### **International Psychogeriatrics**

http://journals.cambridge.org/IPG

Additional services for International Psychogeriatrics:

Email alerts: <u>Click here</u> Subscriptions: <u>Click here</u> Commercial reprints: <u>Click here</u> Terms of use : <u>Click here</u>



# Alcohol use and depression from middle age to the oldest old: gender is more important than age

Robert J. Tait, Davina J. French, Richard Burns and Kaarin J. Anstey

International Psychogeriatrics / Volume 24 / Special Issue 08 / August 2012, pp 1275 - 1283 DOI: 10.1017/S1041610212000087, Published online: 20 February 2012

Link to this article: http://journals.cambridge.org/abstract S1041610212000087

#### How to cite this article:

Robert J. Tait, Davina J. French, Richard Burns and Kaarin J. Anstey (2012). Alcohol use and depression from middle age to the oldest old: gender is more important than age. International Psychogeriatrics, 24, pp 1275-1283 doi:10.1017/S1041610212000087

Request Permissions : Click here



# Alcohol use and depression from middle age to the oldest old: gender is more important than age

Robert J. Tait,<sup>1,2</sup> Davina J. French,<sup>2</sup> Richard Burns<sup>2</sup> and Kaarin J. Anstey<sup>2</sup>

<sup>1</sup> Centre for Mental Health Research, Australian National University, Canberra, Australia
<sup>2</sup> Centre for Research on Ageing, Health and Wellbeing, Australian National University, Canberra, Australia

#### ABSTRACT

**Background:** Alcohol use disorders are associated with other mental health disorders in young adults, but there are few data on alcohol use and mental health outcomes in older adults, particularly the oldest old. This study examines the relationship between alcohol consumption and depressive symptoms.

**Methods:** Data were collected from the Dynamic Analyses to Optimise Ageing (DYNOPTA) project, which has pooled nine Australian longitudinal studies. Alcohol consumption was classified using standard drinks (10 g alcohol)/day as: abstinent, low risk ( $<0-\le2$  standard drinks), long-term risk ( $>2-\le4$ ) and short-term risk (>4). Probable depression was classified from harmonized scores on various standard instruments (e.g. Centre for Epidemiological Studies Depression scale).

**Results:** Overall, 39,104 (86%) participants contributed data. Alcohol classification at baseline showed 7,526 abstinent, 28,112 low risk, 2,271 long-term risk, and 1,195 short-term risk participants. Age ranged from 45 to 103 year (median 60). Using generalized estimating equations (GEE), there were significant gender by alcohol and gender by age interactions, so the analysis was split by gender. Among males, the abstinent and short-term risk groups had increased likelihood of depression: in females the abstinent, long- and short-term risk groups had increased odds of depression. Increased odds of depression was also associated with former and current smoking, younger age-group, not being partnered, leaving school before age 15 and increasing levels of health-impaired walking, dressing, or bathing.

**Conclusion:** The impact of alcohol use differs by gender, nevertheless those using higher levels of alcohol or who smoke should be screened for depression and may benefit from interventions.

Key words: aged, oldest old, longitudinal, DYNOPTA, risk factors

#### Introduction

The pattern of alcohol consumption varies across the adult lifespan with those aged 60 years or older being the most likely to drink alcohol on a daily basis. However, young adults (< 30 years) are most likely to engage in patterns of alcohol use that confer either long- or short-term risks (Australian Institute of Health and Welfare, 2008). Epidemiological data show that the presence of an alcohol use disorder increases the risk of a mental health disorder and *vice versa* (Kessler *et al.*, 1996). Cross-national data from over 29,000 people aged 14–64 indicate that increasing levels of alcohol consumption (use, problem, dependence) are associated with an increased proportion of mood disorders (Merikangas et al., 1998) with most people reporting that their alcohol use pre-dated their mood disorder (Merikangas et al., 1998). However, the link between lower, "non-clinical," levels of alcohol use and mood is less certain in later life, with evidence that moderate consumption may be related to improved mood and quality of life (Byles et al., 2006; Chan et al., 2009). Furthermore, data from community samples suggest that men are more likely to use alcohol as a means of coping with depression than women, but that women may be more vulnerable to depressive symptoms associated with heavy alcohol use (Nolen-Hoeksema, 2004).

The burden of depression also varies across the adult life course. Based on scores of depressive symptomatology, there appears to be a marked increase in depression from mid-life (>40 years)

*Correspondence should be addressed to*: Dr. Robert J. Tait, Centre for Mental Health Research, College of Medicine and Health Science, Building 63, Eggleston Road, Australian National University, Canberra, ACT, 0200, Australia. Phone: +61 2 6125 9106; Fax: +61 2 61250733. Email: Robert. Tait@anu.edu.au. Received 1 Dec 2011; revision requested 6 Jan 2012; revised version received 9 Jan 2012; accepted 10 Jan 2012. First published online 20 February 2012.

to later life (>70 years), but when assessed as the proportion exceeding the threshold score on a standard screening instrument this increase appears less pronounced (Gatz *et al.*, 1993). In contrast, other reports have indicated a U-shaped trajectory, with reduced levels of negative affect from mid-life before negative affect increases in the oldest group (>80 years) (Teachman, 2006), no increase even in the oldest old (Haynie *et al.*, 2001), or even reduced prevalence of affective disorders in those aged 75–85 year (Australian Bureau of Statistics, 2008). However, it should be noted that there are limited data for the oldest old (Stek *et al.*, 2004).

Increased levels of physical disability have been causally linked with depression (Gayman *et al.*, 2008), which may lead to increased depressive symptoms in advanced old age; however, at least one recent study has shown that the association between disability and depression lessens in the oldest old (Mehta *et al.*, 2008). These authors suggest that the risk and protective factors for depression in older adults may be age-specific.

The current study used data from the Dynamic Analyses to Optimise Ageing (DYNOPTA) project that has harmonized data from nine longitudinal Australian studies (Anstey et al., 2010). We examined the association between the use of alcohol and depressive symptomatology in community dwelling adults aged from mid-life to the oldest old, using analyses that also controlled for smoking status and physical impairment. Given the inconsistencies among reports on the relationship of depression with age and with alcohol use, it was tentatively hypothesized that depression would increase with age and with alcohol use. The size of the DYNOPTA cohort allows exploration of these complex relationships separately for males and females (Nolen-Hoeksema, 2004).

#### Methods

Details of the DYNOPTA cohort and the component studies have been previously reported (Anstey *et al.*, 2010). Six of the DYNOPTA studies collected the key variables used here. The contributing datasets and their baseline samples were: the Australian Longitudinal Study of Ageing (ALSA) (n = 2,087); Australian Longitudinal Study of Women's Health (ALSWH) (n = 26,137); Australian Diabetes, Obesity and Lifestyle Study (AusDiab) (n = 7,296); Household Income and Labour Dynamics of Australia (HILDA) (n = 6,164); Melbourne Longitudinal Studies on Healthy Ageing (MELSHA) (n = 1,000); and the Personality and Total Health Through Life Study (PATH) (n = 2,550). Of these 45,234 people, 39,104 (86%)

had depression, alcohol consumption, and disability data at baseline and were living in the community at each follow-up.

All the studies included questions on the frequency and quantity of alcohol typically consumed, similar to the format in the Alcohol Use Disorders Identification Test (Babor et al., 1992). From these values, average daily consumption was estimated. The current Australian guidelines recommend no more than two standard drinks per day (total 20 g of alcohol) for the general adult population to be at "low risk." Consuming between two and four drinks per day increases the risk of "long-term" harms (e.g. cancer) and more than four drinks per day increases the risk of "short-term" harms (e.g. accidents). Furthermore, those aged 60 and above are advised to consult a health professional to obtain individual direction on an appropriate level of alcohol consumption (National Health and Medical Research Council, 2009).

The studies used a range of established screening instruments to assess depression. ALSA used the Center for Epidemiologic Studies Depression Scale (CES-D) (Radloff, 1977); the Short-Form Health Survey-36 (Ware et al., 1993) was used in ALSWH, AusDiab, and HILDA; the Mental Health Components Summary score from the SF-12 (Ware et al., 1996) was used in PATH; and MELSHA used the Psychogeriatric Assessment Scales (PAS) (Jorm et al., 1995). The method for standardizing these scores and the creation of a binary "probable depression" variable is described elsewhere (Burns et al., 2011). In brief, it involved using the cut points on each scale that have been validated against diagnostic measures. The recommended cut points on the SF-12 and SF-36 (60, 55, and 50 - reversed to reflect poor health with higher scores) equate to 1.0, 1.2, and 1.6 standard deviations (SD) above the mean on the harmonized variable. For the CES-D, cut-off values of 16, 18, and 20 equate to 1.0. 1.2, and 1.6 on the harmonized variable. For the PAS, scores of 4 and 5 correspond to 1.2 and 1.8 on the new variable. Therefore, a cut-off of 1.5 SD above the mean was selected as an indicator of "probable depression," with the resultant prevalence by age and gender validated against national Australian data. "Impairment" was categorized by combining self-reported ability to walk 1 km (yes/no) and impairment in dressing or bathing ("not at all limited," "a little limited," or "limited a lot") to form a four-item scale (walk 1 km and not at all limited, not at all limited, and a little limited or limited a lot).

Generalized Estimating Equations (GEE) were used to evaluate the relationship between the demographic and substance use predictors and probable depression. The GEE models were implemented in SPSS version 19 and specified an unstructured working correlation matrix. As the period between waves of data collection varies across the studies, time was included as years in the study since baseline. Other time-varying variables were the classification of alcohol use ("low risk," abstinent, "long-term risk," and "short-term risk") and smoking ("never," "ex-smoker," and "current smoker"), partner status (partnered vs. not partnered), and physical impairment category ("walk 1 km and not at all limited," "not at all limited," "a little limited," or "limited a lot"). Timeinvariant factors were education (left school aged 14 year or younger vs. 15 year or older), gender, and baseline age group. Due to the small cell sizes in some older age groups, age was divided into tenyear periods from age 45.

#### Results

Table 1 shows demographic features, smoking status, and alcohol consumption at baseline by ten-year age groups. Alcohol classification revealed 7,526 (19%) abstinent; 28,112 (72%) low risk; 2,271 (6%) long-term risk; and 1,195 (3%) shortterm risk participants. Ages ranged from 45 to 103 years, with a median of 60 years. On each measure, there were significant differences in the proportions by age group. In particular, the decline in current smoking and the increase in the proportion that was abstinent from alcohol at age 85 or older (38%) compared with younger age groups were notable. The median length of follow-up was 4 years (inter-quartile range (IQR) 0-7.8) with the median number of interviews being three (IOR 1-3). Figures 1 shows the prevalence of depression by age group and alcohol consumption for males and females, with a U-shaped curve only clearly evident for males. The overall prevalence of probable depression, shown by the black bars, was highest in the extreme age groups, i.e. 45-54 years 10.8%, 85 years or older 9.4%. It should be noted that at baseline there were no women aged 85 years and above in the short-term risk consumption group and only eight in the long-term risk group; none had depression. Among the males, there were four in the short-term risk group; none had depression.

The GEE models showed a significant interaction between gender and alcohol category (Wald 10.7 (3) p=0.014) and gender and age group (Wald 14.0 (4) p=0.007). The interaction of alcohol by age group was not significant. To facilitate interpretation, the analyses were stratified by gender. There were significant main effects on

all measures shown in Table 2. With respect to alcohol, among females the short-term risk (odds ratio (OR) 1.54), long-term risk (OR 1.22), and abstinence groups (OR 1.23) all had increased odds of probable depression compared with lowrisk drinking. Among males, both short-term risk drinking (OR 1.30) and abstinence (OR 1.47) had increased odds compared with low-risk drinking. There was no evidence of increased odds of depression in the long-term risk group. Both current and former smokers had increased likelihood of depression compared with never smokers. For male and female former smokers, the respective increases were 26% and 10%; for current smokers of either gender, the increase was over 70%.

For both males and females, each age group had a lower likelihood of (probable) depression compared to the 45–54 year group. Those without a partner, and those who left school before 15 years of age, also had increased likelihood of depression. Compared to those who could walk 1 km and who had no limitation of dressing/bathing, each of the other "impairment" categories had increased likelihood of depression. In addition, among females, the odds of depression declined by 2% for each year post baseline.

A post hoc analysis was conducted to investigate if the relationship between abstinence and depression was due to changes in alcohol status (potentially due to declines in health). A new alcohol status variable was constructed identifying those with a minimum of two waves of data, those who were abstinent at every wave, and those who were at low risk at every wave. There were 16,319 "always low risk" and 4,346 "always abstinent" participants, comprising 30% of the males (n=2,345) and 58% of the females (n = 18,320). The new alcohol variable replaced the earlier alcohol variable in the GEE model. In both males and females, those who were always abstinent had increased odds of depression males 60% and females 20% (Table 3). Among females, the odds ratios on other measures were essentially unchanged in magnitude and direction from the first model. Among males, the effects were mixed, including declines in the magnitude of the impact of impairment on depression and increased magnitude of effect for smoking.

#### Discussion

The crude prevalence of depression showed the U-shape previously reported, with those aged 45–54 years having the highest prevalence of depression, which declined through the young-old and old before increasing among the oldest old (Teachman, 2006). However, after controlling for

			STATISTIC				
VARIABLE		45-54 ( <i>N</i> =17,668)	55-64 ( <i>N</i> = 5,255)	65-74 ( <i>N</i> =13,060)	75-84 (N = 2,620)	85+ (N=501)	
Gender female	n (%)	15,502 (87.7)	2,599 (49.5)	11,301 (86.5)	1,565 (59.7)	235 (46.9)	5,048 (4) p < 0.001
Left school <15 years	n (%)	1,814 (10.3)	963 (18.3)	5,302 (41.3)	1,292 (49.7)	285 (57.0)	5,106 (4) p < 0.001
Partnered	n (%)	14,567 (82.7)	4,163 (79.2)	8,150 (62.5)	1,531 (58.5)	199 (39.7)	2,260 (4) p < 0.001
"Impairment"							
Walk 1 km $+$ not limited	n (%)	16,180 (91.6)	4,520 (86.0)	9,698 (74.3)	1,787 (68.2)	268 (53.5)	2,569 (12) p < 0.001
Not limited	n(%)	582 (3.3)	311 (5.9)	1,964 (15.0)	470 (17.9)	132 (26.3)	
Limited a little	n (%)	647 (3.7)	339 (6.5)	1,057 (8.1)	287 (11.0)	82 (16.4)	
Limited a lot	n (%)	259 (1.5)	85 (1.6)	341 (2.6)	76 (2.9)	19 (3.8)	
Smoking status							
Never	n (%)	9,150 (53.1)	2,655 (50.6)	7,470 (59.1)	1,393 (54.1)	275 (54.9)	863 (8) p < 0.001
Ex-smoker	n(%)	5,002 (29.0)	1,923 (36.6)	4,143 (32.8)	1,009 (39.2)	199 (39.7)	
Current smoker	n (%)	3,095 (17.9)	673 (12.8)	1,021 (8.1)	173 (6.7)	27 (5.4)	
Alcohol status							
Low risk	n (%)	14,031 (79.4)	3,792 (72.2)	8,315 (63.7)	1,693 (64.6)	281 (56.1)	3,076 (12) p < 0.001
Abstinent	n(%)	2,305 (13.0)	406 (7.7)	3,884 (29.7)	739 (28.2)	192 (38.3)	
Long-term risk	n (%)	931 (5.3)	647 (10.4)	629 (4.8)	140 (5.3)	24 (4.8)	
Short-term risk	n (%)	401 (2.3)	510 (9.7)	232 (1.8)	48 (1.8)	4 (0.8)	
Probable depression	n (%)	1,910 (10.8)	463 (8.8)	922 (7.1)	199 (7.6)	47 (9.4)	136 (4) p < 0.001

## Table 1. Demographic characteristics by age group at baseline



(b)

Figure 1. Probable depression in males (upper) and females (lower) at baseline by age group and alcohol consumption group: (a) Male; (b) Female.

		MALES		FEMALE		
(REFERENCE CATEGORY)	В	LOWER 95% CI	UPPER 95% CI	В	LOWER 95% CI	UPPER 95% CI
Time in years from baseline	0.98	0.95	1.02	0.98**	0.97	0.99
Age group						
85+	0.56*	0.38	0.84	0.29**	0.19	0.43
75-84	$0.47^{**}$	0.36	0.62	0.35**	0.29	0.42
65–74	0.52**	0.41	0.65	0.36**	0.33	0.40
55–64	0.82*	0.69	0.99	0.72**	0.64	0.81
(45–54)						
Partnered (yes)	1.58**	1.34	1.87	1.37**	1.27	1.46
Left school (aged $\geq 15$ years)	1.29*	1.08	1.54	1.60**	1.48	1.74
"Impairment" Limited a lot	3.47**	2.69	4.48	3.27**	2.81	3.81
Limited a little	3.32**	2.78	3.96	3.36**	3.07	3.68
Not limited	2.62**	2.15	3.20	2.16**	1.98	2.36
(Walk 1 km/not limited)						
Tobacco Current smoker	1.72**	1.41	2.09	1.71**	1.57	1.86
Former smoker	1.26*	1.07	1.48	$1.10^{*}$	1.02	1.17
(Never smoker)						
Alcohol Short-term risk	1.30*	1.06	1.59	1.54**	1.22	1.95
Long-term risk	0.99	0.82	1.19	$1.22^{*}$	1.08	1.38
Abstinent	1.47**	1.22	1.78	1.23**	1.14	1.32
(Low risk)						

Table 2. Generalized estimating equation (GEE) results for predictors of (probable) depression

\*p < 0.05, \*\*p < 0.001, and CI = confidence interval

Table 3	. Generalized	estimating e	equation (0	GEE) results fo	r predictors	of (probable	e) depression for
those w	ith longitudin/	ally stable al	cohol consi	umption eithe	r "always ab	stinent" or '	'always low risk"

VARIABI E		MALES		FEMALE		
(REFERENCE CATEGORY)	В	LOWER 95% CI	UPPER 95% CI	В	LOWER 95% CI	UPPER 95% CI
Time in years from baseline	1.01	0.96	1.06	0.99*	0.98	0.997
Age group						
85+	0.49*	0.25	0.95	0.27**	0.15	0.50
75–84	0.50*	0.32	0.79	0.37**	0.29	0.48
65–74	$0.48^{*}$	0.31	0.73	0.37**	0.33	0.42
55–64 (45–54)	0.91	0.68	1.24	0.71**	0.61	0.84
Partnered (yes)	$1.67^{*}$	1.25	2.24	1.37**	1.25	1.49
Left school (aged $\geq 15$ years)	$1.48^{*}$	1.09	2.01	1.63**	1.47	1.81
"Impairment" Limited a lot	2.45**	1.62	3.69	2.97**	2.41	3.67
Limited a little	2.23**	1.66	3.01	3.12**	2.76	3.53
Not limited	2.12**	1.54	2.90	2.13**	1.90	2.39
(Walk 1 km/not limited)						
Tobacco Current smoker	1.91**	1.42	2.71	$1.71^{**}$	1.53	1.90
Former smoker (Never smoker)	1.39*	1.15	1.81	1.14*	1.04	1.25
Alcohol Always abstinent (Always low risk)	1.61*	0.86	2.21	1.20*	1.08	1.34

p < 0.05, p < 0.001. CI = confidence interval

other factors, among those aged 85 years and above, there was a lower likelihood of depression than in the youngest group. For both men and women, those with low-risk alcohol consumption had lower odds of depression than those who abstained or who were short-term risk consumers. Among women, but not men, long-term risk alcohol use was also associated with probable depression.

A review reported that the prevalence of depression in those over 75 years living in the community varied between 5% and 25%, with a weighted prevalence of 11.3% (Stek et al., 2004), congruent with the 7.6% and 9.4% reported here for the two oldest groups. Data from an elderly cohort (mean age 72 years) in the USA shows that occasional (<3 times/week) to moderate regular alcohol use (>3 days/week and >170 g/week) compared with abstinence was associated with significantly lower depression scores for women (and non-significantly different for men) (Chan et al., 2009). However, women in the current study using up to 140 g of alcohol per week had lower odds of depression than abstainers, but those in the 141-280 g range had increased odds compared to the reference group.

A range of explanations could underlie the relationship between low-risk alcohol use and reduced odds of depression. As noted previously, continued use of alcohol may contribute to overall health with, for example, moderate alcohol use being causally related to lower heart disease via lipids and hemostatic factors (Rimm et al., 1999). Further, abstainers are typically less socially integrated (Lucas et al., 2010) and have less social support (Rodgers et al., 2000), factors that are associated with poorer mental health. Alternatively, those with better health may require fewer medications with contra-indications for alcohol, and better well-being may result in greater social support through the capacity to continue to participate in social networks where alcohol consumption is an incidental element. For this reason, our conclusions highlight alcohol use as a risk indicator, not a causal contributor, for poor mental health.

Over the life span, the net disability adjusted life years attributed to alcohol use is 2.3% of the total burden of disease in Australia (Australian Institute of Health and Welfare, 2003) with the potential benefits from moderate use of alcohol, such as improved cardiovascular outcomes (Mukamal *et al.*, 2005) and mortality (Byles *et al.*, 2006) failing to fully offset the harms. However, among those aged 65 and above, the consumption of alcohol has a net effect of reducing the burden of disease by 2.8% (Australian Institute of Health and Welfare, 2003). In the current cohort, there was no evidence of lowrisk alcohol use increasing the burden of disease attributable to depression.

Across the majority of age groups for males and females, those who were abstinent had the highest prevalence of depression. Abstinence from alcohol is also associated with other adverse risk indicators, such as lower socioeconomic status, lower levels of education, and greater financial strain (Anstey et al., 2005; Pattenden et al., 2008). In the current data, we were able to control for some demographic factors that could account for the relationship between abstinence and mood, including the presence of physical impairment, but other factors may still account for the relationship. Furthermore, those who move from being alcohol consumers to abstainers may do so due to declining health (Turvey et al., 2006). Physical impairment was associated with probable depression and when it was included in the multivariate analysis, the increased depression in the oldest age group was no longer apparent. The up-turn in depression in the oldest old may therefore be attributable to their increasing disability rather than to aging *per se*.

A number of limitations should be noted in interpreting our findings. Alcohol consumption was estimated from categorical frequency and quantity questions concerning typical levels of alcohol consumption, which limits their precision. However, this method has been shown to have a similar level of reliability to diary methods in light drinkers, with both approaches performing less well with heavy drinkers (>32 drinks per week) (Webb et al., 1991). The current analysis did not control for measures of health such as selfreported diagnosis of chronic conditions or selfrated health, as these measures were only available from a limited subset of DYNOPTA studies. The presence of major health problems could account for both depression and abstinence, and may explain the apparent relationship with depression. However, others have found moderate alcohol use to be associated with improved quality of life even after controlling for chronic conditions such as diabetes and cardiovascular disease (Chan et al., 2009). The sensitivity analysis of those who were "abstainers" at each wave and those who were "low-risk" drinkers at each wave supports the notion that differences in depression outcomes are not due to recent changes in alcohol consumption status, but does not eliminate the possibility that some people may have become abstainers before the start of the study, potentially due to declining health.

It should be noted that the very low prevalence of higher levels of drinking among people at the older end of the spectrum, especially women consuming more than two drinks per day (i.e. only eight women in the age 85 plus group), means that any effects will be difficult to detect and limits the potential to generalize recommendations. Finally, our data did not include information on whether or not individuals had received advice on appropriate levels of alcohol consumption, which may explain the low prevalence of long- and short-term risk patterns of alcohol use seen in the oldest groups.

#### Conclusions

The substantial sample size of the DYNOPTA cohort and, in particular, the inclusion of many at the oldest end of the age spectrum provides a unique opportunity to examine the relationship between alcohol consumption and depressive symptoms while controlling for a range of other factors. The increased likelihood of depression symptoms associated with long-term (women only) and shortterm risk patterns of alcohol use did not vary with age, suggesting that these are not age-specific risk factors for depression. Drinking more than two drinks per day, along with tobacco use, may provide markers that would enable targeted screening for depression and for interventions to reduce these lifestyle risk factors in mid to later life.

#### **Conflict of interest**

None.

#### **Description of authors' roles**

R.J. Tait conducted the initial analysis and wrote the initial draft. D.J. French and R. Burns developed the initial topic area and contributed to subsequent statistical analyses. K.J. Anstey initiated the DYNOPTA project and provided critical interpretation of the data. All the authors contributed to the final version of the paper and provided editorial input.

#### **Acknowledgments**

The data on which this research is based were drawn from several Australian longitudinal studies including: the ALSA, the ALSWH, the AusDiab, the HILDA, the MELSHA, and the PATH. These studies were pooled and harmonized for the DYNOPTA project. DYNOPTA was funded by an NHMRC Grant No. 410215. All studies would like to thank the participants for volunteering their time to be involved in the respective studies. Details of all studies contributing data to DYNOPTA, including individual study leaders and funding sources, are available on the DYNOPTA website (http://dynopta.anu.edu.au). In this paper, the findings and views reported are those of the author(s) and not those of the original studies or their respective funding agencies. Work on this paper was supported by the NHMRC Grant No. 410215 (for the second and third authors) and NHMRC Research Fellowship No. 1002560 (for the last author).

#### References

- Anstey, K. J. et al. (2010). Cohort profile: the Dynamic Analyses to Optimise Ageing (DYNOPTA) Project. International Journal of Epidemiology, 39, 44–51.
- Anstey, K. J., Windsor, T. D., Rodgers, B., Jorm, A. F. and Christensen, H. (2005). Lower cognitive test scores observed in alcohol abstainers are associated with demographic, personality, and biological factors: the PATH through life project. *Addiction*, 100, 1291–1301.
- Australian Bureau of Statistics (2008). National Survey of Mental Health and Wellbeing: Summary of Results. Cat. no. 4326.0. Canberra: ABS.
- Australian Institute of Health and Welfare (2003). Summary Attributable Burden: Risk Factors. Canberra: AIHW.
- Australian Institute of Health and Welfare (2008). 2007 National Drug Strategy Household Survey: Detailed Findings. Drug statistics series no. 22 Cat. no. PHE 107. Canberra: AIHW.
- Babor, T. F., de la Fuente, J. R., Saunders, J. B. and
  Grant, M. (1992). The Alcohol Use Disorders Identification
  Test: Guidelines for Use in Primary Health Care. Geneva:
  World Health Organization.
- Burns, R. A., Butterworth, P., Windsor, T., Luszcz, M. A., Ross, L. A. and Anstey, K. J. (2011). Deriving prevalence estimates of depressive symptoms throughout middle and old age in those living in the community. *International Psychogeriatrics*. Epublished ahead of print. doi:10.1017/S1041610211002109.
- Byles, J., Young, A., Furuya, H. and Parkinson, L. (2006). A drink to healthy aging: the association between older women's use of alcohol and their health-related quality of life. *Journal of the American Geriatrics Society*, 54, 1341–1347.
- Chan, A. M., von Mühlen, D., Kritz-Silverstein, D. and Barrett-Connor, E. (2009). Regular alcohol consumption is associated with increasing quality of life and mood in older men and women: the Rancho Bernardo Study. *Maturitas*, 62, 294–300.
- Gatz, M., Johansson, B., Pedersen, N., Stig, B. and Reynolds, C. (1993). A cross-national self-report measure of depressive symptomatology. *International Psychogeriatrics*, 5, 147–156.
- Gayman, M. D., Turner, R. J. and Cui, M. (2008). Physical limitations and depressive symptoms: exploring the nature of the association. *Journal of Gerontology, Series B: Psychological Sciences and Social Sciences*, 63B, S219–S228.
- Haynie, D. A., Berg, S., Johansson, B., Gatz, M. and Zarit, S. H. (2001). Symptoms of depression in the oldest old. Journals of Gerontology, Series B: Psychological Sciences and Social Sciences, 56, P111–P118.

Jorm, A. F. *et al.* (1995). The psychogeriatric assessment scales: a multidimensional alternative to categorical diagnoses of dementia and depression in the elderly. *Psychological Medicine*, 25, 447–460.

Kessler, R. C., Nelson, C. B., McGonagle, K. A., Edlund, M. J., Frank, R. G. and Leaf, P. J. (1996). The epidemiology of co-occurring addictive and mental disorders: implications for prevention and service utilization. *American Journal of Orthopsychiatry*, 66, 17–31.

Lucas, N., Windsor, T. D., Caldwell, T. M. and Rodgers,
B. (2010). Psychological distress in non-drinkers: associations with previous heavy drinking and current social relationships. *Alcohol and Alcoholism*, 45, 95–102.

Mehta, M. et al. (2008). Depressive symptoms in late life: associations with apathy, resilience and disability vary between young-old and old-old. *International Journal of Geriatric Psychiatry*, 23, 238–243.

Merikangas, K. R. *et al.* (1998). Comorbidity of substance use disorders with mood and anxiety disorders: results of the International Consortium in Psychiatric Epidemiology. *Addictive Behaviors*, 23, 893–907.

Mukamal, K. et al. (2005). Alcohol use and risk of ischemic stroke among older adults: the Cardiovascular Health Study. Stroke, 36, 1830–1836.

National Health and Medical Research Council (2009). Australian Guidelines to Reduce Health Risks from Drinking Alcohol. Canberra: NHMRC.

**Nolen-Hoeksema, S.** (2004). Gender differences in risk factors and consequences for alcohol use and problems. *Clinical Psychology Review*, 24, 981–1010.

Pattenden, S., Nanchahal, K., Primatesta, P. and Thom,
B. (2008). Self-reported never-drinkers in England
1994–2003: characteristics and trends in adults aged 18–54
years. Alcohol and Alcoholism, 43, 91–96.

**Radloff, L. S.** (1977). The CES-D Scale: a self-report depression scale for research in the general

population. *Applied Psychological Measurement*, 1, 385–401.

Rimm, E. B., Williams, P., Fosher, K., Criqui, M. and Stampfer, M. J. (1999). Moderate alcohol intake and lower risk of coronary heart disease: meta-analysis of effects on lipids and haemostatic factors. *BMJ*, 319, 1906–1912.

Rodgers, B., Korten, A. E., Jorm, A. F., Christensen, H., Henderson, S. and Jacomb, P. A. (2000). Risk factors for depression and anxiety in abstainers, moderate drinkers and heavy drinkers. *Addiction*, 95, 1833–1845.

Stek, M. L., Gussekloo, J., Beekman, A. T. F., van Tilburg, W. and Westendorp, R. G. J. (2004).
Prevalence, correlates and recognition of depression in the oldest old: the Leiden 85-plus study. *Journal of Affective Disorders*, 78, 193–200.

**Teachman, B. A.** (2006). Aging and negative affect: the rise and fall and rise of anxiety and depression symptoms. *Psychology and Aging*, 21, 201–207.

Turvey, C. L., Schultz, S. K. and Klein, D. M. (2006). Alcohol use and health outcomes in the oldest old. Substance Abuse Treatment Prevention and Policy, 1, 8. doi: 10.1186/1747-1597X-1181-1188.

Ware, J., Kosinski, M. and Keller, S. (1996). A 12-item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity. *Medical Care*, 34, 220–233.

 Ware, J., Snow, K., Kosinski, M. and Gandek, B. (1993).
 SF-36 Health Survey Manual and Interpretation Guide.
 Boston: The Health Institute, New England Medical Centre.

Webb, G. R., Redman, S., Gibberd, R. W. and Sanson-Fisher, R. W. (1991). The reliability and stability of a quantity-frequency method and a diary method of measuring alcohol consumption. *Drug and Alcohol Dependence*, 27, 223–231.