and this was most likely because they became legally able to purchase by the second and third surveys.

Models aiming to determine how changes in measures predicted membership to the trajectory with the greatest rate of decrease showed no clear patterns for any of the trajectories (see Appendix 4, Table 4 for tabulated results and further description).

Trajectories for 16 to 17-year-olds

Two trajectories were identified among male drinkers aged 16 to 17. Group 1 (32% of the sample) was comprised of drinkers that increased from an average of 1.8 drinks[6] to 3.4 drinks. Group 2 (68%) was comprised of heavier drinkers who decreased from an average of 8.1 drinks in 2012 to 6.5 drinks in 2015 (Figure 5).

Figure 5: Trajectories for 16 to 17-year-old male drinkers: quantity of alcohol consumed on a typical drinking occasion.

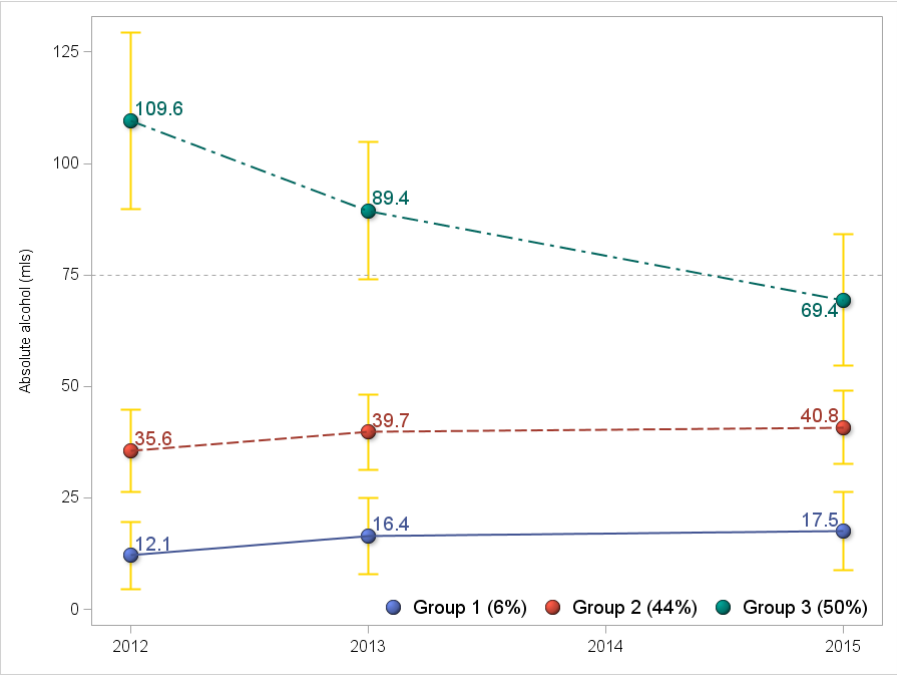


[6] Defined as 10g or 12.7ml of ethanol.

Factors that predicted membership to Group 2 (compared to Group 1) among young males, were if at wave 1 (year 2012) they were supplied alcohol socially by a friend, if they smoked tobacco or used cannabis. No other variables included in the model were significant (eg, underage access, physical availability, marketing exposure and liking, affordability, satisfaction with health or level of education). See Appendix 3 for tabulated results (Table 2).

Three trajectories were identified for female drinkers aged 16 to 17. Group 1 (6%) and Group 2 (44%) were statistically stable over time. Drinkers in Group 1 consumed on average 1 drink in 2012 to 1.4 drinks in 2015. For drinkers in Group 2 it was 2.8 drinks in 2012 to 3.2 drinks in 2015. Group 3 (50%) decreased from on average 8.6 drinks in 2012 to 5.5 drinks in 2015 (Figure 6).

Figure 6: Trajectories for 16 to 17-year-old female drinkers: quantity of alcohol consumed on a typical drinking occasion.

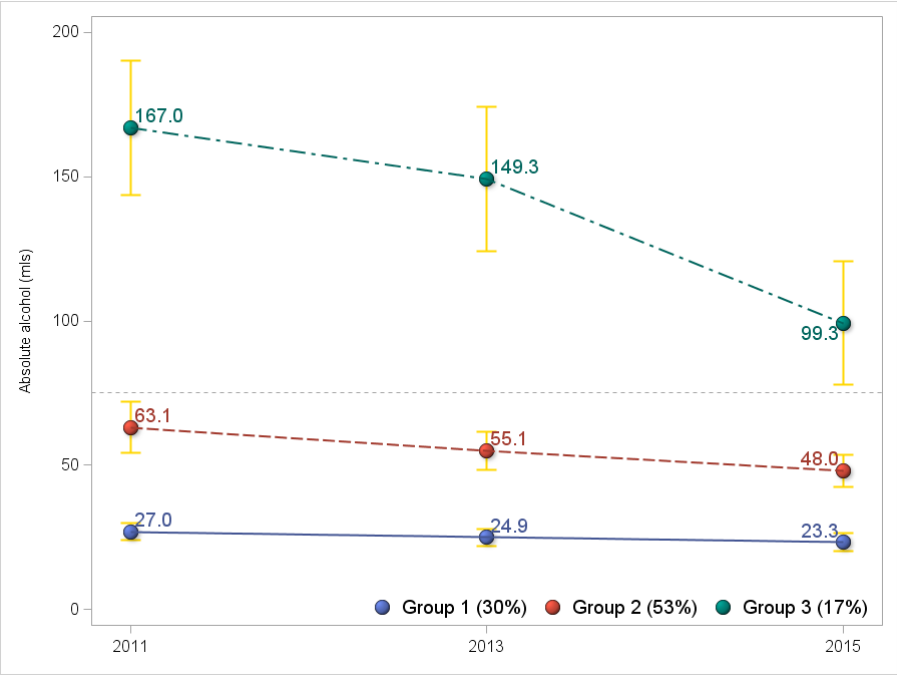


Female drinkers aged 16 to 17 were more likely to be heavier drinkers if they were Māori, and at wave 1 were supplied alcohol socially by a friend and/or smoked tobacco. They were more likely to be in lower quantity group if they were of Asian ethnicity (see Appendix 3 for model results - Table 2).

Trajectories for 16 to 65-year-olds

Three trajectories were identified for male drinkers aged 16 to 65. Group 1 (30%) decreased from an average of 2.1 drinks in 2011 to 1.8 drinks in 2015; Group 2 (53%) decreased from on average 5 drinks to 3.8 drinks. Group 3 (17%) were heavier drinkers that decreased at a greater rate relative to the other trajectories (from on average 13.1 drinks in 2011 to 7.8 drinks in 2015) (Figure 7).

Figure 7: Trajectories for 16 to 65-year-old male drinkers: quantity of alcohol consumed on a typical drinking occasion.

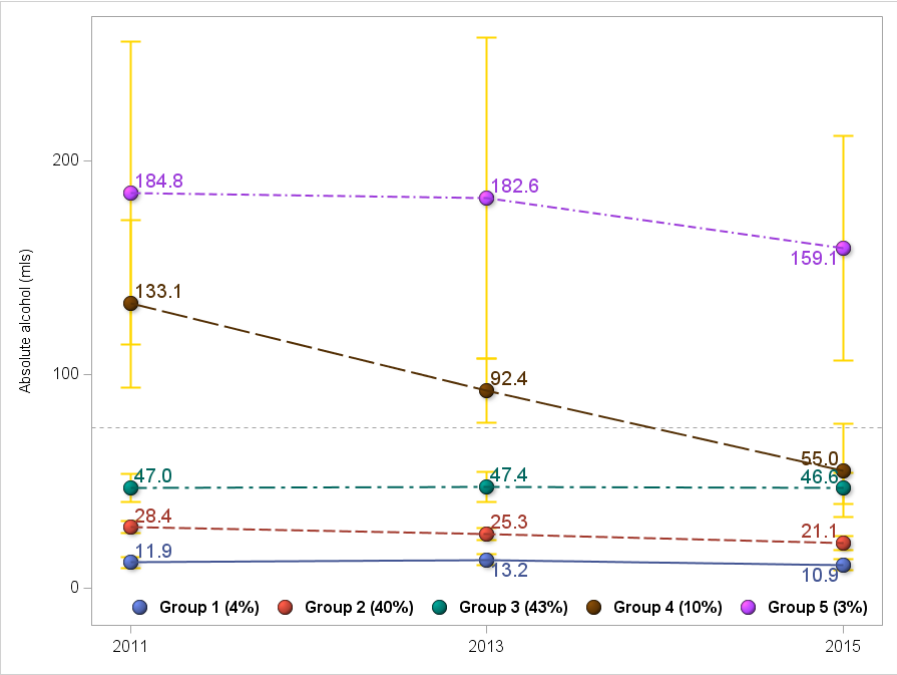


Male drinkers aged 16 to 65 were more likely to be heavier drinkers if they were Māori or Pasifika, and at wave 1, liked alcohol advertising, purchased from off-premises after 11pm, smoked tobacco or used cannabis. Males were more likely to be in a lower quantity group if they were of older age and had higher education (see Appendix 3, Table 3 for model results).

Five trajectories were identified for female drinkers aged 16 to 65. Group 1 (4%) was statistically stable (at around 1 drink) over the time. Group 2 (40%) decreased from 2.2 drinks in 2011 to 1.7 drinks in 2015. Group 3 (43%) was statistically stable (at an average of around 3.7 drinks). Group 4 (10%) decreased from on average 10.5 drinks in 2011 to 4.3 drinks in 2015 and Group 5 (3%) was statistically stable at on average 14.5 drinks to 12.5 drinks (ie, was comprised of heavier drinkers) (Figure 8).

Female drinkers aged 16 to 65 were more likely to be in a higher quantity group if they were Māori or Pasifika, and, at wave 1, liked alcohol advertising, smoked tobacco or used cannabis. Females were more likely in a lower quantity group if they were satisfied with their health, were of older age and had medium or high education, relative to lower education (see Appendix 3, Table 3 for model results).

Figure 8: Trajectories for 16 to 65-year-old female drinkers: quantity of alcohol consumed on a typical drinking occasion.



Discussion

Most international studies assessing declines in adolescent consumption have used cross-sectional data. The current study utilised longitudinal data to assess both average drinking patterns and drinking trajectories. The two types of analysis revealed different findings[7].

Average consumption

When average drinking patterns were assessed it was found that average quantity of alcohol consumed on a typical drinking occasion (Aims 1 & 2) decreased over the three survey waves. Younger age groups decreased their typical occasion quantity more than the older age groups. This finding is in keeping with a cross-sectional study that found that decreases in average consumption between 2001 and 2014 were concentrated in the younger groups in the Australian population (Livingston et al., 2018).

Longitudinal trajectories

The longitudinal trajectory analysis (Aim 3) found that the decline in quantity of alcohol consumed on a typical drinking occasion was concentrated among the heavier drinking trajectories. This was the case for both males and females.

For the 16 to 17-year-olds (at wave 1) who aged through to 20 to 21-years-old (by wave 3), the decline seen among the heaviest drinkers denotes a departure from the usual behaviour (in transition from adolescence through to emergent adulthood) found previously. Prior New Zealand research using longitudinal trajectory analysis found that quantities increased through adolescence for all trajectories (Boden et al., 2019). Similarly, increases in quantity trajectories have been found up to 21-years-old (Casswell, Pledger et al., 2002).

The previous studies were undertaken prior to the more recent trend of declining adolescent consumption. The findings from the current study suggest that declines in heavier drinking among the 16 to 17-year-olds (at wave 1) are translating through to emergent adulthood (20 to 21-years-old). A recent trajectory analysis from New York found a small decrease in the average drinks consumed per day between emergent adulthood (around age 23) and young adulthood (age 33 years) (Windle, 2020). However, in the current study we found decreases by age 20 to 21-years-old.

Although declines occurred among the heavier drinking trajectories, drinkers in these trajectories were still at high-risk of experiencing harm. Most heavier drinking trajectories still remained at the level of drinking around 6+ drinks on a typical drinking occasion by wave 3.

[7] The difference in findings between the average quantity of alcohol consumed on a typical drinking occasion and the trajectory analysis is related to the relative size of the trajectory groups and the homogeneity (heterogeneity) within (between) the groups.

Consuming at these levels places drinkers at high-risk for a range of injuries and alcohol-related diseases including cancer (Babor et al., 2010; National Health and Medical Research Council, 2009).

A collective shift in drinking

This study looked broadly to understand if a collective shift occurred as we did not set out to empirically test this theory. The results from the 16 to 17-year-old trajectories provided no evidence of a collective shift. Within the 16 to 17-year-olds, while the heavier trajectory declined, the lighter trajectories increased (for males) or remained stable (for females) meaning there was a narrowing of the gap between the groups.

These findings differ from some international studies that have found evidence for adolescents' consumption declining at all levels (Brunborg et al., 2014; Norström & Svensson, 2014; Oldham et al., 2019; Raninen et al., 2014). However, these studies have used cross-sectional data and not longitudinal data trajectories and so direct comparison is not possible. It also appears that adolescents are not simply reflecting changes found among drinkers in the general population, as the 16 to 17-year-old trajectories differed from those among the 16 to 65-year-olds.

Other possible explanatory factors

One aspect of the study was to try to explain drinking trajectory membership (Aim 3). Variables available were those related to policy, social mechanisms, indicators of health consciousness and demographics.

Some variables were found to predict membership to the heavier drinking trajectory for the 16 to 17-year-olds. These included ethnicity, tobacco or cannabis use (for males only) and social mechanisms, specifically the social supply of alcohol by a friend. These are some of the same variables that have been shown to predict heavier drinking in other New Zealand research (eg, Huckle, Huakau, Sweetsur, Huisman, & Casswell, 2008; Meiklejohn, Connor, & Kypri, 2012). However, the change in these explanatory variables over the survey waves had limited ability to explain membership to the trajectory with the greatest rate of decrease (which was often the heavier drinking trajectory), as no clear patterns were revealed.

For the 16 to 65-year-olds, liking of alcohol adverts was also important in predicting membership to the heavier drinking trajectory. In New Zealand, and elsewhere, published research on alcohol advertising has mainly focussed on young people (Chambers et al., 2018; Jernigan, Noel, Landon, Thornton, & Lobstein, 2017; Lin, Casswell, You, & Huckle, 2012). This study finds that alcohol marketing is also an important predictor for heavier drinking among adults. Tobacco use, cannabis use, purchasing late and ethnicity also predicted membership to a heavier trajectory for the 16 to 65-year-olds. Whereas, being of older age, Asian ethnicity and having a high level of education were protective in relation to

heavier consumption. However, as with the adolescents, change in these variables over the survey waves had limited ability to predict membership to the trajectory with the greatest rate of decrease, as no clear patterns were revealed.

Limitations

This study was not able to include all potentially relevant contributors to changes in alcohol consumption. The measures included in this study were limited to the measures that were collected in the surveys. Further, some potentially relevant factors (eg, youth culture) may be hard to measure/operationalise, at least in a quantitative methods approach. For example, we were not able to include measures of social media impact. Previous studies have found mixed results as to the impact on adolescent drinking behaviour. An Australian study found that taking an interest in health context on social media was one factor, among others, related to reduced alcohol consumption among those aged 15 to 29 (Raggatt et al., 2019). However, alcohol marketing is prevalent on the internet and on social media platforms, and adolescents and young people engage with peers on social network sites in ways that may promote drinking (Pape et al., 2018). A Norwegian study found that more time spent on social media was associated with a greater likelihood of heavy episodic drinking among adolescents (Brunborg, Andreas, & Kvaavik, 2017). Moreover, Twitter and Facebook did not become widely used until after the declines in youth consumption began (Pape et al., 2018) and this seems to be the case in New Zealand also.

We conducted multiple imputation to correct for attrition bias. We included longitudinal and additional cross-sectional replenishment samples to improve the quality of imputation. The imputation was done on the whole sample distribution which preserves the trend ie, the method considered the behaviour of all drinkers when imputing. Without the multiple imputation there would be an underestimation of heavy drinking.

The surveys relied on self-reported responses which may be subject to bias, in particular, under-reporting. The survey questions used in this current study have previously been found to have good validity, accounting for over 90% of the alcohol available for consumption in New Zealand (Casswell, Huckle, Wall, & Yeh, 2014). Under-age adolescents may under-report more than adults (Stockwell, Zhao, & MacDonald, 2014). Further, under-reporting may have become less likely as the adolescents became of legal age. However, if this did occur, it was not to a level sufficient to explain the key findings of the study.

The 16 to 17-year-old sample was contrasted with those aged 16 to 65, which also included 16 to 17-year-olds. As independent samples were collected, this meant that the same 16 to 17-year-olds were not being contrasted (wave 1 for the 16 to 65-year-olds was collected in 2011 and wave 1 for the 16 to 17-year-old sample was collected in 2012). We also found that even if there was an age effect, the declines in the heavy trajectories among the 16 to 65-year-olds were not mainly explained by the 16 to 17-year-olds. Further the 16 to 17-year-olds comprised only a small fraction of the 16 to 65-year-olds (3.5%).

Conclusion and implications

Declines in average quantities were driven mainly by declines in heavy drinkers across the survey waves. This was found for both adolescents (16 to 17-year-olds) and the wider population (16 to 65-year-olds). Although declines occurred among the heavier drinkers, most were still consuming around six or more drinks on a typical drinking occasion at wave 3. The decline among the adolescents who were heavier drinkers did not appear to be explained by a collective shift of drinking or be reflective of wider changes among the population. While some policy, social mechanisms and use of tobacco or cannabis measures predicted belonging to a heavy drinker trajectory, changes in these variables over the survey waves did little to explain membership to the trajectory with the greatest rate of decline among adolescents (or adults).

To date there is no consensus in the research literature about why adolescents' consumption has been declining. The findings of this study are in keeping with the literature. This raises broad and important questions of what measures future research needs to investigate. Possible future directions, drawn both from the findings of this study and the wider literature, include changes in youth culture towards alcohol, such as drinking and intoxication losing their symbolic power as a rite of passage into adulthood, or a culture of alcohol maturity in which adolescents are maturing out of the tendency to drink heavily more quickly than in past generations.

The findings from the trajectory analysis may provide some support for a culture of early alcohol maturity. Heavier drinking declined as 16 to 17-year-olds reached 20 to 21-years-old which is earlier than has generally been found in previous research. There may also be a need to go beyond alcohol-specific factors in our search for the answers and look at broader societal changes. For example, a comprehensive pattern of lifestyle changes of which alcohol is one component, a more in-depth assessment of the effects of social media, or a better understanding of generational differences. Adolescents in the current global context are experiencing threats of climate and economic influences. These types of broader cultural and societal shifts may operate cross-country as well, which may provide clues; as while we have seen declines in adolescent drinking in New Zealand, this trend has also been occurring in many other high-income countries.

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Appendices

Appendix 1: Full description of multiple imputation

Multiple imputation via chained equations was used to control for any bias due to attrition (Deng et al., 2013). This was done separately for the 16 to 19-year-old sample and the 16 to 65-year-old sample. Respondents who completed a survey at wave 1 were imputed for any future waves, if they had missing data, to allow for a complete longitudinal sample 2011 through 2015 (or 2012 through 2015 in the case of the adolescent sample). All data, including replenishment samples, were used to inform the imputation (replenishment samples were not included directly in the analysis, only to inform the imputation). Models were built to impute the data (using all variables outlined in the measures section). The imputation models identified people that were lost to follow-up (binary variable) as well as missing observations measured at the baseline time (wave 1) (eg, social supply variables). Imputation was undertaken for all variables included in the analysis, except for age that was fully recorded over the three waves.

One hundred imputed datasets were used for each sample (aged 16 to 17 and 16 to 65). The number of imputations recommended depend on the particular dataset and modelling strategy (or complexity of the outcome to analyse). There are some rules based on response rate but only point estimates are reliable. Also, a small number of imputations might not be adequate for inferential goals (confidence intervals and *p* values). Our strategy was trying to keep the relative efficiency (a compromise between the fraction of missing information and the number of imputations) high, ie, close to 1 (or 0.99).

Full description of trajectory analysis (Aim 3)

The trajectory analysis focused on quantity of alcohol consumed on a typical drinking occasion given this measure is related to acute harm. Further, the only increase in frequency of drinking found in Aim 1 & 2 was for the 16 to 17-year-olds and this was most likely because they became legally able to purchase by the second and third surveys.

A trajectory analysis of quantity of alcohol consumed on a typical drinking occasion was implemented using the method of Jones et al. (2001) considering a censored normal distribution for the outcome. In this method, a trajectory is represented by a polynomial of order three, or less, that relates the variables of interest to time. The user specifies the number of trajectories to fit the data and the order of the polynomial for each trajectory. Trajectory parameters are estimated, and individuals are assigned to a trajectory group on a probability basis. Trajectory groups are not pre-specified.

To determine the number of trajectories, between two and six trajectory groups were tested in the models. More than six groups were not tested as they became not significant (groups with almost zero frequency). Constant, linear and quadratic trajectories were fitted. Cubic trajectories were not significant given the low number of waves involved.

We estimated the trajectories assuming a censored normal distribution for the log of typical occasion quantity. Different trajectories (groups) were estimated depending on the subsample analysed. Bayesian Information Criterion (BIC) was used for model selection among fitted models in a specific subsample.

Note that this full process was repeated over the imputed datasets. Point estimates, standard errors, confidence intervals and *p* values were obtained using PROC MIANALYSE in SAS 9.4, after adapting the output generated by the estimation of the trajectory groups.

Trajectory analysis was conducted for males and females separately to understand if trajectories differed between these groups.

Trajectory analysis was undertaken in SAS 9.4 by implementing the Proc Traj SAS macro (see Jones et al., 2001).

Once the respondents had been assigned to a trajectory group, ordinal logistic regression models were used to find variables to predict group membership. As the assumption of proportionality did not hold, adjacent-category logit regression models were used when modelling more than two groups.

Socio-demographic variables, policy measures, social mechanisms and other health behaviours observed at the first wave were used to predict whether a respondent belonged to a trajectory group with heavier consumption. Additionally, some interactions were tested among the socio-demographic covariates, but they were not significant. Performance of the logistic models was assessed by checking the proportional odds assumption (that was rejected in almost all the samples, the exception was the youth male sample since only two trajectory groups were estimated) and the Hosmer-Lemeshow test. If there were problems of convergence in the estimation procedure (for example, due to categories without frequency for some predictors), this covariate was not included in the model. Ethnicity in the youth male sample could not be included in the model because the category “Pasifika people” was very low in frequency. But overall, ethnicity is a “risk factor” for heavier drinking. All other variables were available for each sample.

A second set of logistic regression models was used for assessing if the changes in these measures were related to trajectory membership (specifically the trajectory that showed the greatest rate of decrease). The estimated trajectory membership (groups) was treated as the outcome.

For each predictor measured over the three waves we considered four "change" categories: two of no change in their preferences/behaviour, ie, those that did not like/did not consume or did like/did consume (000 or 111) over the three waves, and those that reported disliking/not consuming or liking/consuming at the last wave (xx0 or xx1). For example, a

respondent who liked alcohol advertising over the three waves was categorised as 111, and someone that did not like alcohol advertising at all over the study period was categorised as 000. Changes in late purchasing of alcohol were assessed only for the years 2011 and 2013, as in 2015 it was illegal to purchase and consequently numbers were too small for analysis. Satisfaction with health was excluded from the youth male sample as category “000” had very few observations. Otherwise all other variables were available for each sample.

All the analyses were carried out by gender and by combining the model results over approximately 100 imputed datasets.

Appendix 2: Participant demographics

Table 1: Demographic composition of the 16 to 65 and 16 to 17-year-old samples.

Demographic composition of 16 to 65-year-olds	Percent	Demographic composition of 16 to 17-year-olds	Percent
Age group		**Age group**	
16-17	3.5	16-17	100
18-19	5.2		
20-24	8.4		
25-44	44		
45-54	20.5		
55+	18.5		
Gender		**Gender**	
Female	50.4	Female	47.6
Male	49.6	Male	52.4
Prioritised Ethnicity		**Prioritised Ethnicity**	
Māori	10.2	Maori	11.7
Pasifika	3.7	Pasifika	7
Asian	7.1	Asian	7
NZ European	79.1	NZ European	74.3
Education		**Education**	
Low	9.8	Low	18.9
Medium	45.9	Medium	81.1
High	44.3	High	--

Appendix 3: Models predicting heavier quantity trajectory membership

Table 2: Model results for 16 to 17-year-olds predicting heavier quantity trajectory membership.

Young drinkers aged 16 to 17	**Quantity consumed on a typical drinking occasion**	
Group trajectories	Men	Women
# Groups	2	3
% groups	G1: 32%, G2: 68%	G1: 6%, G2: 44%, G3: 49%
Effect	Men	Women
Age at baseline		
Education: Medium vs low		
Māori vs NZ European		+
Pasifika vs NZ European		
Asian vs NZ European		-
Policy-related variables		
Time to purchase alcohol: less than 5 mins vs more than 5 mins		
Notice alcohol adverts		
Like alcohol adverts		
How affordable is alcohol		
Frequency of being asked for identification: All/most of the time vs Sometimes/occasionally		
Supplied alcohol by parent		
Supplied alcohol by relative		
Supplied alcohol by friend	+	+
Other variables		
Received help for drinking		
Tobacco use	+	+
Cannabis use last six months	+	
Satisfaction with own health		

Notes.

- Where cells are blank this is because estimates were not statistically significant.
- Where cells = + this denotes a statistically significant positive association.
- Where cells = - this denotes a statistically significant negative association.
- The trajectories were estimated assuming a censored normal distribution for the log of quantity of alcohol consumed on a typical drinking occasion. Estimates do not need to be transformed for interpretation.

Table 3: Model results for 16 to 65-year-olds predicting heavier quantity trajectory membership.

Drinkers aged 16 to 65	Quantity consumed on a typical drinking occasion	
Group trajectories	Men	Women
# Groups	3	5
% groups	G1: 30%, G2: 53%, G3: 18%	G1: 5%, G2: 40%, G3: 41%, G4: 11%, G5: 3%
Effect	Men	Women
Age	-	-
Education: Medium vs low		-
Education: High versus low	-	-
Māori vs NZ European	+	+
Pasifika vs NZ European	+	+
Asian vs NZ European	-	-
Policy-related variables		
Time to purchase alcohol: less than 5 mins vs more than 5 mins		
Notice alcohol adverts		
Like alcohol adverts	+	+
How affordable is alcohol		
Purchase alcohol off-premises after 11pm	+	
Purchase alcohol on-premises after 3am		
Other variables		
Received help for drinking		
Tobacco use	+	+
Cannabis use last six months	+	+
Satisfaction with own health		-

Notes.

- Where cells are blank this is because estimates were not statistically significant.
- Where cells = + this denotes a statistically significant positive association.
- Where cells = - this denotes a statistically significant negative association.
- The trajectories were estimated assuming a censored normal distribution for the log of quantity of alcohol consumed on a typical drinking occasion. Estimates do not need to be transformed for interpretation.

Appendix 4: Change in measures over the survey waves predicting trajectory membership

Table 4: Model estimates for 16 to 17 and 16 to 65-year-olds predicting if change in variables across the survey waves predict membership to trajectory with greatest rate of decrease.

Parameter Estimates			Estimate	Std Error	95% Conf Limit		P-value
Youth 16-17 male - Treajectory group 2 (declined) vs group 1							
Parameter Estimates (98 Imputations)							
Parameter		Tobacco	Estimate	Std Error	95% Conf Limit		P-value
Intercept			0.323	0.203	-0.075	0.720	0.112
tobacco_new		111+xx1	1.595	0.646	0.325	2.865	0.0139*
tobacco_new		xx0	2.031	0.951	0.166	3.896	0.0329*
Note: satisfactionhealth could not be included, category 000 very few obs.							
Youth 16-17 female - group 3 (declined) vs groups 1+2							
Parameter Estimates (100 Imputations)							
Parameter		Tobacco Cannabis	Estimate	Std Error	95% Conf Limit		P-value
Intercept			-0.734	0.363	-1.448	-0.021	0.044
tobacco		111	1.808	0.920	0.002	3.614	0.0498*
tobacco		xx0	0.460	0.610	-0.737	1.657	0.451
tobacco		xx1	0.647	0.670	-0.669	1.962	0.335
cannabis		111	0.830	0.740	-0.622	2.281	0.262
cannabis		xx0	1.377	0.600	0.200	2.555	0.0219*
cannabis		xx1	0.530	0.496	-0.443	1.503	0.286
Note: satisfactionhealth could not be included, category 000 very few obs.							
16-65 years male - group 3 (declined) vs groups 1+2							
Parameter Estimates (100 Imputations)							
Parameter	Late purchasing	Tobacco Cannabis	Estimate	Std Error	95% Conf Limit		P-value
Intercept			-1.553	0.153	-1.855	-1.251	<.0001
onoff1113	01		0.560	0.388	-0.203	1.323	0.150
onoff1113	10		0.648	0.228	0.200	1.096	0.0046*
onoff1113	11		0.678	0.302	0.086	1.270	0.0249*
tobacco		111	0.798	0.209	0.388	1.207	0.0001*
tobacco		xx0	0.316	0.218	-0.112	0.744	0.148
tobacco		xx1	0.574	0.237	0.108	1.039	0.0158*
cannabis		111	0.962	0.297	0.378	1.546	0.0013*
cannabis		xx0	0.596	0.212	0.181	1.011	0.005*
cannabis		xx1	0.448	0.217	0.023	0.874	0.0388*
16-65 years female - group 4 (declined) vs groups 1+2+3 - group 5 not included							
Parameter Estimates (95 Imputations)							
Parameter	Late purchasing	tobacco cannabis	Estimate	Std Error	95% Conf Limit		P-value
Intercept			-3.034	0.449	-3.923	-2.145	<.0001
onoff1113	01		0.299	0.725	-1.124	1.722	0.680
onoff1113	10		0.884	0.445	0.009	1.758	0.0476*
onoff1113	11		0.245	0.818	-1.360	1.850	0.765
tobacco		111	1.417	0.343	0.743	2.090	<.0001*
tobacco		xx0	1.162	0.333	0.507	1.816	0.0005*
tobacco		xx1	1.005	0.424	0.172	1.838	0.0182*
cannabis		111	1.227	0.585	0.078	2.376	0.0364*
cannabis		xx0	0.849	0.368	0.127	1.572	0.0213*
cannabis		xx1	0.766	0.417	-0.053	1.584	0.067

Notes. Estimates are regression coefficients. Where imputations are less than 100, a few were removed due to some convergence problems in the estimation of the parameters. This is because there were low or zero frequencies in some categories. The outcome is the trajectory group membership.

Full description of findings: Did change in variables across the three survey waves predict membership to the trajectory with the greatest rate of decrease?

Males, 16 to 17-year-olds

- Among young male smokers, those who stopped smoking tobacco by 2015 were 7.6 times more likely than non-smokers to be in Group 2 (heavier drinkers) relative to Group 1.
- Those who were tobacco smokers in all waves or reported smoking by 2015 (these two groups were combined in the analysis due to low numbers) were five times more likely than non-smokers to be in Group 2 relative to Group 1.
- No changes in the other variables included in the model predicted membership to Group 2.

Females, 16 to 17-year-olds

- Among cannabis users, those who stopped by 2015 were four times more likely than non-cannabis users to be in Group 3 (relative to Group 1 and 2).
- Young females who smoked tobacco consistently (each wave 2012, 2013 and 2015) were 6 times more likely to be in Group 3 relative to non-smokers.

Males, 16 to 65-year-olds

- Among late purchasers of alcohol, those who stopped purchasing late by wave 2 (2013) were 1.9 times more likely than non-late purchasers to be in Group 3 (relative to the other groups).
- Consistently purchasing late, however, was also associated with being in Group 3 (1.9 times more likely relative to non-late purchasers).
- Respondents who consistently smoked tobacco ie, at each wave or smoked by wave 3 (2015) were more likely to be in Group 3 (relative to respondents who were non-smokers in each wave). This was not the case, however, for respondents who had stopped smoking by wave 3.
- Cannabis use was related to membership in Group 3 whether respondents changed their cannabis use across the waves or consistently used cannabis at each wave.

Females, 16 to 65-year-olds

- Females who purchased late in wave 1 but stopped by wave 2 were 2.4 times more likely than non-late purchasers to be in Group 4 (relative to the other groups).
- Tobacco smoking was associated with being in Group 4 relative to non-smokers (this was the case whether respondents changed their tobacco smoking across the waves or consistently smoked tobacco at each wave).
- Cannabis users, relative to non-cannabis users, were more likely to be in Group 4 (excluding those who used cannabis by wave 3 in 2015).

Changes and influences on adolescent drinking in New Zealand

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