Correlates of New Zealanders' drinking status, frequency and intensity: Evidence from the New Zealand Attitudes and Values Study

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Comparisons to the New Zealand Health Survey indicate that the New Zealand Attitudes and Values Study (NZAVS) is a valid measure of drinking behavior among predominately middle-aged/older New Zealanders. Data from the 2014-16 NZAVS is used to identify key demographic and novel personality correlates of New Zealanders' drinking status, frequency and intensity. Men and Extraverted individuals were consistently found more likely to be a drinker, drink frequently and intensely. Those high on Honesty-Humility were less likely to be a drinker and drink intensely. Māori, Pacific and young people, and those living in highly deprived areas were infrequent but high intensity drinkers. Extraversion consistently showed strong associations with drinking behaviour suggesting that social factors are key drinking motives among middle-aged/older New Zealanders. Further research is warranted on the utility of personality-targeted interventions.

Keywords: *Drinking intensity, drinking frequency, personality traits, New Zealand*

Introduction

According to the 2018/19 New Zealand Health Survey (NZHS), 80.3% of New Zealand adults were past-year drinkers; 26.9% of which were heavy episodic drinkers (at least monthly) and 24.9% were hazardous drinkers (Ministry of Health [MOH], 2019a). In this survey, heavy episodic drinking was defined as consuming 6 or more alcoholic drinks on one occasion, and hazardous drinkers were identified using the Alcohol Use Disorders Identification Test[1] (AUDIT; Babor et al., 2001). The high prevalence of such negative drinking behaviour is a major public health concern as this can lead to many adverse health and social consequences. Drinking increases one's risk of infectious, liver and cardiovascular diseases, and has been linked with a range of mental illnesses (Rehm, 2011). It can further lead to family disruptions, workplace problems, financial difficulties and violent or anti-social behaviour (Kraus et al., 2009; Rehm, 2011). Thus, it is vital to better understand the drinking patterns of different groups and implement target interventions for those at greater risk of suffering alcohol-related harm.

Several demographic factors have been linked with alcohol use among New Zealanders. Generally, men, younger individuals, and those of Māori or Pacific ethnicity or lower socio-economic status (SES) have shown higher prevalence of binge, risky or hazardous drinking[2] (Health Promotion Agency [HPA], 2017, 2018; Jatrana, Carter, McKenzie, & Wilson, 2011; Kypri et al., 2009; MOH, 2015a, 2015b, 2016). Interestingly, high deprivation and Pacific ethnicity, along with Asian ethnicity, were also linked with lower likelihood of being a drinker (Huakau et al., 2005; MOH, 2015a, 2016, 2019a). Although those living in highly deprived areas and Pacific peoples are less likely to drink, those that do drink appear to drink in high intensities. There were also prominent differences between risk factors of high intensity drinking and frequent drinking. Men, those living in less deprived areas, European/Others and older people tended to be frequent drinkers (HPA, 2017, 2018; MOH, 2015a). Taken together, these findings highlight the importance of distinguishing between the differential predictors of drinking status, intensity and frequency to gain a more accurate insight into the drinking patterns of distinct groups in New Zealand.

Personality traits and drinking behaviour

Currently, little is known about the psychological contributors to drinking behaviours among New Zealanders. This includes the role of personality traits; "one's enduring pattern of thinking, feeling and behaving" (McCrae & Costa, 1997, p.509). Personality traits have been linked to distinct drinking patterns and motives (Kuntsche et al., 2006; Stewart & Devine, 2000) and thus help us better identify those at higher risk of adopting negative drinking behaviours and develop

[1] The AUDIT is a reliable screening tool for identifying hazardous drinkers based on their level of alcohol consumption, dependence and risk of negative health consequences. A score of 8+ on this 10-item scale is considered to indicate hazardous drinking.

[2] Drinking intensity is measured in diverse ways across studies and definitions of 'heavy', 'binge', or 'risky' drinking are inconsistent. These terms have usually been defined as having 5 to 8+ drinks on one occasion. Some studies specify differential limits for men and women (e.g. 6+/4+ drinks respectively). The current study is interested in assessing drinking intensity on a continuous scale and identifying group differences in the typical amount of alcohol consumed in one occasion. Thus, we do not specify definitions of 'heavy' or 'risky' drinking but broadly examine group differences in 'drinking intensity.'

tailored interventions for specific groups (See Appendix for definitions of Big-Six personality traits). In previous international studies, high Extraversion and low Conscientious have typically been associated with both frequent and high intensity drinking (Adan et al., 2017; Erevik et al., 2017; Hakulinen et al., 2015). On the other hand, Openness to experience has been linked with decreased likelihood of alcohol misuse (Erevik et al., 2017; Hakulinen et al., 2015). However, it is unclear whether these findings can be generalized to the New Zealand context as the role of personality traits has yet been assessed in New Zealand.

The present study aims to address this research gap by assessing the relation between the Big-Six personality traits and drinking behaviour using data from the 2014 to 2016 New Zealand Attitudes Values Study (NZAVS). Firstly, we assess the validity of the NZAVS (a non-government postal survey) in measuring population drinking patterns by comparing its findings to the New Zealand Health Survey (NZHS; a face-to-face and computer administered government survey). Subsequently, we use NZAVS data to assess the differential personality and demographic correlates of drinking status, frequency, and intensity. As the NZAVS includes a wider array of demographic variables than the NZHS, it allows us to identify the drinking patterns of a broader range of demographic groups. Most importantly, the present study provides a novel contribution to the literature by assessing the relationship between personality traits and drinking behaviour in the unique context of New Zealand.

METHODS

Sampling Procedure

The NZAVS is a longitudinal panel study of a national probability sample of New Zealand adults. This research is reviewed by the University Human Participants Ethics Committee every three years and has most recently been approved from 5-September-2017 until 3-June-2021 (Reference Number: 014889). In Time 1 (2009), the NZAVS recruited participants by randomly selecting samples from the New Zealand electoral roll (N= 6,518, response rate: 16.6%). A non-random booster sample was recruited at Time 3 (2011) through an unrelated survey posted on an online newspaper website. Further random booster samples were recruited from the 2012 and 2014 Electoral Roll in subsequent Time periods (Sibley, 2020). The validity of the NZAVS in monitoring changes in New Zealanders' political attitudes over time has been well-demonstrated (Sibley et al., 2017; See Appendix for details on sample sizes and response rates).

The NZHS is a continuous face-to-face and computer administered government survey that publishes annual updates on the health of New Zealanders. It uses a multi-stage, probability- proportional-to-size sampling design. The current study uses data on drinking frequency and intensity from the 2013/14, 2014/15 and 2016/17 NZHS provided by Statistics New Zealand. Each annual sample included around 14,000 adults. Note that there have been changes to the alcohol consumption question since 2015/16 (see notes in Table 3). Refer to NZHS Content Guide on the Ministry of Health website for further details on survey methodology (MOH, 2019b).

Participants

This study uses NZAVS data collected in Time 6 (2014; N= 15,820), Time 7 (2015; N=13,942) and Time 8 (2016; N= 21,937). Participants for each time point had a mean age of 49, 51 and 50 years respectively, and median household income of $90,000. Sixty three percent of each sample were female, with 89-90% being European, 11-12% being Māori, 3% being of Pacific and 4% being of Asian ethnicity (ethnic categories were not mutually exclusive). Seventy-seven to seventy eight percent of participants from each time point were employed, and 74-75% were parents and had partners.

Measures

To measure drinking frequency, participants were asked "how often do you have a drink containing alcohol?" There were five response options: 'Never – I don't drink', 'Monthly or less', 'Up to 4 times a month', 'Up to 3 times a week', '4 or more times a week' and 'Don't know.' Drinking intensity was measured using the open-ended question: "how many drinks containing alcohol do you have on a typical day when drinking?" These 2 items were derived from the 10-item AUDIT which is included in the annual NZHS. We only focus on these 2 items in this study as the remaining 8 AUDIT items were not included in the NZAVS. Note that the NZHS did not include a 'Never – I don't drink' response option for the drinking frequency question but identified past year drinkers by asking whether participants "had a drink containing alcohol in the last year."

NZAVS participants were asked to report their gender, relationship and employment status, date of birth, and annual household income. Ethnicity was measured using the standard New Zealand Census item, in which participants could indicate each ethnic group they identified with. Education was coded as an eleven-level ordinal variable (0 = no qualification to 10 = doctorate). Deprivation was measured using the 2013 New Zealand Deprivation Index, which uses census information to assign a decile-rank index from 1 (least deprived) to 10 (most deprived) to each meshblock unit (Atkinson et al., 2014). SES was measured using the New Zealand socio-economic index (Milne et al., 2013). Personality traits were measured using the Mini-IPIP6 (Sibley et al., 2011), which assesses the Big-six personality traits using four-item subscales rated from 1 (very inaccurate) to 7 (very accurate). An example item for Extraversion included "I am the life of the party."

Statistical Analyses

The proportion of NZAVS and NZHS participants within each drinking frequency and intensity group were calculated using SPSS. Differences in proportion between the two studies are examined using Chi-square differences tests and Cramer's V effect sizes. NZAVS data was subsequently used to identify the differential correlates of drinking status, frequency and intensity. Separate analyses were conducted on Mplus using data collected in 2014 (Time 6), 2015 (Time 7) and 2016 (Time 8) respectively. For each time point, a range of demographic variables (e.g. age, gender, ethnicity, education,

deprivation level) and the Big-Six personality traits were simultaneously included as predictors for (1) drinking status, (2) frequency and (3) intensity. Details on the specific regressions and outcomes variables are noted below:

Binary logistic regressions were conducted using 'drinker' (0=abstainer, 1=drinker) as the outcome variable. Those who indicated "Never-I don't drink" in response to the item "How often do you have a drink containing alcohol?" were categorized as "abstainer", while those who chose either; 'monthly or less', 'up to 4 times a month', 'up to 3 times a week', or '4 or more times a week' were categorized as "drinker" ('Don't know' was excluded).

Ordinal logistic regressions were conducted using 'drinking frequency' as the outcome variable (1= 'Monthly or less', 2= 'Up to 4 times a month', 3= 'Up to 3 times a week', 4= '4 or more times a week').

Multiple regressions were conducted using 'drinking intensity' as the outcome variable.[3] Drinking intensity refers to the number of drinks containing alcohol one consumes on a typical day when drinking.

Only drinkers were included in the latter two analyses as abstainers were those that indicated they "never" drink when asked how often they drink. All analyses applied standard NZAVS (adjusting for gender, ethnicity, region) or NZHS (adjusting for deprivation, gender, ethnicity, region, age) weighting variables accordingly.

RESULTS

Comparison to the NZHS

As seen in Tables 1 to 3, the distribution of responses to questions were similar across time points for both the NZAVS and NZHS. The majority of participants in both studies were categorized as drinkers, although a slightly smaller proportion of NZHS participants indicated being past-year drinkers (see Table 1 notes for details on categorization). In the NZAVS, around a quarter of participants selected each of the four drinking frequency categories across all three survey years. Comparatively, a larger proportion of NZHS participants selected drinking 'monthly or less' (33.2-34%).

Most NZAVS participants indicated drinking '1 to 2 drinks', followed by '3 or 4 drinks' on a typical day when drinking for all time points. A slightly lower proportion of NZHS participants selected these same categories for all three time points. However, a much larger proportion of NZHS participants indicated consuming '7 to 9' (3.8-4.2% versus 1.9-2.4%) and '10 or more' drinks (7.1-7.7% versus 2.4-2.9%) than the NZAVS. Chi-square differences tests for the proportion of drinkers, drinking frequency and intensity between the NZAVS and NZHS were all significant. However, the Cramer's V effect sizes were relatively small for all three tests (.09, .15, .17 respectively) and below the cut point for a medium effect size (.21).

Demographic and personality correlates of drinking behaviour

Using NZAVS data, separate regression analyses were conducted to identify demographic and personality correlates of drinking status, frequency and intensity in Time 6, 7 and 8. Odds ratios or beta values of demographic and personality variables in Time 6, 7 and 8 are reported consecutively in brackets unless otherwise specified. Only key results are reported in-text. See tables in Appendix for further details on regression results.

Binary logistic regression: drinking status

Demographic correlates. Men (OR = 1.588, 1.391, 1.557), partnered individuals (OR = 1.368, 1.240, 1.278), employed individuals (OR = 1.519, 1.407, 1.524), and those with higher income (OR = 1.132, 1.271, 1.165) were

Table 1. Percentage of drinkers and non-drinkers in the NZAVS (item: "how often do you have a drink containing alcohol?") and NZHS (item: "have you had a drink containing alcohol in the last year?").

NZAVS	Time 6 (2014) (N= 15,036)	Time 7 (2015) (N= 13,423)	Time 8 (2016) (N= 20,893)
Drinkers	83.0%	83.5%	83.6%
Non-drinkers	17.0%	16.5%	16.4%
NZHS	**2013/14 (N=13,299)**	**2014/15 (N= 13,494)**	**2015/16 (N= 13,769)**
Drinkers	80.2%	79.5%	80.1%
Non-drinkers	19.8%	20.5%	19.9%

Note: NZAVS participants who selected "Never – I don't drink" categorized as 'non-drinkers', everyone else (excluding 'Don't know') categorized as 'drinkers.' NZHS participants who selected 'yes' categorized as drinkers, 'no' categorized as non-drinkers. N refers to number of participants who responded to question (excludes missing values and those who refused to answer or selected 'don't know'). Standard sample weighting applied for all samples (N for NZHS before weighting reported as results show population estimate of N after weighting).

[3] We ran a multiple regression instead of a poisson model as the drinking intensity variable included non-integer values. This is because drinking intensity was measured using an open-ended question: "how many drinks containing alcohol do you have on a typical day when drinking."

Table 2. Percentage of participants who selected each response category for the item asking "How often do you have a drink containing alcohol?" in the NZAVS and NZHS.

NZAVS	Time 6 (2014) (N= 12,486)	Time 7 (2015) (N= 11,203)	Time 8 (2016) (N= 17,460)
Monthly or less	26.8%	25.7%	26.2%
Up to 4 times a month	23.9%	22.9%	23.9%
Up to 3 times a week	24.7%	25.0%	25.1%
4 or more times a week	24.7%	26.4%	24.8%
NZHS	2013/14 (N=10,478)	2014/15 (N= 10,560)	2015/16 (N= 10,808)
Monthly or less	33.2%	33.8%	34.0%
Up to 4 times a month	23.6%	22.0%	22.0%
Up to 3 times a week	21.2%	21.9%	22.4%
4 or more times a week	22.1%	22.3%	21.6%

Note: N refers to number of participants who responded to question (excludes missing, don't know and refused). Those who selected "don't know" or "Never- I don't drink' in NZAVS excluded. Standard sample weighting applied for all samples (N for NZHS before weighting reported as results show population estimate of N after weighting).

more likely to be drinkers across all time points. Higher SES in Time 8 (OR=1.005) was linked with higher odds of being a drinker.

Pacific (OR=.551, .500, .496) and Asian peoples (OR=.267, .339, .418), religious people (OR=.501, .520, .503), and those living in areas with higher deprivation (OR=.922, .915, .915) were less likely to be drinkers across all time points. Those living in urban areas were less likely to be drinkers in Time 8 (OR= .870).

Personality correlates. Higher Extraversion (OR=1.278, 1.241, 1.263) and lower Honesty-humility (OR=.921, .904, .942) were associated with higher odds of being a drinker across all time points. Higher Conscientiousness in Time 7 and 8 (OR=.906, .912) and higher Neuroticism in Time 7 (OR=.928) were also linked with an increased likelihood of being a drinker.

Ordinal logistic regression: Frequency

Demographic correlates. Men (OR = 1.639, 1.662, 1.655), older (OR=1.035, 1.034, 1.037) and partnered individuals (OR=1.131, 1.176, 1.171), and those with higher income (OR=1.204, 1.275, 1.295) drank more frequently in all three time points. Those with higher SES in Time 6 (OR=1.003) and higher education in Time 7 (OR=1.036) also drank more frequently. On the other hand, Māori (OR=.644, .711, .718), Pacific (OR=.693, .662, .609) and Asian peoples (OR=.393, .446, .437), parents (OR=.879, .872, .769), religious people

Table 3. Percentage of participants who were categorized within each response category to the item asking "How many drinks containing alcohol do you have on a typical day when you are drinking?" in the NZAVS and NZHS.

NZAVS	Time 6 (2014) (N= 11,812)	Time 7 (2015) (N= 10,651)	Time 8 (2016) (N= 16,466)
1 or 2	66.0%	67.5%	65.8%
3 or 4	22.3%	21.7%	21.8%
5 or 6	6.8%	6.5%	7.1%
7 to 9	2.1%	1.9%	2.4%
10 or more	2.8%	2.4%	2.9%
NZHS	2013/14 (N=10,437)	2014/15 (N= 10,536)	2015/16 (N= 5,422)
1 or 2	60.3%	60.5%	57.7%
3 or 4	20.0%	19.3%	20.7%
5 or 6	8.8%	9.1%	9.8%
7 to 9	3.8%	3.8%	4.2%
10 or more	7.1%	7.3%	7.7%

Note: N refers to the number of participants who responded to question. NZAVS item was originally asked as open-ended question (item did not include 'Don't know' category). We report percentages for half the 2015/16 NZHS sample, as the other half were asked the same question but with a show card depicting the number of 'standard drinks' in common alcoholic drinks (NZAVS question did not include show card). N refers to number of participants who responded to question (excludes missing values, those who refused or selected 'don't know' in NZHS). Standard sample weighting applied for all samples (N for NZHS before weighting reported as results show population estimate of N after weighting).

(OR=.698, .700, .715), and those with higher deprivation (.942, .950, .950) drank less frequently.

Personality correlates. Those with higher Extraversion in all time points (OR=1.176, 1.175, 1.203), higher Neuroticism in Time 7 and 8 (OR=1.065, 1.051) and higher Conscientiousness in Time 6 (OR=1.048) drank more frequently.

Multiple regression: Intensity

Demographic correlates. Across all time points, being male (B=.692, .720, .782), younger (B = -.023, -.021, -.026), of Māori (B = .871, .835, .872) or of Pacific ethnicity (B= 1.808, 1.514, 1.120) and living in areas with higher deprivation (B = .072, .058, .050) were associated with higher drinking intensity.

Being Asian (B = -.644, -.591, -.717), religious (B = -.235, -.234, -.285), having higher education (B = -.065, -.054, -.074) and a partner (B = -.315, -.307, -.410) were associated with decreased drinking intensity in all three time points. Being a parent in Time 8 (B=-.146) and lower income in Time 6 (B= -.094) were linked with decreased drinking intensity. Higher SES (B = -.008, -.006) and being employed (B = -.205, -.157) were linked with decreased drinking intensity in Time 6 and 8.

Personality correlates. Higher Extraversion (B = .276, .203, .245) and lower Honesty-humility (B = -.094, -.124, -.141) were linked with higher drinking intensity across all three time points. Agreeableness was only associated with lower drinking intensity in Time 6 (B=-.088), and Neuroticism was linked with higher drinking intensity in Time 6 and 8 (B=0.53, .074).

Overall, gender (β=.153, .168, .174), age (β=-.138, -.128, -.161), Māori (β=.121, .121, .122) and Pacific ethnicity (β=.169, .153, .107), and Extraversion (β=.138, .106, .127) showed the strongest associations with drinking intensity.

DISCUSSION

Validity of the NZAVS

The present study assessed the validity of the NZAVS data in measuring population drinking patterns by comparing its estimates on drinking status, frequency and intensity to the NZHS. In all three consecutive survey years (2014-16), most NZAVS participants (83%) indicated being a drinker, and approximately one quarter of participants each indicated drinking 'monthly or less', 'up to 4 times a month', 'up to 3 times a week', and '4 or more times a week.' These proportions are comparable to the NZHS but a much larger proportion of NZHS participants indicated drinking 'monthly or less' (33.2-34.0%). Both studies indicated that New Zealanders commonly drink '1 to 2 drinks' or '3 or 4 drinks' on a typical drinking occasion. However, a considerably lower proportion of NZAVS reported consuming '7 to 9' (1.9-2.4% versus 3.8-4.2%) or '10 or more' (2.4-2.9% versus 7.1-7.7%) drinks on a typical day when drinking. Said again, the NZAVS tends to show a lower rate of infrequent but high intensity drinkers relative to the NZHS.

Disparities in estimates between the NZAVS and NZHS can largely be explained by their distinct study methodologies and sample characteristics. Whereas the NZHS is an extensive face-to-face and computer assisted government survey, the NZAVS is a non-government postal survey. People are generally less likely to respond to non-government surveys (O'Neill & Sincavage, 2004), with younger individuals showing especially lower response rates to postal surveys (Hanna Tolonen et al., 2006; Hazell et al., 2008). Consequently, only around 5% of NZAVS participants were aged 18 to 24 years while around 26% of NZHS participants were aged 15 to 24 years for each survey year.[4] Young drinkers tend to drink less frequently but consume high volumes of alcohol in one occasion (HPA, 2017; MOH, 2015a) and are more likely to agree that "it's OK to get drunk as long as it's not every day" (18-24 years [43%] versus 25+ years [16%]; HPA, 2017). Hence, the larger proportion of young participants in the NZHS appear to be driving their higher rate of infrequent but high intensity drinkers.

The NZAVS has previously shown strong validity in measuring New Zealanders attitudes in voting projections (Sibley et al., 2017). Our results indicate that NZAVS is also a valid measure of population drinking patterns among middle-aged/older New Zealand adults. Considering the disparity in sample composition, NZAVS estimates of population drinking patterns were fairly consistent with the NZHS and differences in proportions between the two studies had small effect sizes. Disparities in findings between the two studies is likely driven by the lower proportion of younger respondents in the NZAVS. Subsequently, the current study used NZAVS data to identify the differential correlates of drinking status, frequency and intensity among predominantly middle-aged/older New Zealanders. It extends on the NZHS by assessing a wider range of demographic correlates and identifying novel personality correlates of New Zealanders' drinking behaviour.

Demographic correlates of drinking behaviour

Not all demographic variables showed consistent effects across the three survey years, but our results showed a similar general trend to earlier New Zealand studies (e.g. HPA, 2018; Jatrana et al., 2011; MOH, 2015a). Men, partnered and employed individuals and those with higher income were more likely to be drinkers. On the other hand, religious, Asian and Pacific peoples were less likely to be drinkers. Men reported drinking both frequently and intensely, but correlates of frequent drinking did not always correspond to that of high intensity drinking. Partnered and older individuals, and those with higher income drank more frequently. However, along with Asian peoples, religious people and those with higher education, partnered and older individuals tended to be low intensity drinkers. Pacific, Māori and Asian peoples, religious people, parents and those living in more deprived areas drank less frequently. Yet, Māori and Pacific peoples and those living in more deprived areas tended to be high intensity drinkers.

Our findings indicate that gender, age, ethnicity and deprivation level are key demographic correlates of drinking behaviour independent of a range of other demographic and personality characteristics. Men were consistently found more likely to be a drinker, to drink frequently and in higher intensities. As men are more

[4] NZAVS did not include participants younger than 18.

likely to engage in risky behaviours such as driving or working machinery under the influence of alcohol, they are especially at risk of experiencing alcohol-related harm (MOH 2015a). Therefore, it is vital to implement public campaigns that educate men about responsible drinking behaviours and managing alcohol misuse. Our results also reinforce the importance of implementing target interventions for Māori, Pacific and young drinkers, and drinkers living in highly deprived areas. Although these groups drink less frequently, they are at greater risk of alcohol-related harm as they consume high volumes of alcohol on one occasion (HPA, 2018; MOH, 2015a). Promoting low risk drinking to these groups is an important step to reducing health inequalities as these groups are typically found to exhibit poorer physical and/or mental health outcomes (MOH 2018; 2019a).

Older individuals, those with partners and higher income reported drinking frequently but in lower intensities. These groups appear to have more established drinking patterns and may be less likely to encounter the same degree or type of alcohol-related harm as high intensity drinkers. However, it is important to better understand the long-term impact of frequent drinking on their health outcomes, especially among older individuals. As older individuals are more vulnerable to the physiological effects of alcohol (Barry & Blow, 2016), frequently consuming even low quantities of alcohol may have a greater toll on their health over time. Older adults who drank more than three times per week and had several health conditions were found more likely to experience drinking problems (e.g. interpersonal and functioning problems, falls and accidents; Moos, Brennan, Schutte & Moos, 2005), indicating that older drinkers with poor health may require focused interventions. It is essential to increase insight into the differential risk and type of alcohol-related harm experienced by older New Zealanders to develop more appropriate and effective interventions for this group.

The Big-Six personality traits

Previous international studies have generally identified high Extraversion and low Conscientiousness as personality risk factors of frequent or high-intensity drinking (Adan et al., 2017; Erevik et al., 2017; Hakulinen et al., 2015). Only Extraversion showed a strong and consistent pattern in our study. High Extraversion was associated with a higher likelihood of being a drinker as well as frequent and high intensity drinking in all three survey years. Conscientious was linked with a lower likelihood of being a drinker in Time 7 and 8, and increased drinking frequency in Time 6 but was not significantly associated with drinking intensity. Neuroticism showed associations with higher drinking frequency and intensity in two time points, but these associations were not as strong as Extraversion. Interestingly, Honesty-Humility was linked with a lower likelihood of being a drinker and high intensity drinking across all survey years. Our findings indicate that Extraversion and Honesty-Humility are the two most important personality traits associated with drinking behaviour among middle-aged/older New Zealanders.

Different personality traits have been found to be related to distinct drinking motives. Whereas high Neuroticism has been linked with coping motives, high Extraversion and low Conscientiousness has been linked with social and enhancement motives (Kuntsche et al., 2006; Stewart & Devine, 2000). Extraversion showed a particularly strong association with drinking behaviour in our study, suggesting that enhanced mood states and social factors may be key drinking motives among middle-aged/older New Zealanders. Several New Zealand adults agree that 'binge drinking is a part of kiwi culture' (HPA, 2018), and consider alcohol an important part of how New Zealanders socialize, relax and 'feel at ease' (Bev, 2010). It is essential to challenge the widespread cultural acceptance of drinking and provide public education the consequences of alcohol misuse. These messages could be delivered at community or social events, along with guidelines of responsible drinking and tips on maintaining a healthy social life without drinking. Community programmes could also promote alternative and culturally appropriate ways of socialising to groups at higher risk of negative drinking patterns or alcohol-related harm.

Personality traits showed strong associations with drinking behaviour even after controlling for a wide range of demographic variables. This finding indicates that personality traits may be an important driver of New Zealanders' drinking behaviour and highlights the need for further research on the utility of personality-targeted interventions. Previous international studies have found that personality-targeted interventions can be effective in reducing or preventing alcohol misuse among adolescents (e.g. Conrod et al., 2006, 2013). As personality traits showed consistent associations with drinking behaviour in our study, this suggests that personality-targeted treatment or interventions may also be beneficial for middle-aged/older adults in New Zealand. Personality inventories could be used to identify those at greater risk of alcohol-related harm and tailor treatment or support services to suit the specific personality traits or drinking motives of an individual. For instance, treatment for those high on Neuroticism could focus around adopting healthy coping strategies, whereas those high on Extraversion could be recommended alternative ways to maintain a healthy social life. As the current study broadly assessed the role of personality traits at a population level, further research on the relationship between personality traits and drinking behaviour at the individual level is needed to better understand the utility of personality-targeted interventions.

Limitations

The NZAVS asked about participants' drinking frequency and intensity but did not include the other eight items of the AUDIT. Although this enabled us to identify risk factors of frequent and high intensity drinking, we were unable to accurately examine the demographic and personality correlates of hazardous drinking in New Zealand. Our question on drinking intensity did not define what a standard 'drink' refers to, and hence there may have been differences in the way people interpreted this term. Moreover, as alcohol use has been associated with changes in one's personality traits (Hakulinen & Jokela, 2019), one may argue that greater opportunities to socialize through drinking may in fact lead to higher levels of Extraversion. Future studies should examine the

bi-directional relationship between personality traits and drinking behaviour over time.

High response rates are desired in probability sample surveys as this enables a more accurate estimation of sampling biases (Groves, 2006). However, obtaining high survey response rates have become difficult over the years. The Pew Research Centre report that their telephone survey response rates have decreased from 36% in 1997 to 15% in 2009, stabilizing at 9% in 2012 (Pew Research Center, 2012). Similarly, the NZAVS obtained a relatively low initial response rate of 16.6% in 2009 and average response rate of 9% for booster samples. Fortunately, applying post-survey adjustments can correct for sample biases even when response rates are low (Groves, 2006). Therefore, the NZAVS applies post-stratification sample weighting on gender, ethnicity and region of residence and has been shown to be a valid measure of New Zealanders' political attitudes over time (Sibley et al., 2017). However, it is important to note that this weighting variable does not take age into account, and thus our results had to be interpreted in terms of relevance to the middle-aged/older population.

In terms of panel attrition, ethnic minorities, men, those less educated and of younger age were found least likely to be constant NZAVS respondents (Satherley et al., 2015). As many of these characteristics are generally associated with high intensity drinking (MOH, 2015a, 2019), this suggests that our sample may become increasingly less representative of high intensity drinkers over time. Participants in the booster samples would need to constantly replace these lost drinkers to maintain a representative sample of drinkers. To examine this cycle of replenishment, we compared the difference in proportion of high intensity and frequent drinkers between the retained and booster sample in Time 8 (see Table A5 in Appendix). The retained sample showed a higher percentage of frequent drinkers (i.e. drinking 4 or more times a week) but slightly lower percentage of high intensity drinkers (i.e. drinking at least 5 drinks per occasion). These percentage differences were rather small but still significant. Although this suggests that high intensity drinkers may be more likely to be lost over time, the relatively greater proportion of high intensity drinkers in our booster sample is likely to minimize the impact of their attrition on the representativeness of our data.

Conclusion

Comparisons to the NZHS showed that the NZAVS has a lower rate of young respondents but is still a valid measure of population drinking patterns among middle-aged/older New Zealanders. The current study used 2014-16 NZAVS data to identify key demographic and personality correlates of drinking status, frequency and intensity among predominately middle-aged/older New Zealanders. Men and Extraverted individuals were consistently found more likely to be a drinker, drink frequently and in higher intensities. Honesty-Humility was linked with a lower likelihood of being a drinker and drinking intensely. Among drinkers, Māori and Pacific peoples, young people and those from highly deprived areas were more likely to be infrequent but high intensity drinkers. Our results strengthen evidence on the unique relationship that gender, age, ethnicity and deprivation level have with drinking behaviour, and reveal that Extraversion is a particularly important correlate of frequent and high intensity drinking in New Zealand. Further research on the role of personality traits will provide deeper insight into the drinking motives of New Zealanders and inform the development of personality-targeted interventions.

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Table A1. Interpretation of Big-Six personality traits, including example traits, and likely adaptive benefit and costs resulting from high levels of each personality dimension (adapted from Sibley et al. 2011).

Factor	Interpretation	Example Traits	Likely adaptive benefits of high levels (in evolutionary history)	Likely costs of high level (in evolutionary history)
Extraversion	Engagement in social endeavours	Sociability, leadership, exhibition	Social gains (friends, mates, allies)	Energy and time; risks from social environment
Agreeableness	Ingroup co-operation and tolerance; reciprocal altruism in HEXACO model	Tolerance, forgiveness, (low) quarrelsomeness	Gains from cooperation, primarily with ingroup (mutual help and nonaggression)	Losses due to increased risk of exploitation in short-term exchanges
Conscientiousness	Engagement in task-related endeavours	Diligence, organization, attention to detail	Material gains (improved use of resources), reduced risk	Energy and time; risks from social environment
Neuroticism (low Emotional Stability)	Monitoring of inclusionary status and attachment relations; kin altruism in HEXACO model.	Anxiety, insecurity, (low) calmness	Maintenance of attachment relations; survival of kin in HEXACO model	Loss of potential gains associated with risks to attachment relations.
Openness to Experience	Engagement in ideas-related endeavours	Curiosity, imaginativeness, (low) need for cognitive closure and (low) need for certainty	Material and social gains (resulting from discovery)	Energy and time; risks from social and natural environment
Honesty-Humility	Reciprocal altruism (fairness) Fairness, sincerity, (low)	Fairness, sincerity, (low) entitlement and (low) narcissism	Gains from co-operation, (mutual help and non-aggression)	Loss of potential gains that would result from the exploitation of others (and in particular outgroup members)

Table A2. Sample sizes, retention rates and response rates in each Time point of New Zealand Attitudes and Values Study.

	Time 1 (2009)	Time 2 (2010)	Time 3 (2011)	Time 3.5 (2012)	Time 4 (2012)	Time 5 (2013)	Time 6 (2014)	Time 7 (2015)	Time 8 (2016)
Sample size (N)	6,518	4,441	6,884	4,514	12,180	18,261	15,820	13,942	21,937
N retained from at least one previous Time point	-----	4,423	3,918	4,090	6,807	10,502	15,740	13,941	13,779
N retained from previous Time point only	-----	4,423	3,530	-----	5,762	9,844	14,878	12,550	11,933
Number of Booster Samples	-----	-----	1	-----	5	2	-----	-----	1
Additional N (including booster, occasional opt-in partners)	-----	19	2,966	424	5,374	7,759	82	2	8,158
Response rate (average rate if more than 1 booster sample)	16.6%	-----	92.4%	-----	9.8%	8.55%	-----	-----	9.7%

Note: Time 3 included non-random booster recruited from unrelated online newspaper website. Time 4 included one weighted deprivation booster and four electoral boosters (one random and other three oversampling based on region of residence or ethnicity). Time 5 included a random electoral and Māori electoral booster. Time 8 included a random electoral booster. Around 400-450 Pacific participants were recruited informally via Pacific networks in Time 3.5.

Table A3. Results of binary logistic regression with drinker vs non-drinker (reference category) as outcome variable, Odds Ratio and SE for Time 6, 7 and 8 data.

	Time 6 (2014)		Time 7 (2015)		Time 8 (2016)	
	OR	SE	OR	SE	OR	SE
Gender (0 women, 1 men)	**1.588****	.124	**1.391****	.115	**1.557****	.098
Age	1.003	.003	1.003	.003	.999	.002
Māori (0 no, 1 yes)	.881	.093	.835	.090	.874	.074
Pacific (0 no, 1 yes)	**.551****	.088	**.500****	.081	**.496****	.068
Asian (0 no, 1 yes)	**.267****	.032	**.339****	.043	**.418****	.042
Education (0 low to 10 high)	1.017	.016	.988	.016	.992	.012
Parent (0 no, 1 yes)	**.683****	.065	**.756****	.076	**.814****	.062
Partnered (0 no, 1 yes)	**1.368****	.108	1.240*	.108	**1.278****	.084
Religious (0 no, 1 yes)	**.501****	.033	**.520****	.038	**.503****	.027
NZ Deprivation (0-10)	**.922****	.011	**.915****	.013	**.915****	.010
Log (income)	**1.132****	.030	**1.271****	.054	**1.165****	.034
Socio-economic status	1.003	.003	.999	.003	**1.005****	.002
Employed (0 no, 1 yes)	**1.519****	.119	**1.407****	.127	**1.524****	.098
Urban area (0 rural, 1 urban)	.941	.063	.884	.063	**.870****	.048
Extraversion	**1.278****	.041	**1.241****	.043	**1.263****	.032
Agreeableness	.981	.039	.962	.041	.955	.031
Conscientiousness	.949	.034	**.906****	.033	**.912****	.025
Neuroticism	1.033	.033	.928*	.032	.985	.025
Openness	1.012	.032	1.062	.036	.989	.025
Honesty-Humility	**.921****	.029	**.904****	.031	**.942***	.025

Note: * p < .05, **** p < .01**. "Never" and "Don't know excluded from analyses. N= 13100, R-square= 20%, N= 11808, R-square=19.5%, N= 18788, R-square=17.6% for time points respectively. Sample weighting applied.

Table A4. Results of ordinal logistic regression with alcohol frequency as outcome variable (i.e. "How often do you have a drink containing alcohol?), Odds Ratio and SE for Time 6, 7 and 8 data.

	Time 6 (2014)		Time 7 (2015)		Time 8 (2016)	
	OR	SE	OR	SE	OR	SE
Gender (0 women, 1 men)	**1.639****	.070	**1.662****	.077	**1.655****	.060
Age	**1.035****	.002	**1.034****	.002	**1.037****	.002
Māori (0 no, 1 yes)	**.644****	.047	**.711****	.059	**.718****	.044
Pacific (0 no, 1 yes)	**.693****	.115	**.662****	.098	**.609****	.078
Asian (0 no, 1 yes)	**.393****	.049	**.446****	.057	**.437****	.039
Education (0 low to 10 high)	1.014	.009	**1.036****	.010	1.015	.008
Parent (0 no, 1 yes)	.879*	.047	**.872****	.049	**.769****	.035
Partnered (0 no, 1 yes)	1.131*	.063	1.176*	.071	**1.171****	.056
Religious (0 no, 1 yes)	**.698****	.030	**.700****	.032	**.715****	.026
NZ Deprivation (0-10)	**.942****	.007	**.950****	.008	**.950****	.006
Log (income)	**1.204****	.043	**1.275****	.062	**1.295****	.038
Socio-economic status	1.003*	.002	1.001	.002	1.001	.001
Employed (0 no, 1 yes)	.927	.055	1.020	.068	1.101	.052
Urban area (0 rural, 1 urban)	.964	.040	.975	.044	.955	.034
Extraversion	**1.176****	.021	**1.175****	.023	**1.203****	.018
Agreeableness	.964	.023	1.016	.025	.991	.020
Conscientiousness	1.048*	.022	.967	.021	.985	.017
Neuroticism	1.025	.020	**1.065****	.022	**1.051****	.017
Openness	1.003	.019	.977	.020	1.021	.016
Honesty-Humility	.966	.019	.980	.022	.970	.016

Note: * p < .05, **** p < .01**. "Never" and "Don't know" excluded from analyses. Ordinal outcome variable: 1= 'Monthly or less', 2= 'Up to 4 times a month', 3= 'Up to 3 times a week', 4= '4 or more times a week', Time 6: N= 11361, R-square=16.3%, Time 7: N= 10235, R-square= 15.3%, Time 8: N= 18709, R-square= 16.0%, N= 16252 for time points respectively. Sample weighting applied.

Table A5. Results of multiple linear regression with alcohol intensity as outcome variable (i.e. how many drinks containing alcohol do you have on a typical day when drinking?), Unstandardized and standardized coefficients for Time 6, 7 and 8 data.

	Time 6 (2014)				Time 7 (2015)				Time 8 (2016)			
	B	SE	β	p-value	B	SE	β	p-value	B	SE	β	p-value
Gender (0 women, 1 men)	.692**	.054	**.153**	.000	.730**	.059	**.168**	.000	.782**	.046	**.174**	.000
Age	-.023**	.002	**-.138**	.000	-.021**	.002	**-.128**	.000	-.026**	.002	**-.161**	.000
Māori (0 no, 1 yes)	.871**	.114	**.121**	.000	.835**	.140	**.121**	.000	.872**	.102	**.122**	.000
Pacific (0 no, 1 yes)	1.808**	.325	**.169**	.000	1.514**	.317	**.153**	.000	1.120**	.205	**.107**	.000
Asian (0 no, 1 yes)	-.644**	.141	-.084	.000	-.591**	.148	-.084	.000	-.717**	.093	-.098	.000
Education (0 low to 10 high)	-.065**	.011	-.079	.000	-.054**	.012	-.067	.000	-.074**	.009	-.089	.000
Parent (0 no, 1 yes)	-.036	.067	-.007	.590	-.025	.072	-.005	.725	-.146**	.053	-.029	.006
Partnered (0 no, 1 yes)	-.315**	.073	-.058	.000	-.307**	.084	-.059	.000	-.410**	.062	-.076	.000
Religious (0 no, 1 yes)	-.235**	.055	-.050	.000	-.234**	.059	-.053	.000	-.285**	.042	-.061	.000
NZ Deprivation (0-10)	.072**	.011	.086	.000	.058**	.012	.074	.000	.050**	.009	.061	.000
Log (income)	-.094*	.046	-.044	.040	-.143	.137	-.059	.295	-.059	.034	-.025	.080
Socio-economic status	-.008**	.002	-.060	.000	-.005	.003	-.036	.076	-.006**	.002	-.046	.000
Employed (0 no, 1 yes)	-.205*	.084	-.035	.015	-.149	.096	-.027	.120	-.157**	.060	-.027	.009
Urban area (0 rural, 1 urban)	.022	.055	.004	.690	-.046	.053	-.010	.379	-.039	.045	-.008	.388
Extraversion	.276**	.026	**.138**	.000	.203**	.025	**.106**	.000	.245**	.018	**.127**	.000
Agreeableness	-.088*	.036	-.037	.013	-.049	.028	-.021	.077	-.050	.027	-.021	.064
Conscientiousness	-.009	.025	-.004	.714	-.035	.028	-.016	.220	.013	.023	.006	.570
Neuroticism	.053*	.025	.025	.034	.050	.025	.025	.043	.074**	.020	.037	.000
Openness	-.018	.024	-.009	.445	-.033	.024	-.017	.171	-.043	.020	-.021	.034
Honesty-Humility	-.094**	.030	-.050	.002	-.124**	.034	-.068	.000	-.141**	.021	-.075	.000

Note: * p < .05, ** p < .01. Time 6: N= 10893, R-squared= 18.9%., Time 7: N=9988, R-squared= 17.1%. Time 8: N= 15830, R-squared= 18.0% for time points respectively. Sample weighting applied. Predictors with standardized beta coefficients greater than .10 in bold. Unstandardized coefficient (B) represents amount of change on original scale of measurement, whereas standardized coefficients (β) represent change per standard deviation.

Table A6. Difference in proportions of drinking frequency and intensity between the retained and booster sample in Time 8 of NZAVS.

	Sample Frequency (Percentage)	
Drinker	Retained	Booster
Non-drinker	2130 (16.3)	1303 (16.7)
drinker	10941 (83.7)	6519 (83.3)
Drinking Frequency		
Monthly or less	2824 (25.6)	1749 (26.7)
Up to 4 times a month	2546 (23.1)*	1628 (24.9)*
Up to 3 times a week	2730 (24.8)	1658 (25.3)
4 or more times a week	2841 (25.8)*	1484 (22.7)*
Don't know	76 (0.7)	31 (0.5)
Drinking Intensity		
1 or 2	6920 (67.2)*	3916 (63.5)*
3 or 4	2239 (21.7)	1355 (22.0)
5 or 6	682 (6.6)*	485 (7.9)*
7 to 9	203 (2.0)*	195 (3.2)*
10 or more	256 (2.5)*	217 (3.5)*

Note: 'Retained' includes those retained from at least one previous Time point. 'Booster' includes those sampled from Time 8 random electoral booster and those who self-selected in during the Time 8 booster. '*' indicates significant difference between retained and booster sample based on z-score test. NZAVS sample weighting applied.