Past Year Alcohol Consumption Patterns, Alcohol Problems and Alcohol-Related Diagnoses in the New Zealand Mental Health Survey

Jessie Elisabeth Wells[*] and Magnus Andrew McGee

Department of Population Health, University of Otago, Christchurch 8140, New Zealand

[*]**Address for Correspondence:** Jessie Elisabeth Wells, Department of Population Health, University of Otago, Christchurch PO Box 4345, Christchurch 8140, New Zealand, Tel: 64+-3-364-3602; Fax: +64-364-3614; E-mail: elisabeth.wells@otago.ac.nz

This material supplements but does not replace the content of the peer-reviewed paper published as "Past year alcohol consumption patterns, alcohol problems and alcohol-related diagnoses in the New Zealand Mental Health Survey"

Supplementary Table 1: Fit indices for latent class models of the AUDIT-C questions on alcohol consumption, Q1-3 (N=4823).

Model	Log Likelihood	Number of Parameters	AIC[a]	BIC[b]	AdjBIC[c]	LMR[d]	LMR p-value[d]	Entropy
2 classes	-18,417	23	36,881	37,030	36,957	2081.0	<.0001	0.737
3 classes	-18,049	35	36,169	36,396	36,284	728.9	<.0001	0.833
4 classes	-17,785	47	35,663	35,967	35,818	524.9	<.0001	0.839
5 classes	-17,700	59	35,517	35,900	35,713	167.7	<.0001	0.874
6 classes	-17,631	71	35,404	35,864	35,638	136.5	.02	0.833
7 classes	-17,567	83	35,299	35,837	35,574	127.3	.90	0.820

[a]Akaike's Information Criterion

[b]Bayesian Information Criterion

[c]Bayesian Information Criterion adjusted for sample size

[d]Lo-Mendell-Rubin adjusted likelihood ratio test for k versus (k-1) classes

A five class solution was selected, after consideration of the fit indices (Supplementary Table 1), and examination of sources of fit problems. Although the Lo-Mendell-Rubin adjusted likelihood ratio test (LMR) for k versus (k-1) classes indicated no improvement with a seven class solution, it was less clear on those grounds whether five or six classes were indicated. Simulations by Nylund [1] suggest that LMR can overestimate the number of classes, which lends support to a five class solution here. The fit indices of AIC, BIC and Adjusted BIC did not reach a minimum but the change with each additional class was less than 0.5% after four classes. Inspection of the fit problems showed that pairs of cells defined by adjacent categories on the drinking frequency variable (monthly or less/up to 4 times a month), but the same responses on the other two questions, were almost equally balanced in overestimation and underestimation. Finally, the five class solution was cleaner in that participants allocated to their most likely latent class belonged to that class with probability of 0.89 or more, whereas with six classes this was only 0.66 for one class. The five class solution also had the highest entropy which, while not particularly useful in selecting the number of classes [2], did indicate that it would be acceptable to use assignment to most likely latent class in further analyses.

Supplementary Table 2: Fit indices for latent class models of the AUDIT problem questions, Q4-10 (N=4823).

Model	**Log Likelihood**	**Number of Parameters**	**AIC[a]**	**BIC[b]**	**AdjBIC[c]**	**LMR[d]**	**LMR p-value[d]**	**Entropy**
2 classes	-12,170	49	24,438	24,755	24,599	3577.3	<.0001	0.876
3 classes	-11,804	74	23,756	24,236	24,001	727.8	.70	0.864
4 classes	-11,646	99	23,490	24,132	23,817	314.5	.79	0.887
5 classes	-11,581	124	23,409	24,213	23,819	130.4	.76	0.891

[a]Akaike's Information Criterion

[b]Bayesian Information Criterion

[c]Bayesian Information Criterion adjusted for sample size

[d]Lo-Mendell-Rubin adjusted likelihood ratio test for k versus (k-1) classes

A three class solution was selected. Although LMR suggested that two classes would be adequate, BIC and Adjusted BIC were at a minimum with four classes. Inspection of the three and four class solutions showed that the four class solution subdivided the smallest class in the three class solution such that the most extreme problem class had only 42 participants assigned to it (0.6%), which was too small a number for further analyses, although possibly of clinical significance.

Supplementary Table 3: Distribution of alcohol problem responses for three latent classes formed from the AUDIT questions 4-10 for last year drinkers. Bold values indicate most common responses.

	LC1 – 'never or seldom had problems'	**LC2 - 'occasional problems'**	**LC3 - 'more frequent problems'**
	(N=3920)	**(N=688)**	**(N=215)**
Alcohol problem questions	% (SE)	% (SE)	% (SE)
4. Loss of control in last year			
Never	**97.4 (0.3)**	**62.3 (3.2)**	22.4 (6.2)
Less than monthly	1.4 (0.3)	25.4 (2.5)	3.5 (1.7)
Monthly	0.2 (-[a])	9.5 (1.9)	19.6 (6.0)
Weekly	0.2 (-[a])	2.8 (1.4)	**34.9 (5.4)**
Daily or almost daily	0.3 (-[a])	0.0 (-[a])	19.6 (6.0)
5. Role failure in last year			
Never	**98.6 (0.3)**	**63.6 (3.6)**	**24.4 (5.8)**
Less than monthly	1.4 (0.3)	32.9 (3.0)	22.1 (5.2)
Monthly	0.0 (-[a])	3.3 (1.6)	21.8 (5.6)
Weekly	0.0 (-[a])	0.1 (-[a])	17.6 (5.0)
Daily or almost daily	0.0 (-[a])	0.2 (-[a])	14.1 (4.2)
6. Morning drinking in last year			
Never	**99.9 (-[a])**	**95.9 (1.1)**	**67.8 (6.7)**
Less than monthly	0.1 (-[a])	3.9 (1.0)	4.6 (2.2)
Monthly	0.0 (-[a])	0.0 (-[a])	7.9 (3.0)
Weekly	0.1 (-[a])	0.0 (-[a])	5.0 (2.2)
Daily or almost daily	0.0 (-[a])	0.2 (-[a])	14.7 (4.2)
7. Guilt or remorse in last year			

Never		**97.2 (0.5)**	38.8 (3.7)	26.0 (8.0)
Less than monthly		2.5 (0.5)	**55.7 (4.1)**	7.3 (3.1)
Monthly		0.2 (-[a])	3.6 (1.5)	**30.2 (5.9)**
Weekly		0.0 (-[a])	1.7 (0.9)	15.8 (3.9)
Daily or almost daily		0.0 (-[a])	0.3 (-[a])	20.7 (5.6)
8. Blackouts in last year				
Never		**94.5 (0.6)**	46.6 (3.8)	21.7 (4.5)
Less than monthly		5.2 (0.6)	**46.7 (3.2)**	12.3 (4.8)
Monthly		0.2 (-[a])	6.4 (1.9)	**33.4 (5.6)**
Weekly		0.1 (-[a])	0.2 (-[a])	21.0 (5.0)
Daily or almost daily		0.0 (-[a])	0.1 (-[a])	11.6 (3.4)
9. Injury				
Never		**95.3 (0.5)**	**70.2 (3.1)**	**64.4 (6.1)**
Yes, but not last year		4.1 (0.5)	19.2 (2.7)	11.7 (5.8)
Yes, in last year		0.6 (-[a])	10.6 (1.7)	23.9 (5.5)
10. Concern by Others				
Never		**95.8 (0.5)**	**71.7 (3.4)**	**43.8 (5.7)**
Yes, but not last year		3.3 (0.4)	15.0 (2.8)	13.5 (6.8)
Yes, in last year		0.9 (0.3)	13.3 (1.9)	42.8 (7.1)
Model % in each class		80.1	16.1	3.8
AUDIT-P score(0-28)	Mean (SE)	0.4 (0.02)	4.5 (0.1)	12.2 (0.4)
(7 Qs, 0-4/question)	(SD)	(1.3)	(3.2)	(6.3)

[a]SEs calculated by Mplus for percentages close to 0% or 100% are not applicable

SE: Standard Error. (N=4823)

Supplementary Table 4: ROC comparisons for scores from AUDIT-C questions as indicators of AUDIT problem scores or alcohol diagnoses. Highest AUROC value per outcome shown in bold.

	AUDIT Problem Score (N=4814)			**12-month alcohol diagnosis (N=4821)**	
	1+	**3+**	**10+**	**Disorder**	**Dependence**
Indicator	AUROC[a] (95% CI)	AUROC[a] (95% CI)	AUROC[a] (95% CI)	AUROC[a] (95% CI)	AUROC[a] (95% CI)
AUDIT-C (Q1+Q2+Q3)[a]	0.78 (0.77, 0.79)	0.81 (0.79, 0.82)	**0.84** (0.80,0.88)	**0.87** (0.85, 0.90)	**0.85** (0.80, 0.90)
Q1+Q2[a]	0.73 (0.72, 0.75) ****	0.77 (0.75, 0.78) ****	0.81 (0.77, 0.85) ***	0.85 (0.82, 0.88) ****	0.83 (0.83, 0.89)****
Q1+Q3[a]	0.71 (0.70, 0.73) ****	0.74 (0.72, 0.76) ****	0.79 (0.77, 0.85) ****	0.81 (0.77, 0.84) ****	0.79 (0.74, 0.85) ****
Q2+Q3[a]	**0.80** (0.79, 0.81) ****	**0.82** (0.80, 0.83) *	0.83 (0.79, 0.87)	**0.87** (0.85, 0.89)	**0.85** (0.81, 0.90)
Q1[a]	0.57 (0.55, 0.58)****	0.59 (0.57, 0.61)****	0.65 (0.60, 0.69)****	0.64 (0.61, 0.68) ****	0.63 (0.57, 0.69) ****
Q2[a]	0.73 (0.72, 0.74)****	0.75 (0.73, 0.77) ****	0.78 (0.74, 0.82)****	0.82 (0.79, 0.85) ****	0.81 (0.76, 0.89) *
Q3[a]	0.79 (0.77, 0.80)	0.80 (0.79, 0.82)	0.82 (0.78, 0.86)*	0.85 (0.83, 0.88) ****	**0.85** (0.80, 0.89)
Prevalence of outcome % (95% CI)	34.5 (32.8, 36.3)	16.8 (15.5, 18.2)	2.8 (2.2, 3.4)	4.0 (3.4, 4.8)	1.7 (1.4, 2.2)

[a]Q1=frequency of drinking; Q2=usual amount per drinking day; Q3=frequency of consuming six or more drinks per occasion

* p<.05, ** p<.01, *** p<.001, **** p<.0001 but because of unaccounted for design effects only *** or **** indicate significant differences.

References

1. Nylund KL, Asparoutiov T, Muthen BO (2007) Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. Struct Equ Modeling 14: 535-569.
2. Tein J-Y, Coxe S, Cham H (2013) Statistical power to detect the correct number of classes in latent profile analysis. Struct Equ Modeling 20: 640-657.