The prevalence of hazardous drinking in older New Zealanders

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Comments

This report has not undergone external peer review.

The Prevalence of Hazardous Drinking in Older New Zealanders

Report 2a of 3

A report for the Health Promotion Agency

Massey University-University of Auckland
Research Collaboration on Older Adults Drinking

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Executive summary

Hazardous drinking prevalence in older New Zealanders

Estimates of hazardous drinking in older New Zealanders range from 15% [1] to between 40 and 50% [2-4]. Hazardous drinking is a significant factor contributing to the burden of disease and injury, especially in old age. Facilitating early and accurate identification of hazardous drinking in older adults is therefore an important goal in primary health care settings.

The *Alcohol Use Disorders Identification Test* (AUDIT) [5] and its short versions, such as the 3-item AUDIT-C [6], are standardised alcohol screens assessing hazardous drinking at the primary healthcare level and in research in New Zealand. However, these screens focus only on levels of alcohol consumption, and are insensitive to the factors that might place older adults at significantly increased risk of harm even when drinking small amounts of alcohol (e.g., reduced metabolism, health conditions, and alcohol-interactive medication use). In this respect, there is concern that using a screen not measuring older adult-specific risk factors may result in inaccurate assessments of hazardous drinking rates in this population.

In a national survey of older adults, we compared the classification of hazardous versus non-hazardous drinkers based on the AUDIT-C and the *Comorbidity Alcohol Risk Evaluation Tool* (CARET) [7, 8]. The CARET is an older adult-specific alcohol screen that assesses alcohol-related risks both based on consumption levels and the presence of factors increasing potential harm, including health conditions associated with alcohol use (such as diabetes), the use of alcohol-interacting medication (such as pain medications), symptoms of health issues or frailty (such as low mood, memory problems, and falls), and alcohol risk behaviours (such as drink-driving).

The aim of this study

This study aimed to:

1. compare the prevalence of hazardous drinking in New Zealand older adults using the AUDIT-C and the CARET
2. investigate whether the adoption of an older-adult specific assessment tool, such as the CARET, can improve screening of hazardous drinking in older adults
3. identify the key characteristics of older drinkers whose drinking may mark them as non-hazardous on the AUDIT-C, but whose comorbidities, medication use and health issues increase their likelihood of being deemed hazardous on the CARET.

The dataset

Data were drawn from the 2016 data collection wave of the *New Zealand Health, Work and Retirement Longitudinal Study* (NZHWR) and included 4,026 respondents aged 50-89. In total, 3,673 participants (91% of the sample) completed both alcohol measures. Participants also responded to a range of demographic questions (e.g., age, gender, marital status, work status, education level, economic living standard), measures of health (e.g., physical health, mental health), and past year healthcare utilisation (e.g., times visited their general practitioner).

The results

Analysis indicated that:

- 83% of the sample were current drinkers and 17% were lifetime or current abstainers
- the prevalence of hazardous drinking ranged between 35% (CARET) and 40% (AUDIT-C)
- there was a 90% agreement between the AUDIT-C and the CARET in classifying non-hazardous drinkers and 77% in classifying hazardous drinkers
- 10% of older drinkers were classified as non-hazardous by the AUDIT-C but as hazardous by the CARET because of health-related risk factors
- almost 50% of older New Zealand men were hazardous drinkers according to both the AUDIT-C and CARET screens.

The combination of AUDIT-C and CARET classification resulted in the identification of four drinking-related groups:

1. **'Non-hazardous drinkers' on both screens:** Mainly healthy women; likely to visit GP at least three times a year; drink small amounts of alcohol infrequently with little-to-no binge drinking.
2. **'Hazardous drinkers' on both screens:** Mainly healthy men; likely to visit GP at least three times a year; drink high amounts of alcohol very frequently with monthly binge drinking.
3. **'Hazardous drinkers' AUDIT-C only:** Healthy men and women; *less* likely to visit GP at least three times a year; drink small amounts of alcohol very frequently with some binge drinking.
4. **'Hazardous drinkers' CARET only:** Unhealthy men and women; *more* likely to visit GP at least three times a year; drink small amounts of alcohol frequently with little-to-no binge drinking; are likely to drive after drinking and likely to report symptoms related to health issues including mobility and memory problems.

Those categorised hazardous drinkers on the CARET but not the AUDIT-C are at considerable risk of alcohol-related harm. This is because, while they might fall below the consumption levels traditionally considered hazardous, they are drinking in conjunction with poor health and other health issues (memory problems, sleep problems, falls, depressed mood), and are more likely to drive under the influence of alcohol. However, they are frequent users of primary healthcare services so can be targeted for screening, drinking-related advice and intervention.

Screening for hazardous drinking in older New Zealanders

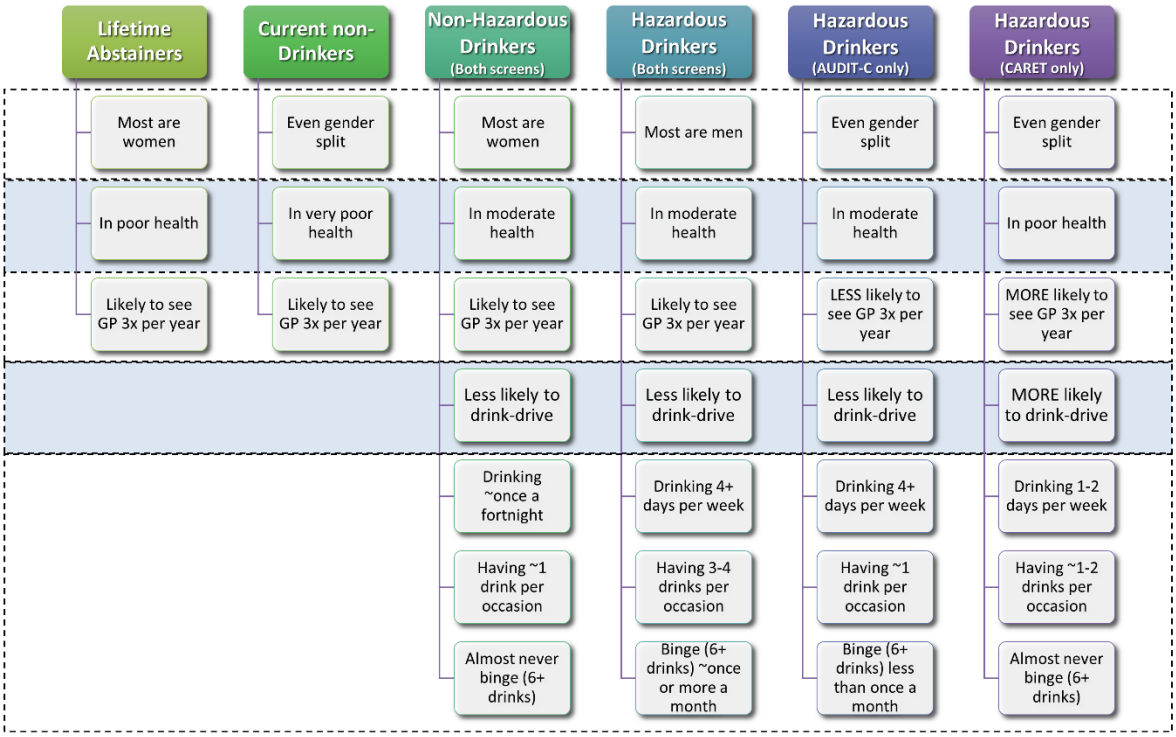
An AUDIT-C threshold of four or more will capture most hazardous older drinkers in New Zealand. However, a subset of those classified as non-hazardous drinkers based on the AUDIT-C screen will still be at significant risk of harm due to drink-driving. Health professionals can identify these at-risk older drinkers as those who are non-hazardous drinkers based on the AUDIT-C screen but:

A. have alcohol-related chronic conditions, or
B. report additional health symptoms (such as memory complaints or depressed mood), or
C. are likely to drive after drinking, or
D. see health professionals at least three times a year.

Supplementing the 3-item AUDIT-C screen with a further question concerning likelihood of driving after drinking reduces the discrepancy between the AUDIT-C and the older adult-specific CARET from 10% to 2%.

Figure 1 offers a quick indication of the key similarities and differences of the older adults in the drinking-related groups identified in this study. Health professionals screening older adults for hazardous drinking might use the characteristics provided to aid in their identification of older drinkers who are likely hazardous drinkers, but do not appear so in the AUDIT-C.

Figure 1. Key demographic, health, healthcare utilisation and drinking characteristics that differentiate between older adults in each drinking-related group.



1.0 Hazardous drinking prevalence in older New Zealanders

1.1 Hazardous drinking in older New Zealanders

The World Health Organization (WHO) states that hazardous drinking "*is a pattern of alcohol consumption that increases the risk of harmful consequences for the user or others. Hazardous drinking patterns are of public health significance despite the absence of any current disorder in the individual user*" [(5)]. Hazardous drinking is distinct from the notion of alcoholism or addiction, but encompasses alcohol-related physical and mental health ramifications that affect our communities and health systems, such as injuries and violence from acute high-level drinking and the development of chronic health conditions due to lower-level, long-term alcohol use.

Existing literature on hazardous drinking in older New Zealanders is relatively small, but there are estimates at the national level. The Ministry of Health's New Zealand Health Survey (NZHS) includes a robust indicator of hazardous drinking; specifically the WHO's *Alcohol Use Disorders Identification Test* (AUDIT)[1]. An analysis of the proportion changes in hazardous drinking rates across different age groups from 2006/07 to the most recent survey in 2016/2017 illustrates the growing issue of older adults' hazardous alcohol use [(1)]. Specifically, hazardous drinking has declined over the past decade in younger adults (those aged 15-24), but has steadily increased in those aged 25-75 years old. Levels of hazardous drinking in older age groups in New Zealand appear to peak at ages 55-64 (15% of this cohort), and then to drop to less than 5% of those aged 75 and over.

Findings from the *New Zealand Health, Work and Retirement Longitudinal Study* (NZHWR) offer further insight into the rates and predictors of hazardous drinking in older New Zealanders compared to older adults in other countries. The NZHWR uses the AUDIT-C, a brief but comparable version of the AUDIT [(9)], to screen for hazardous drinking in a manner similar to other longitudinal studies of ageing such as the 18-country *Survey of Health, Ageing and Retirement in Europe (SHARE)* [(10)] which uses an AUDIT-C adaptation. Results from the NZHWR study show that the prevalence of hazardous drinking in New Zealanders aged 50-89 years may range from 42% to 56% [(2-4)], which is significantly higher than the average of 22% seen in SHARE countries [(10)].

Both the NZHWR and SHARE studies indicate that hazardous drinking is much more likely in older men than in older women, in those aged 50-65 than in those aged 65 and over, and in those with better socio-economic status including those with higher education and more wealth. It is clear that rates of hazardous drinking in older New Zealanders are high, which makes the identification of hazardous older drinkers a primary concern.

1.2 Measuring hazardous drinking in older adults: The AUDIT-C versus the CARET

Considering the health-related effects of excessive alcohol consumption, the rates of hazardous drinking in adults aged 50 years and over is concerning. The potential for alcohol-related harm increases as people age - not just from the level of alcohol consumed, but because the ageing body has a reduced capacity to metabolise alcohol and, in combination

[1] Due to its international standardisation, the 10-item AUDIT and its family of abbreviated screens (i.e., the 3-item AUDIT-C) is one of the world's most common screens for hazardous alcohol use. They have been employed across many different countries and within a diverse range of populations.

with age-related loss of body water necessary to dilute alcohol, older adults become increasingly sensitive to its effects [11].

Furthermore, as people age, they are more likely to develop health conditions exacerbated by alcohol use (such as heart disease or diabetes); to use alcohol-interactive medication (such as anxiety or pain medication); to develop health issues which alcohol can make worse (such as gastroesophageal reflux); and to be affected by alcohol-related accidents (such as falls) [12]. Consequently, older adults are more susceptible to the harmful effects of alcohol at any level of consumption. Early detection, therefore, is crucial to prevent alcohol-related harm in the older population.

Most alcohol screening tools, including the AUDIT and the AUDIT-C, focus on levels of alcohol consumption (i.e., frequency and quantity of drinking). The AUDIT is one of the world's most well-validated screening tools of hazardous drinking and has been the alcohol use screen included in New Zealand Health Surveys for the past decade [13, 14]. It has also been used with older adult populations [15], and is recommended for use in New Zealand primary health care settings [16, 17]. The 3-item AUDIT-C is a standardised brief version of the 10-item AUDIT that is equivalent in identifying hazardous drinkers across a range of populations [9], is recommended for use in primary health care by the United States National Institute on Alcohol Abuse and Alcoholism [18], and has been used in the NZHWR since 2006.

However, these screens are – by design - insensitive to the alcohol-related factors that place older adults at significantly increased risk of harm, even when drinking small amounts of alcohol. Using a screen in primary health care and research that does not take into account additional risk factors that increase alcohol-related harm in older adults may provide an inaccurate assessment of hazardous drinking in older New Zealanders.

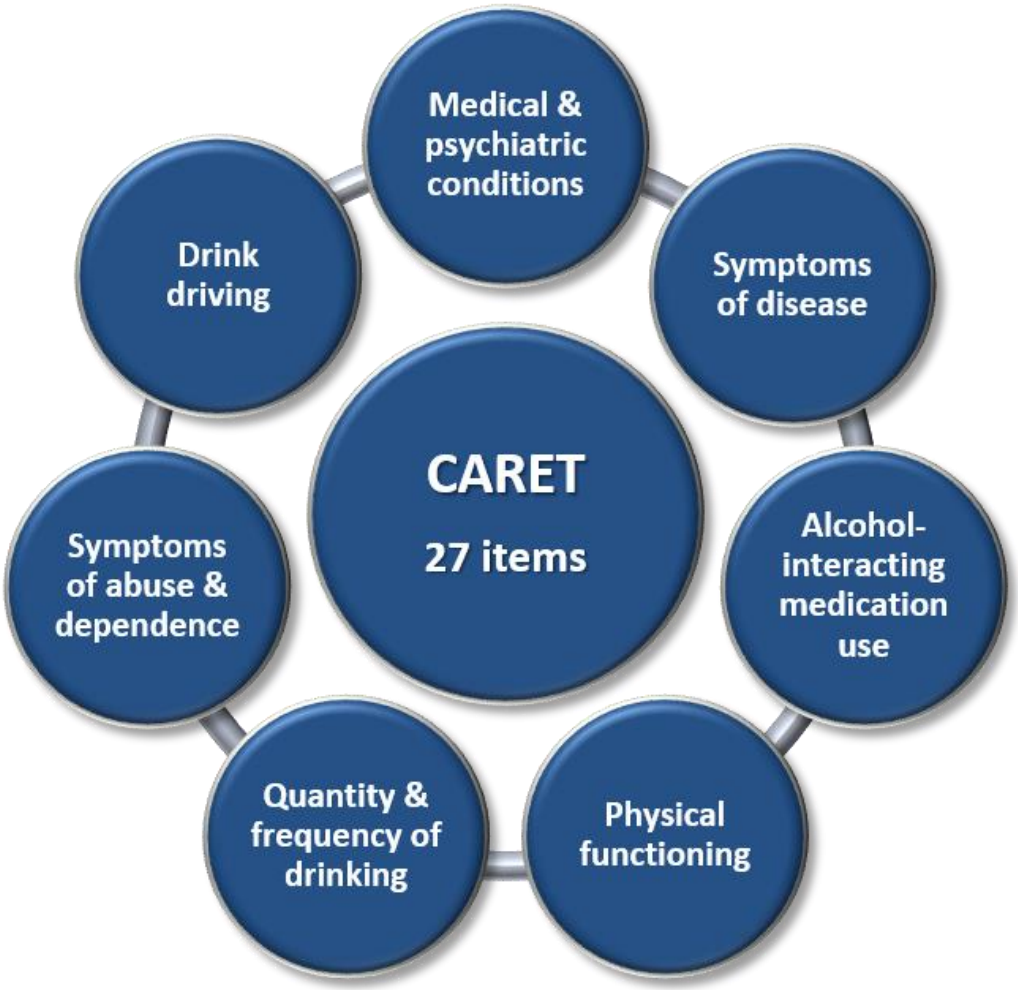
A panel of international experts in gerontology, geriatrics and alcohol use in the United States undertook a comprehensive evaluation of the factors that enhance older adults' risk of alcohol-related harm, and developed a screening tool to more accurately assess hazardous drinking in older medical patients - the *Alcohol-related Problems Survey* (ARPS) [12]. In contrast to the AUDIT and AUDIT-C, the ARPS assesses alcohol-related risk on levels of consumption and the presence of factors increasing potential harm, including health conditions associated with alcohol use, the use of alcohol-interacting medication, indications of health issues or frailty, and alcohol risk behaviour. The strength of the ARPS lies in its capacity to identify older drinkers who may be drinking at non-hazardous levels according to existing screens, but whose co-morbidities, medication use, frailty, and risk behaviours make their use of alcohol hazardous to their health [7, 12, 19].

Moore et al. developed a brief version of the ARPS for use in primary healthcare screening and surveying - the *Comorbidity Alcohol Risk Evaluation Tool* (CARET) [7, 8]. The CARET is much shorter than the ARPS, but still targets the key factors that contribute to hazardous alcohol use in older adults.

Figure 2 illustrates the key components covered in the CARET screen. The threshold for hazardous drinking is determined based on quantity and frequency of drinking in combination with the presence of medical conditions, alcohol-interactive medication use, symptoms of disease, frailty, symptoms of abuse, and frequency of drink-driving. The CARET has been successfully used to assess hazardous drinking in American older adults [20, 21], and the difference in healthcare expenditure between hazardous and non-

hazardous drinking in older adults [22]. The CARET has also been used as the basis for interventions to reduce hazardous drinking in older community-dwelling adults [23] and in clinical care patients in the United States [24]. The CARET offers healthcare professionals and researchers a potentially more sensitive tool than the AUDIT for the identification of hazardous drinking in older adults [25].

Figure 2. The alcohol-risk components covered by the Comorbidity Alcohol Risk Evaluation Tool (CARET).



1.3 Aims of the current study

The aims of the current study were threefold:

1. To compare the prevalence of hazardous drinking in New Zealand older adults using the AUDIT-C and the CARET.
2. To investigate whether the adoption of older-adult specific assessment items, such as from the CARET, can improve screening of hazardous drinking in older adults.
3. To identify the key characteristics of older drinkers whose drinking may mark them as non-hazardous on the AUDIT-C, but whose comorbidities, medication use and health issues increase their likelihood of being deemed hazardous on the CARET.

2.0 The dataset & measurement used

We used the 2016 data collection wave of the NZHWR to assess the rate of hazardous drinking in older New Zealanders[2]. The NZHWR is a government-funded study established in 2006 at Massey University to follow thousands of New Zealanders aged 55-70 to understand factors that determine health and independence in older adults. The NZHWR sends postal surveys to thousands of New Zealanders on a biennial basis to track their current health, wealth, social, working and demographic status.

Data from the NZHWR cover four main domains: determinants of mental and physical health in later life; living standards of older adults; quality of life; and ethnicity. By the 2016 data collection wave, the NZHWR had expanded its original age range to encompass New Zealanders aged 50-89, thus offering a more comprehensive coverage of the experiences of older adults in New Zealand [(26)].

2.1 The NZHWR 2016 sample

The NZHWR 2016 data collection wave included 4,026 respondents aged 50-89. A total of 3,673 participants (91% of the sample) completed all relevant alcohol measures required to categorise them on both screening tools, and were included in the study. The NZHWR oversamples older Māori; therefore, weighting is applied to ensure that analyses accurately reflect the Māori/non-Māori proportion of older New Zealanders.

Analyses presented in this report were based on data from the 2016 NZHWR data collection wave (i.e., it is cross-sectional and does not necessarily reflect pre- or post-2016 rates). Information concerning the NZHWR methodology has been reported in more detail by Towers et al. [(26)].

Table 1 illustrates the characteristics of the NZHWR 2016 sample weighted (post-stratification) to reflect the appropriate age, gender, and Māori/non-Māori breakdown of the New Zealand older adult population as at 2016.

[2] Dr Andy Towers (report co-author) is a member of the Massey University team managing the NZHWR study. Access to the NZHWR data by the collaborators authoring this report was facilitated by Dr Towers.

Table 1: Characteristics of the NZHWR 2016 sample weighted.						
	Total		**Men**		**Women**	
Demographics	*N*	*%*	*N*	*%*	*N*	*%*
N	3,673	100%	1,843	51%	1,772	49%
Age						
50-59 years	-	19.7%	-	19%	-	20.5%
60-69 years	-	52.9%	-	54%	-	51.5%
70+years	-	27.3%	-	27%	-	28%
Mean (SD)	*65.5 (7)*	-	*65.5 (6)*	-	*65.5 (7)*	-
Economic Living standard						
Hardship	-	10%	-	9%	-	12%
Comfortable	-	24%	-	24%	-	24%
Good	-	63%	-	67%	-	64%
Mean (SD)	*24.7 (6)*	-	*24.9 (6)*	-	*24.4 (6)*	-
Employment status						
Working	1,894	63%	1,038	66%	855	60%
Retired	779	26%	388	25%	391	28%
Other (e.g., caregiver)	322	11%	149	9%	174	12%
Marital status						
Married/partnered	2,755	77%	1,538	84%	1,216	69%
Divorced/separated	367	10%	138	7 %	230	13%
Widow/widower	267	7%	53	3%	215	12%
Single/never married	213	6%	111	6%	102	6%
Educational qualifications						
No qualification	706	20%	380	21%	327	19%
High school	872	24%	388	21%	484	27%
Post-High school/Trade	1,216	34%	673	37%	543	31%
Tertiary	799	22%	394	21%	405	23%

Note: Category totals indicated may not sum to total sample N due to missing data on individual survey variables.

2.2 Measuring alcohol use: The AUDIT-C

In 2016, the NZHWR questionnaire used the AUDIT-C [6], a 3-item brief version of the WHO's 10-item AUDIT [5]. The AUDIT-C assesses alcohol consumption indicators: the frequency and typical quantity of alcohol use, and the frequency of binge drinking. Prior research [27] illustrates that an AUDIT-C score of 4 or more out of 12 provides an adequate hazardous drinking threshold for older men and older women.

The AUDIT-C items and response options are as follows:

The AUDIT-C questions and response options

1. **Frequency:** How often do you have a drink containing alcohol?
   Responses: never; monthly or less; 2 to 4 times a month; 2 to 3 times a week; 4+ times a week
2. **Quantity:** How many drinks containing alcohol do you have on a typical day when drinking?
   Responses: 1 to 2 drinks; 3 to 4 drinks; 5 to 6 drinks; 7 to 9 drinks; 10+ drinks
3. **Binge drinking:** How often do you have six or more drinks on one occasion?
   Responses: never; less than monthly; monthly; weekly; daily or almost daily

A supplementary question was included asking those indicating that they 'never' currently consume alcohol to specify whether they had done so in the past (see the blue box below).

Supplementary alcohol history question
4. **Non-drinker classifier:** If you 'Never' had a drink containing alcohol in the past 12 months, have you ever drunk alcohol in the past? *Responses: Yes; No*.

This supplementary question allowed us to more accurately classify non-drinkers as either lifetime abstainers (i.e., non-drinkers who have never previously consumed alcohol), or as current non-drinkers (i.e., those who have previously consumed alcohol but are current abstainers). This classification of non-drinking groups is particularly helpful in distinguishing between lifetime abstainers and current non-drinkers, as previous research indicates that these groups have distinct socio-economic and health characteristics [28, 29]. In the current study, our analysis (see Tables 5 and 6) also suggests that current non-drinkers are slightly more likely to have lower socio-economic status and poorer health than lifetime abstainers.

2.3 Measuring alcohol use: The CARET

In 2016, in addition to the AUDIT-C, the NZHWR study also used the 27-item CARET [7, 8]. The CARET evaluates whether older adults are drinking hazardously with regard to the level of alcohol consumption (i.e., frequency, quantity and binge drinking as assessed by the AUDIT-C). It also assesses whether such drinking occurs in the presence of critical factors known to increase the risk of alcohol-related harm for older adults. This includes chronic conditions (e.g., heart disease, diabetes, liver disease); physical or psychological impairment (e.g., mobility issues, depression symptoms, memory and sleep problems, falls); use of alcohol-interactive medication (e.g., analgesics, anxiolytics); and alcohol risk behaviour (e.g., driving after consuming three or more standard drinks).

As a much shorter version of the ARPS, the CARET is better suited for use in public health surveys and comprehensive screening. The CARET calculates the threshold for hazardous drinking by taking into account factors that might increase harm at lower levels of consumption.

The hazardous drinking questionnaire used in the 2016 NZHWR survey combined the AUDIT-C and CARET questions, and is presented in Appendix 1.

2.4 Covariates

All participants in the 2016 NZHWR completed questions related to their socio-demographic status, health and healthcare utilisation.

2.4.1 Socio-demographic variables

Demographic variables included age, gender, marital status (married or in de facto relationship; neither married nor in de facto relationship), work status (working full- or part-time; retired; and other), and highest educational qualification (no qualification; secondary school; post-secondary/trade certificate; tertiary).

The short form version of the 'Economic Living Standards Index' (range: 0-31) developed by the New Zealand Ministry of Social Development was used to assess financial and economic wellbeing [30]. Higher scores on the 'Economic Living Standards Index' indicate better

economic wellbeing. The 'Economic Living Standards Index' can be divided into three categories indicative of hardship (range: 0-16), fairly comfortable (range: 17-24) or good living standards (range: 25-31).

2.4.2 Health and healthcare utilisation variables

Physical health and mental health: Self-assessed physical health and mental health were measured using the physical health and mental health component summary scores on the self-reported SF-12v2 [31]. Summary scores were normed for the older New Zealand population using coefficients developed from the New Zealand Health Survey [32]. Scores can be interpreted relative to a population mean of 50 and standard deviation of 10, with higher scores indicating better physical and mental health.

Healthcare utilisation: Participants completed five questions related to their healthcare utilisation patterns in the 12 months prior to the survey. These questions have been used over the longitudinal course of the NZHWR, and were sourced from the 'Taking the Pulse: 1996/97 New Zealand Health Survey' [33]. Questions included frequency of visits to a general practitioner (GP); using a service at, or being admitted to, a hospital; being admitted to hospital for one night or longer; visiting a hospital emergency department as a patient; and consulting another health care professional.

2.5 The analysis: Assessing agreement between alcohol screens for older drinkers

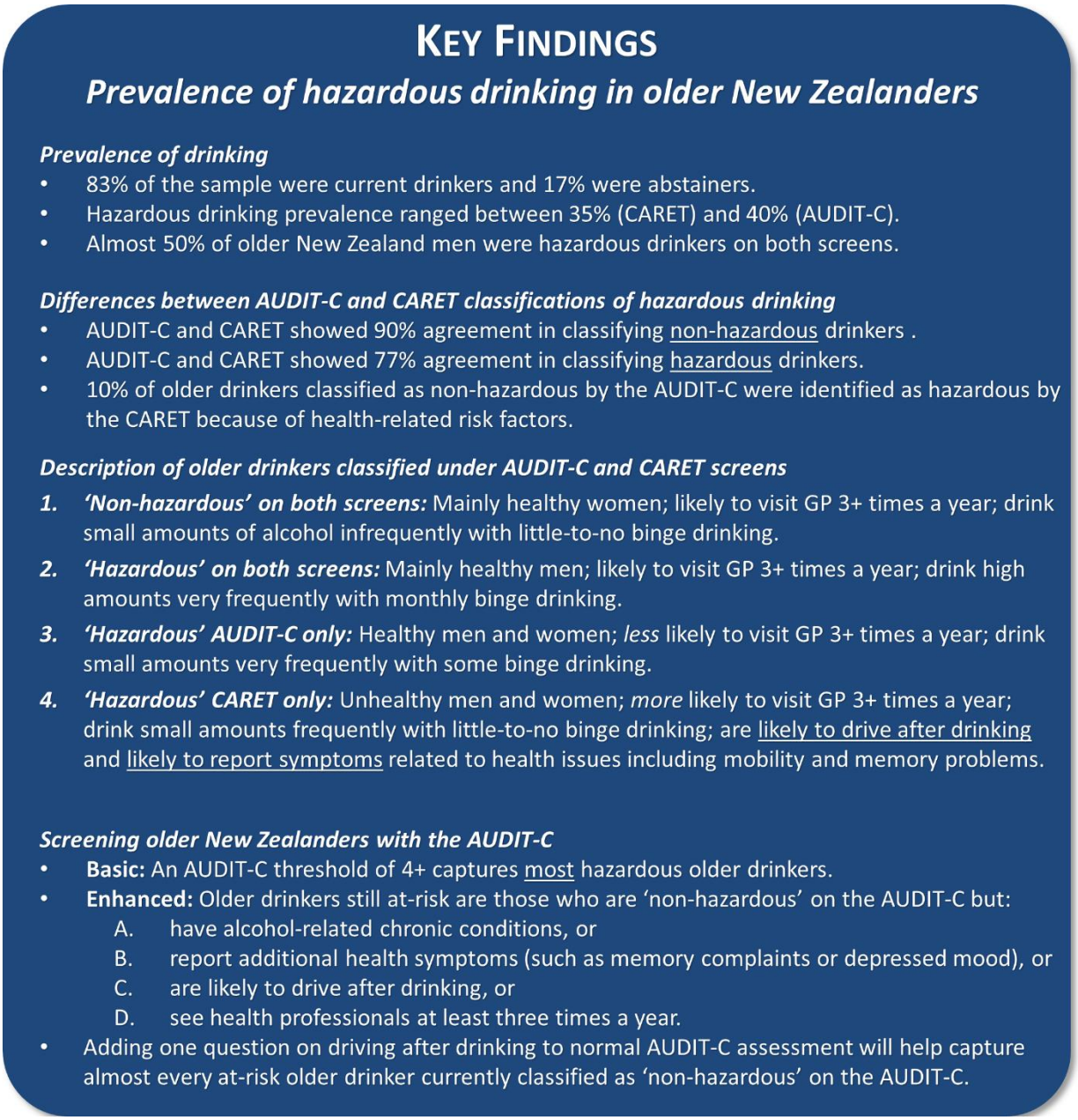
Classification agreement between the AUDIT-C and CARET was calculated using Cohen's kappa coefficient. Kappa values range from −1 to +1, with +1 indicating a perfect agreement. Socio-demographic differences in drinking groups were examined using chi-square (χ^2) test, analysis of variance (*F*), and independent samples t-test (*t*). Indicators of effect size specific to these analytic techniques were calculated; namely, phi coefficient (Φ) for chi-square, eta-square (η^2) for ANOVA, and Cohen's d (*d*) for t-test. It is best practice to employ both statistical significance testing and effect size estimation so that results can be assessed, both with regard to statistical and practical significance (i.e., utility in clinical decision-making).

3.0 The prevalence of hazardous drinking in older New Zealanders

3.1 Key findings: The prevalence of hazardous drinking

Figure 3 below provides the key findings from our analysis of the prevalence of hazardous drinking in older New Zealanders.

Figure 3. Key findings regarding the prevalence of hazardous drinking in older New Zealanders.



3.2 Hazardous drinking: Comparing AUDIT-C and CARET outcomes

Using weighted data to reflect the New Zealand population aged 50 and over, Figure 4 presents the proportion of the sample classified as hazardous or non-hazardous drinkers on the AUDIT-C and the CARET.

This graph also uses the supplementary question concerning 'history of drinking' to delineate the two non-drinking sub-groups: lifetime abstainer and current non-drinker.

Results indicate that 83% of older New Zealanders drank alcohol to some degree, while 13% were current abstainers and 4% were lifetime abstainers. Regardless of which screen was used, over one-third of older New Zealanders were drinking at levels that may result in harm (40% on the AUDIT-C versus 35% on the CARET). This is a high rate of hazardous drinkers in a population group at significant risk of alcohol-related harm, but it matches levels indicated by research in older drinkers in the United States [20]. A little bit less than half of the sample were classified as non-hazardous drinkers by both screens (43% on the AUDIT-C and 48% on the CARET).

Figure 4. Proportion of abstainers, hazardous drinkers, and non-hazardous drinkers as assessed on the AUDIT-C and the CARET.

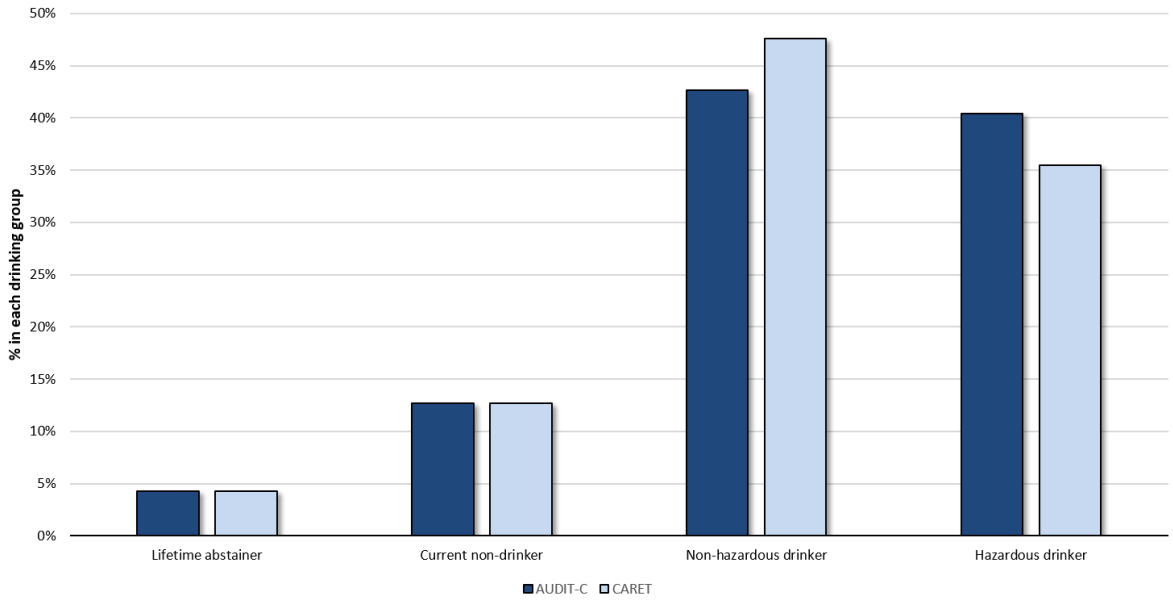


Table 2 contrasts the proportion of participants classified into each of the four drinking-related groups based on the CARET and the AUDIT-C. There was a moderate agreement between the AUDIT-C and the CARET[3].

In total, 1,565 participants (43% of the total sample, Figure 4 and Table 2) were classified on the AUDIT-C as 'non-hazardous drinkers' due to the generally low level of drinking frequency, quantity and binging. The CARET classified 90% of the same participants as 'non-hazardous drinkers'. The remaining 10% were classified as 'hazardous drinkers' by the

[3] Analysis of agreement (Cohen's kappa): κ = .671 [95% CI: .645; .700], p < .001

CARET due to the presence of comorbidities and other health issues that make even low levels of drinking potentially hazardous.

Of the 1,485 participants (40% of the total sample, Figure 4 and Table 2) that the AUDIT-C classified as 'hazardous drinkers' due to their frequency and quantity of drinking, the CARET also classified 77% as 'hazardous drinkers'.

However, 23% of drinkers whose level of consumption was classified by AUDIT-C as hazardous were classified by the CARET as non-hazardous. This could be because (a) they only just reach the threshold for 'hazardous drinking' on the AUDIT-C (i.e., they are not likely to be very heavy drinkers); and/or (b) they likely lack the comorbidities to make this level of drinking hazardous to their health.

Table 2: A matrix of the level of agreement between AUDIT-C and CARET classifications.

		CARET									
		Lifetime abstainer		Current non-drinker		Non-hazardous drinker		Hazardous drinker		Total	
		N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
AUDIT-C	Lifetime abstainer	156	100%	-	-	-	-	-	-	156	100%
	Current non-drinker	-	-	466	100%	-	-	-	-	466	100%
	Non-hazardous drinker	-	-	-	-	1406	90%	159	10%	1565	100%
	Hazardous drinker	-	-	-	-	341	23%	1144	77%	1485	100%

It should be noted then that there is a difference in the consumption threshold for hazardous drinking between the AUDIT-C and the CARET. When comorbidities are not present, the CARET uses a higher threshold for hazardous drinking based on consumption indicators. Because of its more stringent threshold, in the absence of comorbidities the AUDIT-C identifies a higher proportion of older drinkers as hazardous than the CARET does.

Overall, analysis of classification agreement between the AUDIT-C and the CARET suggests that the AUDIT-C:

1. identifies a greater proportion of drinkers as 'hazardous' than the CARET
2. classifies approximately 10% of older drinkers as 'non-hazardous' despite critical alcohol-related risk factors being present.

3.3 Differences in classification based on age and gender

Table 3 provides a breakdown of the AUDIT-C drinking categories by age-group and gender. The results suggest that age has little influence on the AUDIT-C classification of hazardousness, with less than five percentage point difference in hazardous drinking rates across age groups. However, gender plays a critical role; 31% of older women were classified as hazardous drinkers compared to 50% of older men. This reflects previous research showing that older New Zealand men are more likely to drink hazardously than their female counterparts [4, 29].

Table 3: Breakdown of AUDIT-C drinking categories across sample in total and by age-group.								
	Lifetime abstainer		Current non-drinker		Non-hazardous drinker		Hazardous drinker	
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Total	156	4%	466	13%	1,565	43%	1,485	40%
Age								
50-59	25	3%	81	11%	333	44%	318	42%
60-69	72	4%	243	12%	846	43%	814	41%
70+	59	6%	142	15%	386	41%	353	38%
Gender								
Male	51	3%	218	12%	655	36%	919	50%
Female	103	6%	237	13%	886	50%	547	31%

Table 4 provides a breakdown of the four drinking categories classified by the CARET across age-group and gender. The results suggest that hazardous drinking under the CARET is more clearly linked to age – there are more hazardous drinkers in the youngest age group (by eight percentage points) than in the oldest age group (i.e., increasing age reduced the likelihood of hazardous drinking). Gender was also associated with hazardous drinking in the CARET. The CARET classified 25% of older women as hazardous drinkers, compared to 46% of older men.

Table 4. Breakdown of CARET drinking categories across sample in total and by age-group.								
	Lifetime abstainer		Current non-drinker		Non-hazardous drinker		Hazardous drinker	
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Total	156	4%	466	13%	1747	48%	1303	36%
Age								
50-59	25	3%	81	11%	355	47%	297	39%
60-69	72	4%	243	12%	944	48%	716	36%
70+	59	6%	142	15%	448	48%	291	31%
Gender								
Male	51	3%	218	12%	730	40%	844	46%
Female	103	6%	237	13%	992	56%	441	25%

These breakdowns suggest that, regardless of the screening tool used, up to 50% of older New Zealand men use alcohol at a level that is potentially harmful.

3.4 Socio-demographic and health characteristics of drinking groups

We split the sample into six classifications resulting from Table 2: Lifetime abstainer; current non-drinker; non-hazardous drinker (both screens agree); hazardous drinker (both screens agree); hazardous on the AUDIT-C only; and hazardous on the CARET only.

We then explored whether these groups were distinguishable based on key drinking, socio-demographic and health characteristics. In addition, we investigated whether those screening hazardous on the AUDIT-C but not the CARET did so because they drink more but are healthier, compared with those screening hazardous on the CARET but not on the AUDIT-C.

Tables 5 and 6 illustrate the differences across groups on these key characteristics. Results suggest that drinking-related groups could be differentiated based on drinking, socio-demographic and heath characteristics.

Overall, the results suggest that:

1. both the AUDIT-C and CARET classify high drinking frequency and high quantity consumed as ‘hazardous’
2. those classified as ‘hazardous on the AUDIT-C only’ are frequent drinkers in relatively good mental and physical health
3. those classified as ‘hazardous on the CARET only’ drink smaller amounts at a much lower frequency and binge less than those deemed hazardous on the AUDIT-C. However, they are in poorer health than those ‘hazardous on the AUDIT-C only’.

Differences between drinking and non-drinking groups were found in some, but not all, of the socio-demographic and health factors. Some factors (i.e., age, marital status, work status, and mental health) show statistically significant differences between these drinking groups, but the effect sizes are small. Such small effect sizes indicate that, while differences between drinking groups might exist at a statistical level, they are so minor that they are not practically meaningful for differentiating drinking-related groups in clinical decision-making and real-world settings.

Table 5: Mean and standard deviations of six drinking-related groups on key demographic factors.														
	Lifetime abstainer		Current non-drinker		Non-hazardous drinker (both)		Hazardous drinker (both)		Hazardous AUDIT-C only		Hazardous CARET only			
	M	SD	M	SD	M	SD	M	SD	M	S.D	M	SD	Size of differences[b]	
Drinking pattern[a]													*F*	η^2
Frequency (0-4)	-	-	-	-	1.74	.78	3.54	.71	3.70	.61	2.29	.78	2721.19*	0.79
Quantity (0-4)	-	-	-	-	0.05	.22	1.20	1.00	0.09	.28	0.31	.60	556.35*	0.44
Binge (0-4)	-	-	-	-	0.04	.21	1.27	1.23	0.33	.56	0.05	.22	446.58*	0.38
Demographics & health														
Age (50-89)	67.28	6.81	66.18	6.69	65.58	6.64	64.90	6.46	65.65	6.27	64.59	6.43	5.93*	0.01
Physical Health (0-100)	45.08	10.45	42.17	12.31	47.80	9.32	48.10	9.42	49.49	8.37	46.00	11.42	31.29*	0.04
Mental Health (0-100)	50.97	9.07	47.59	11.49	50.59	9.24	50.06	9.96	52.61	7.43	49.13	9.25	11.75*	0.02

[a] This reflects AUDIT-C item totals for average frequency (from '1=Never drink' up to '5 = drink 4+ days per week'), quantity (from '1=1-2 drinks per occasion' up to '5=10+ drinks per occasion') and binge prevalence (from '1=never' up to '5=daily or almost daily').

[b] The symbol *F* reflects the results of one-way Analysis of Variance assessing between groups differences on each factor; the symbol η^2 reflects Eta Squared which is an indication of the size of effect of each factor in generating differences between groups: small effect: ≥ 0.01; medium effect: ≥ 0.06; large effect: ≥ 0.14

*Level of significance of this difference: $p < .001$.

Table 6: Comparing percentages of key demographic factors for six drinking-related groups.														
	Lifetime abstainer		Current non-drinker		Non-hazardous drinker (both)		Hazardous drinker (both)		Hazardous AUDIT-C only		Hazardous CARET only			
	N	%	N	%	N	%	N	%	N	%	N	%	Size of differences[a]	
Gender													χ^2	Φ
Male	51	33.1%	218	47.9%	567	41.0%	756	67.1%	163	47.9%	88	55.7%	196.85*	0.23
Female	103	66.9%	237	52.1%	816	59.0%	370	32.9%	177	52.1%	70	44.3%	-	-
Marital status														
Married/partnered	134	87.0%	334	72.1%	1047	75.4%	815	71.7%	267	78.8%	133	83.6%	29.36*	0.09
Not married/partnered	20	13.0%	129	27.9%	341	24.6%	321	28.3%	72	21.2%	26	16.4%	-	-
Work status														
Working	57	49.1%	209	58.7%	719	61.4%	652	66.7%	193	68.2%	87	65.9%	55.13*	.14
Retired	33	28.4%	83	23.3%	324	27.7%	246	25.2%	72	25.4%	28	21.2%	-	-
Other	26	22.4%	64	18.0%	128	10.9%	80	8.2%	18	6.4%	17	12.9%	-	-
Educational qualifications														
None	43	27.9%	141	30.7%	221	16.0%	226	20.0%	53	15.5%	32	20.0%	94.99*	0.16
Secondary	40	26.0%	107	23.3%	354	25.6%	283	25.0%	58	17.0%	38	23.8%	-	-
Post-secondary/trade	40	26.0%	147	32.0%	459	33.2%	404	35.7%	129	37.8%	49	30.6%	-	-
Tertiary	31	20.1%	65	14.1%	350	25.3%	219	19.3%	101	29.6%	41	25.6%	-	-
Economic living standard														
In hardship	14	9.5%	90	20.0%	134	9.8%	100	8.9%	12	3.6%	22	14.1%	122.38*	0.19
Comfortable	58	39.5%	133	29.5%	314	22.9%	237	21.2%	64	19.2%	46	29.5%	-	-
Good	75	51.0%	228	50.6%	924	67.3%	781	69.9%	258	77.2%	88	56.4%	-	-

[a] The symbol χ^2 is Chi Squared which reflects an assessment of potential difference in sample proportions between categories; the symbol Φ is the Phi Coefficient which reflects an assessment of the size of effect of each factor in generating differences between groups: small effect: ≥ 0.1; medium effect: ≥ 0.3; large effect: ≥ 0.5

* Level of significance of this difference: $p < .001$.

3.5 Differentiating between AUDIT-C and CARET 'hazardous' drinkers

Tables 7 and 8 compare those classified as 'hazardous on the CARET only' to drinkers identified as 'hazardous by the AUDIT-C'. The aim of this comparison is to understand whether hazardous drinkers 'missed' by the traditional screening tool (i.e., the AUDIT-C) have distinct socio-demographic, health or drinking-related characteristics.

The results shown in Table 7 indicate that those classified hazardous drinkers on the CARET only, consume smaller amounts of alcohol less frequently and are much less likely to binge drink. However, they are much more likely to drive within two hours of consuming three or more alcoholic drinks. They have poorer self-reported health and display more symptoms of disease (such as memory problems, sleep problems, tipping or falling).

Table 7: Comparing drinking patterns and health of hazardous drinkers on the AUDIT-C and the CARET.

	Hazardous drinker on AUDIT-C[b]		Hazardous drinker on CARET only		Size of differences[c]	
	M	*SD*	*M*	*SD*	*t*	*d*
Drinking pattern[a]						
Frequency (0-4)	3.58	0.69	2.29	0.78	22.05*	1.09
Quantity (0-4)	0.95	1.00	0.31	0.60	7.80*	0.38
Binge (0-4)	1.06	1.18	0.05	0.22	10.71*	0.53
Factors increasing harm[d]						
Drink-driving (1-6)	1.46	0.98	1.81	1.01	-4.34*	0.21
Chronic conditions (0-5)	0.67	0.80	0.73	0.89	-0.79	0.04
Symptoms of disease (1-18)	8.39	1.87	8.86	2.06	-2.99*	0.15
Medication use (0-11)	1.21	1.36	1.19	1.39	0.16	0.01
Demographics & health						
Age (50-89)	65.65	6.27	64.59	6.43	0.89	0.04
Physical Health (0-100)	48.42	9.21	46.00	11.42	3.04*	0.15
Mental Health (0-100)	50.64	9.50	49.13	9.25	1.89	0.09

[a] This reflects AUDIT-C item totals for average frequency (from '1=Never drink' up to '5 = drink 4+ days per week'), quantity (from '1=1-2 drinks per occasion' up to '5=10+ drinks per occasion') and binge prevalence (from '1=never' up to '5=daily or almost daily');
[b] 'Hazardous on the AUDIT-C' includes those who are hazardous drinkers using both the AUDIT-C and CARET criteria;
[c] The symbol *t* reflects the results of an independent samples t-test assessing between groups differences on each factor; the symbol *d* reflects Cohen's *d* which is an indication of the size of effect of each factor in generating differences between groups: small effect: ≥ 0.20; medium effect: ≥ 0.50; large effect ≥ 0.80
[d] Detailed description of chronic conditions, symptoms of disease and medication use is provided in questions 1-3 in Appendix 1.
*Level of significance of this difference: $p < .001$
Numbers in brackets indicate the theoretical score range for each variable.

The results shown in Table 8 indicate that those classified 'hazardous drinkers on the CARET only' are also more likely to be married/partnered and living in hardship.

Table 8: Comparing socio-demographic characteristics of hazardous drinkers on the AUDIT-C and the CARET.

	Hazardous drinker on AUDIT-C		Hazardous drinker on CARET only		Size of differences[a]	
	N	%	N	%	$\chi 2$	Φ
Gender						
Male	930	63%	89	56%	2.97	0.04
Female	556	37%	71	44%	-	-
Marital status						
Married/partnered	394	27%	26	16%	8.02*	0.07
Not married/partnered	1083	73%	133	84%	-	-
Work status						
Working	846	67%	87	66%	4.43	0.06
Retired	318	25%	28	21%	-	-
Other	99	8%	17	13%	-	-
Educational qualifications						
None	279	19%	32	20%	2.35	0.04
Secondary	341	23%	38	24%	-	-
Post-secondary/trade	533	36%	49	31%	-	-
Tertiary	320	22%	41	26%	-	-
Economic living standard						
In hardship	112	8%	22	14%	16.52*	0.10
Comfortable	301	21%	46	30%	-	-
Good	1039	72%	88	56%	-	-

[a] The symbol χ^2 is Chi Squared which reflects an assessment of potential difference in sample proportions between categories; the symbol Φ is the Phi Coefficient which reflects an assessment of the size of effect of each factor in generating differences between groups: small effect: ≥ 0.1; medium effect: ≥ 0.3; large effect: ≥ 0.5

* Level of significance of this difference: $p < .01$

Apart from consumption indicators, the factors most strongly associated with hazardousness on the CARET were driving after drinking and symptoms of disease (e.g., sleep problems, memory problems, falls).

Next, we investigated how the classification of hazardousness between the two screens would change if the calculation of the AUDIT-C scoring incorporated a drink-driving criterion. If participants reporting driving within two hours of consuming three or more alcoholic drinks were classified as hazardous drinkers regardless of their general consumption level on the AUDIT-C, the classification discrepancy between the two screens would reduce from 10% to 2%. This suggests that supplementing the AUDIT-C with a single item assessing driving under the influence of alcohol would substantially increase screening efficiency in the older adult population.

3.6 Healthcare utilisation across drinking groups

In addition to understanding how groups of older drinkers (particularly those at greatest risk of alcohol-related harm) might differ on key characteristics, it is useful to know whether these

older drinkers are seen by health professionals in order for effective screening and identification to take place.

We explored the degree to which older New Zealanders in this sample used healthcare services in the previous 12 months, ranging from General Practitioner (GP) visits, hospital admissions, to visiting specialists. Figures 5-9 highlight these results. Overall, these figures indicate that most people across all drinking groups, except those categorized as hazardous on the AUDIT-C only, visit their GP at least three times a year but use of additional health care services, such as admission to emergency care and hospital or visiting a specialist, is relatively uncommon.

Figure 5. Proportion of each drink-related group seeing a GP in the last 12 months.

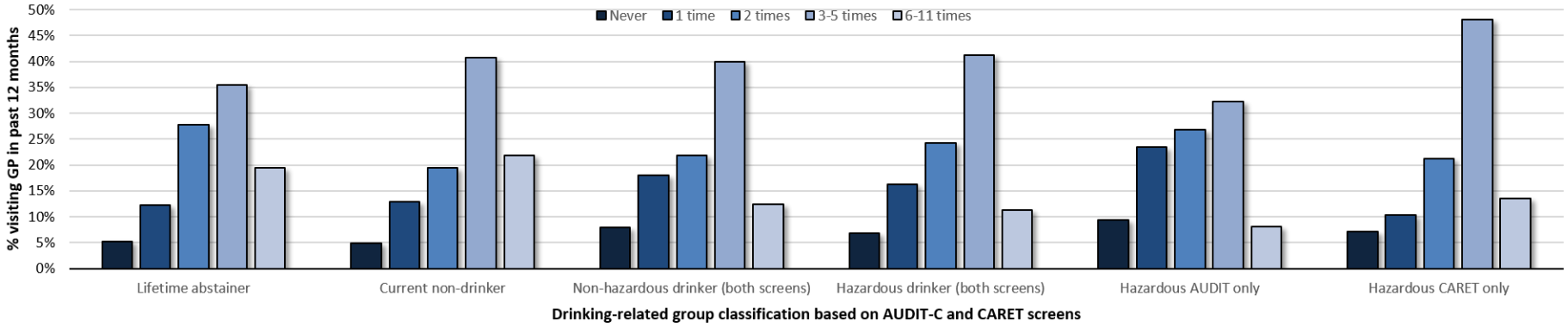


Figure 6. Proportion of each drink-related group being a patient at an Emergency Department in the last 12 months.

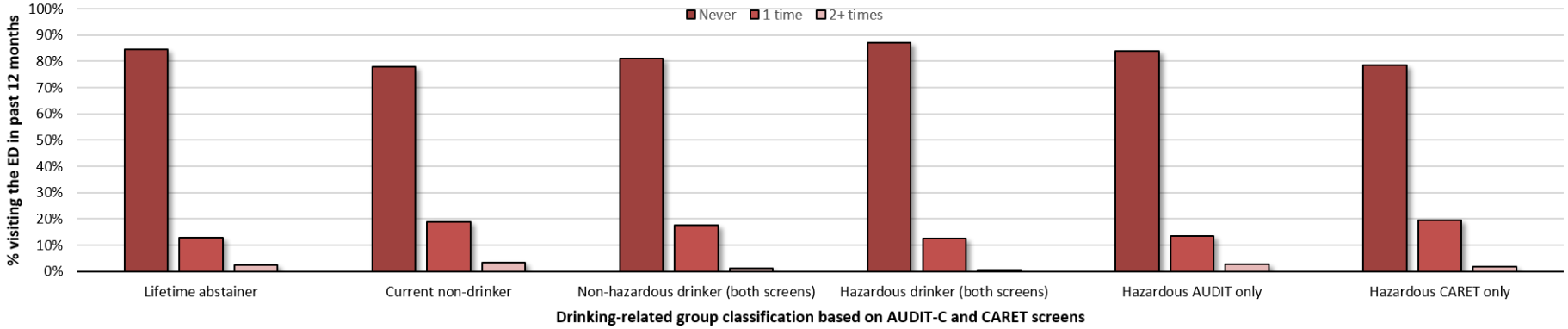


Figure 7. Proportion of each drink-related group that has either used a service at/been admitted to a hospital in the past 12 months.

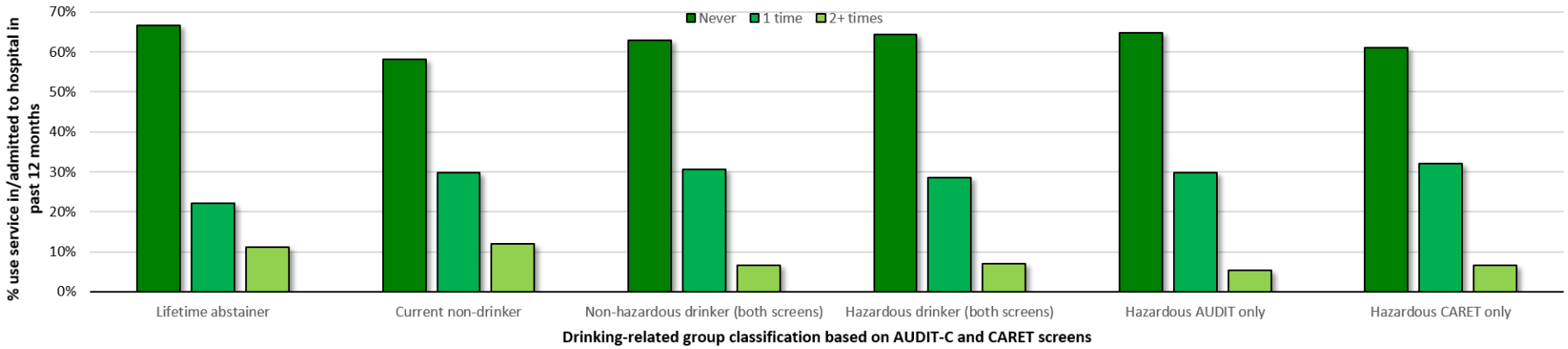


Figure 8. Proportion of each drink-related group that has been admitted to a hospital for 1 or more nights in the past 12 months.

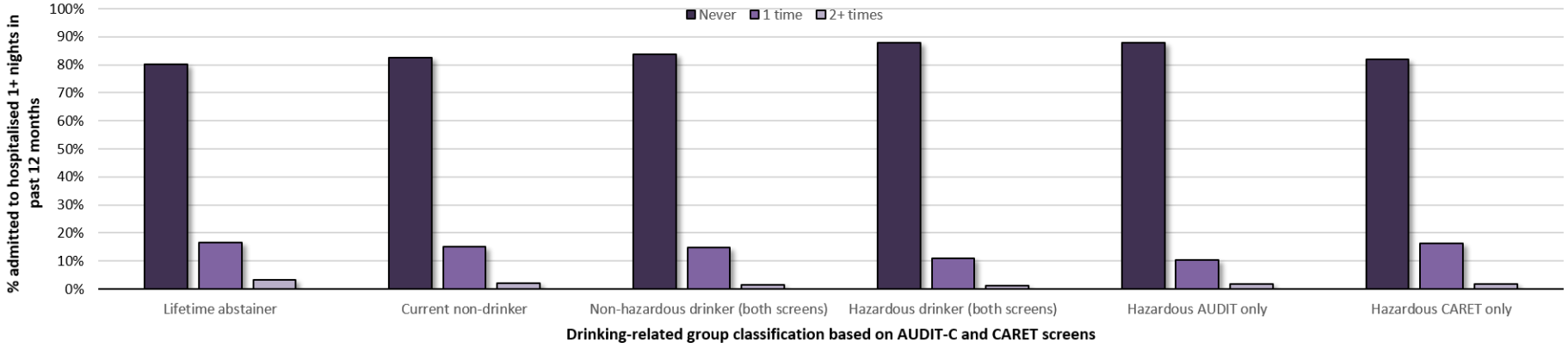
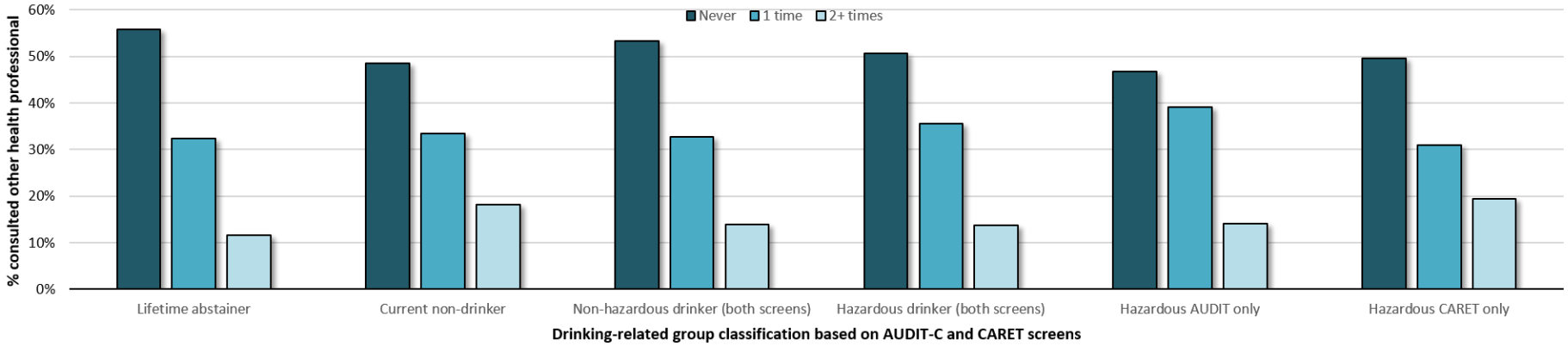


Figure 9. Proportion of each drink-related group that has consulted a health professional other than those mentioned earlier: GP, ED staff, hospital service staff.



Using proportional analysis (chi-square tests for independence), we examined the degree to which the results highlighted in Figures 5-9 reflected statistical differences across these drinking-related groups.

The results of this analysis presented in Table 9 indicate that drinking-related groups were statistically different on all but one of the healthcare utilisation questions, but effect sizes were very small.

Only GP visits (Figure 5) provided a meaningful difference (i.e., a small-to-medium effect), with those classified as 'hazardous drinkers on the CARET only' being *more* likely than any other group to have visited their GP in the previous year, with approximately two-thirds of this group seeing their GP three or more times. This contrasts with those in the hazardous AUDIT-C only group, of whom less than half saw their GP with this frequency (i.e., they appear to be a healthier subset of drinkers so require less healthcare services).

Table 9: Chi-square tests for overall difference among drinking-related groups in each healthcare utilisation behaviour.

	Test for significant difference			
	Chi-Square	df	Sig.	Phi[a]
Past 12 months healthcare utilisation				
1. Seen a GP	100.547	15	.000	.167
2. Gone to emergency dept. as a patient	52.334	15	.000	.120
3. Used a service at, or admitted to, hospital	43.242	15	.000	.109
4. Been admitted to hospital 1+ nights	23.104	15	.082	.080
5. Consulted another health professional	38.412	15	.001	.103

[a]Phi Coefficient reflects an assessment of the size of effect of each factor in generating differences between groups: small effect: ≥ 0.1; medium effect: ≥ 0.3; large effect: ≥ 0.5.

These results highlight that the group of at-risk drinkers (on the CARET) who are normally classified as non-hazardous on traditional alcohol use screens (i.e., the AUDIT-C) regularly visit their healthcare professionals. Due to their comparatively poor health, they are much more likely to be present in healthcare settings.

As such, it is highly likely that healthcare professionals could identify them, and undertake screening with these clients to assess the degree to which their apparently low levels of drinking might in fact be risky in relation to their comorbidities, health issues, and alcohol risk behaviours.

References

1. Ministry of Health. (2017) Tier 1 statistics 2015/16: New Zealand Health Survey. Ministry of Health, Wellington
2. Herbert, S., and Stephens, C. (2015) Alcohol use and older Māori in Aotearoa. *Journal of Ethnicity in Substance Abuse* 14, 251-269
3. Stevenson, B. S., Stephens, C., Dulin, P., Kostick, M., and Alpass, F. (2015) Alcohol consumption among older adults in Aotearoa/New Zealand: a comparison of 'baby boomers' and 'over-65s'. *Health Psychology and Behavioral Medicine* 3, 366-378
4. Towers, A., Stephens, C., Dulin, P., Kostick, M., Noone, J., and Alpass, F. (2011) Estimating older hazardous and binge drinking prevalence using AUDIT-C and AUDIT-3 thresholds specific to older adults. *Drug and Alcohol Dependence* 117, 211-218
5. Babor, T. F., Higgins-Biddle, J. C., Saunders, J. B., and Monteiro, M. G. (2001) The Alcohol Use Disorders Identification Test (AUDIT): Guidelines for use in primary care. World Health Organization, Geneva
6. Bush, K., Kivlahan, D. R., McDonell, M. B., Fihn, S. D., and Bradley, K. A. (1998) The audit alcohol consumption questions (audit-c): An effective brief screening test for problem drinking. *Archives of Internal Medicine* 158, 1789-1795
7. Moore, A. A., Beck, J. C., Babor, T. F., Hays, R. D., and Reuben, D. B. (2002) Beyond alcoholism: identifying older, at-risk drinkers in primary care. *Journal of Studies on Alcohol* 63, 316-324
8. Moore, A. A., Giuli, L., Gould, R., Hu, P., Zhou, K., Reuben, D., Greendale, G., and Karlamangla, A. (2006) Alcohol use, comorbidity, and mortality. *Journal of the American Geriatrics Society* 54, 757-762
9. Aalto, M., Alho, H., Halme, J. T., and Seppä, K. (2009) AUDIT and its abbreviated versions in detecting heavy and binge drinking in a general population survey. *Drug and Alcohol Dependence* 103, 25-29
10. Bosque-Prous, M., Brugal, M. T., Lima, K. C., Villalbí, J. R., Bartroli, M., and Espelt, A. (2017) Hazardous drinking in people aged 50 years or older: a cross-sectional picture of Europe, 2011–2013. *International Journal of Geriatric Psychiatry* 32, 817-828
11. Heuberger, R. A. (2009) Alcohol and the older adult: a comprehensive review. *Journal of Nutrition for the Elderly* 28, 203-235
12. Fink, A., Tsai, M. C., Hays, R. D., Moore, A. A., Morton, S. C., Spritzer, K., and Beck, J. C. (2002) Comparing the alcohol-related problems survey (ARPS) to traditional alcohol screening measures in elderly outpatients. *Archives of Gerontology and Geriatrics* 34, 55-78
13. Ministry of Health. (2013) Hazardous Drinking in 2011/12: Findings from the New Zealand Health Survey. Ministry of Health, Wellington
14. Ministry of Health. (2016) Annual Update of Key Results 2015/16: New Zealand Health Survey. Ministry of Health, Wellington
15. Culberson, J. W. (2006) Alcohol use in the elderly: beyond the CAGE. Part 2: Screening instruments and treatment strategies. *Geriatrics* 61, 20-26
16. Ministry of Health. (2001) DHB toolkit: minimising alcohol and other drug related harm: to minimise the harm caused by alcohol, illicit and other drug use to both individuals and the community. Ministry of Health, Wellington
17. National Advisory Committee on Health and Disability. (1999) Guidelines for recognising, assessing and treating alcohol and cannabis abuse in primary care. National Health Committee, Wellington
18. U.S. Department of Health Human Services. (2005) Helping patients who drink too much: A clinician's guide. *National Institute on Alcohol Abuse and Alcoholism. NIH Publication*, NIH, Washington

19. Fink, A., Morton, S. C., Beck, J. C., Hays, R. D., Spritzer, K., Oishi, S., and Moore, A. A. (2002) The Alcohol-Related Problems Survey: identifying hazardous and harmful drinking in older primary care patients. *Journal of the American Geriatrics Society* 50, 1717-1722
20. Barnes, A. J., Moore, A. A., Xu, H., Ang, A., Tallen, L., Mirkin, M., and Ettner, S. L. (2010) Prevalence and correlates of at-risk drinking among older adults: The project SHARE study. *Journal of General Internal Medicine* 25, 840-846
21. Sacco, P., Burruss, K., Smith, C. A., Kuerbis, A., Harrington, D., Moore, A. A., and Resnick, B. (2015) Drinking behavior among older adults at a continuing care retirement community: affective and motivational influences. *Aging & Mental Health* 19, 279-289
22. Yan, T., Xu, H., Ettner, S. L., Barnes, A. J., and Moore, A. A. (2014) At-risk drinking and outpatient healthcare expenditures in older adults. *Journal of the American Geriatrics Society* 62, 325-328
23. Kuerbis, A. N., Yuan, S. E., Borok, J., LeFevre, P. M., Kim, G. S., Lum, D., Ramirez, K. D., Liao, D. H., and Moore, A. A. (2015) Testing the initial efficacy of a mailed screening and brief feedback intervention to reduce at-risk drinking in middle-aged and older adults: The Comorbidity Alcohol Risk Evaluation Study. *Journal of the American Geriatrics Society* 63, 321-326
24. Moore, A. A., Blow, F. C., Hoffing, M., Welgreen, S., Davis, J. W., Lin, J. C., Ramirez, K. D., Liao, D. H., Tang, L., and Gould, R. (2011) Primary care-based intervention to reduce at-risk drinking in older adults: a randomized controlled trial. *Addiction* 106, 111-120
25. Kuerbis, A., Moore, A. A., Sacco, P., and Zanjani, F. (2017) 17 Future directions for aging and alcohol. *Alcohol and Aging: Clinical and Public Health Perspectives*, 261
26. Towers, A., Stevenson, B., Breheny, M., and Allen, J. (2016) Health, Work, and Retirement Longitudinal Study. *The Encyclopaedia of Geropsychology.* 10, 978-981
27. Dawson, D. A., Grant, B. F., Stinson, F. S., and Zhou, Y. (2005) Effectiveness of the derived Alcohol Use Disorders Identification Test (AUDIT-C) in screening for alcohol use disorders and risk drinking in the US general population. *Alcoholism: Clinical and Experimental Research* 29, 844-854
28. Naimi, T. S., Xuan, Z., Brown, D. W., and Saitz, R. (2013) Confounding and studies of 'moderate'alcohol consumption: The case of drinking frequency and implications for low-risk drinking guidelines. *Addiction* 108, 1534-1543
29. Towers, A., Philipp, M., Dulin, P., and Allen, J. (2018) The "health benefits" of moderate drinking in older adults may be better explained by socioeconomic status. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences* 73, 649-654
30. Jensen, J., Spittal, M., Crichton, S., Sathiyandra, S., and Krishnan, V. (2002) Direct measurement of living standards: the New Zealand ELSI scale. Ministry of Social Development, Wellington
31. Ware, J. E., Kosinski, M., Dewey, J. E., and Gandek, B. (2000) *SF-36 health survey: Manual and interpretation guide*, Quality Metric Inc.
32. Frieling, M. A., Davis, W. R., and Chiang, G. (2013) The SF-36v2 and SF-12v2 health surveys in New Zealand: norms, scoring coefficients and cross-country comparisons. *Australian and New Zealand Journal of Public Health* 37, 24-31
33. Sarfati, D., Scott, K., Haslett, S., Johnston, G., and Hodges, I. (1999) Taking the pulse: the 1996/97 New Zealand health survey. Ministry of Health, Wellington

Appendix

Appendix 1: The CARET and AUDIT-C questions used in the NZHWR 2016 data collection wave

The following questions are about your health and health related behaviours. Please tick the box that best answers each question.

1. In the past 12 months, has a doctor told you that you have:

	No	*Yes*
a. High blood pressure	☐₁	☐₂
b. Active or chronic gout	☐₁	☐₂
c. Diabetes	☐₁	☐₂
d. Depression	☐₁	☐₂
e. Active/chronic hepatitis, cirrhosis or other liver condition	☐₁	☐₂

2. In the past 12 months, how much of the time have you had any of the following problems?

	Never/Rarely	*Sometimes*	*Often*
a. Problems sleeping	☐₁	☐₂	☐₃
b. Feeling sad or blue	☐₁	☐₂	☐₃
c. Memory problems	☐₁	☐₂	☐₃
d. Heartburn, stomach pain, nausea, or vomiting	☐₁	☐₂	☐₃
e. Tripping, bumping into things	☐₁	☐₂	☐₃
f. Falling/Accidents	☐₁ *Never*	☐₂ *1-2 times*	☐₃

3. Do you now take any of these medications <u>at least 3-4 times</u> a week?

	At least 3-4 times per week:	
	No	*Yes*
a. Two or more regular or extra strength (100mg or more) aspirins	☐₁	☐₂
b. Arthritis and pain medicines *(eg, Apo-Allopurinol, I-Profen, Panadol, Celebrex)*	☐₁	☐₂
c. Ulcer and stomach medication *(eg, Famox, Losec, Somac, Ranitidine Arrow)*	☐₁	☐₂
d. Blood pressure medicines *(eg, Betaloc, Atacand, Dilzem, Felo, Apo-Prazo)*	☐₁	☐₂
e. Nitrate medicines *(eg, Duride Tabs, Corangin, Nitrolingual pump spray)*	☐₁	☐₂
f. Anti-depressant medicines *(eg, Amitrip, Citalopram, Anten, Fluox, Loxamine)*	☐₁	☐₂
g. Anticoagulants or blood thinners *(eg,warfarin)* at least 3-4 times a week	☐₁	☐₂
h. Seizure medicines *(eg, Tegretol, Lamotrigine, Phenobarbitone PSM, Dilantin)*	☐₁	☐₂
i. Nonprescription medicines for allergies or sleep problems *(eg, Phenergan)*	☐₁	☐₂

j. Prescription sedatives or sleeping medicines *(eg, Apo-Zopiclone, Hypam, Ox-Pam, Normison, Nitrados)*	☐1	☐2
k. Stronger Narcotic medications *(eg, Codeine Phosphate Tabs, Oxycontin, Tramal)*	☐1	☐2

4. During the past 12 months, how often did you have:

	Daily or almost daily	4-5 times a week	2-3 times a week	Once a week	2-3 times a month	Once a month	Less than monthly	Never
a. A drink containing alcohol	☐1	☐2	☐3	☐4	☐5	☐6	☐7	☐8
b. 4 or 5 drinks on 1 occasion?	☐1	☐2	☐3	☐4	☐5	☐6	☐7	☐8
c. 6 or more drinks on 1 occasion?	☐1	☐2	☐3	☐4	☐5	☐6	☐7	☐8

This question merged delivery of the 'Frequency' and 'Binge' questions into a single format allowing us to ask the frequency and binge questions specific to the CARET (questions **a** and **b**) and also the AUDIT-C (**a** and **c**)

The format of this revised response scale allowed us to score both the CARET and the AUDIT-C in a manner reflecting the original response scales of each.

5. If you 'Never' had a drink containing alcohol in the past 12 months, have you ever drunk alcohol in the past?

Yes	***No***	
☐1	☐2	(If you ticked 'No' please skip to question 7)

6. During the past 12 months, on days that you drank, how many drinks did you usually have? (Please count 'one drink' to equal: *a 330ml can or bottle of beer* OR *a 100ml glass of wine* OR *a 30ml shot of spirits* OR *a cocktail containing 1 shot* OR *a glass of sherry*)

10 or more	7, 8 or 9	5 or 6	4	3	2	1	Less than 1
☐1	☐2	☐3	☐4	☐5	☐6	☐7	☐8

The format of this revised response scale allows us to score both the CARET and the AUDIT-C in a manner reflecting the original response scales of each.

7. During the past 12 months, on how many days did you drive a car or other vehicle within 2 hours of having 3 or more drinks?

21 or more days	16-20 days	10-15 days	3-9 days	1-2 days	Never
☐1	☐2	☐3	☐4	☐5	☐6