

# An evaluation of a participatory health promotion mobile app addressing alcohol use problems: The “Daybreak” program



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# Final Report

## **An evaluation of a participatory health promotion mobile app addressing alcohol use problems: The “Daybreak” program**

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## EXECUTIVE SUMMARY

This report provides an assessment of Hello Sunday Morning's online-based Daybreak program with or without online coaching. We quantified outcomes in terms of 1) reduced alcohol risk and alcohol consumption, 2) improved mental health and wellbeing and 3) engagement with Daybreak.

We recruited 793 participants, with more than 70% classified in the highest ('probably dependent') category on the 10-item Alcohol Use Disorders Identification Test (AUDIT). Most of the participants were female (70%) and the level of educational attainment was high, with 77% having undertaken at least some university education. The primary outcome measure was the three-item AUDIT-C score with secondary outcomes assessed as seven-day alcohol consumption (standard drinks), psychological distress (K-10) and quality of life (EUROHIS).

There were 398 people randomised to the Intervention group (Daybreak program, including online health coaching) and 395 to the Control group (Daybreak with health coaching excluded) at baseline. We collected follow-up information from 334 (42%) people at one month and 293 (37%) at three months.

Across the groups, from baseline to three months, the findings showed a substantial reduction in alcohol risk, as measured by the AUDIT-C, down from a mean of 9.1 to 5.8 with an accompanying change in alcohol consumption, down from a mean of 37 to 17 standard drinks per week. Significantly improved scores were also seen on measures of psychological distress and quality of life.

The study was designed as a randomised control trial to compare the impact of receiving online health coaching within the Daybreak program with no coaching within Daybreak. However, due to a programming error, some 48 (11.9%) people in the Control group received or sent a message to the coaching services; this compared with 81 (20.1%) in the Intervention group. Therefore, the main analysis controlled for engagement with online coaching. There were 68 (17%) people in the Intervention and 38 (10%) in the Control group who engaged with online coaches, defined as  $\geq 1$  message sent to an online coach. As a single factor, online coaching did not significantly improve key outcomes (AUDIT-C, alcohol consumption, K-10 and EUROHIS).

Finally, outcomes were assessed using generalised estimating equations for each of the key outcome measures (AUDIT-C, K-10, standard drinks and EUROHIS). For each outcome, the model assessed change over time and between groups, while adjusting for age, sex, engagement with coaching, number of blog shares and comments. In none of the models was the critical 'time' (baseline, one month, three months) by 'group' (Intervention, Control) nor the 'time' by 'engagement' interaction significant. That is, change over time was similar across these factors with both groups showing improved outcomes and with outcomes being similar for those who did or did not engage with online coaching.

Overall, participants showed significant and clinically important changes over three months, however, we were unable to attribute this to accessing online coaching. These outcomes are also notable given the proportion of the cohort who were 'probably dependent' on alcohol at the start of the study. Generally, those with alcohol dependence would be referred for more intensive treatment. Improved outcomes for these participants while accessing an online program opens new treatment opportunities.

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## 1.0 INTRODUCTION

The role of alcohol as a risk factor for a wide range of health conditions, is well documented, such that the most recent Global Burden of Disease study listed alcohol use as the seventh leading risk factor for disease burden and deaths (Griswold et al., 2018). Importantly, the harms that arise from alcohol use also impact on other people, in addition to the consumer. In Australia, including harms to others, alcohol consumption is estimated to cost society about AUD 30 billion per year (Laslett et al., 2010).

Only about one-fifth of those with an alcohol disorder report using a treatment service for any mental health problem in the previous year (Teesson et al., 2010). To overcome this reticence and to identify people with less severe alcohol problems, there has been increasing emphasis on finding those who have risky patterns of alcohol use, through opportunistic screening in settings where people are not seeking treatment for alcohol-related problems (Landy et al., 2016; O'Donnell et al., 2014). Those with less severe problems receive brief or less intensive interventions, but those who appear to have more entrenched problems can still be referred for more traditional treatment methods. The importance of this approach has resulted in screening, brief intervention and referral to treatment (SBIRT) being mandated in the USA for level 1 and 2 trauma centres (American College of Surgeons Committee on Trauma, 2014).

Nevertheless, SBIRT has not been widely adopted either in hospitals or primary care in Australia. Alternative models for reaching people with risky patterns of alcohol use via the internet have been tested in both university student and general population samples and found to be effective in reducing alcohol consumption and harms (Riper et al., 2014; Riper et al., 2011; White et al., 2010). In the general population (e.g. excluding studies based on university students) significant reductions in problem drinking were found at 6 and 9 months, with more intensive interventions having greater effects than single session interventions (Riper et al., 2011). Compared with control participants those in the Intervention group were drinking about two standard drinks per week fewer and were more likely to be drinking within low-risk guidelines, but the inclusion of professional guidance did not increase the effect of interventions compared with unguided trials (Riper et al., 2014). However, again the reach of these programs has generally been limited.

Hello Sunday Morning is an Australian non-profit that builds technology to support people to change their relationship with alcohol. In 2010, Hello Sunday Morning released an online blogging platform that supported people to reduce their alcohol consumption or abstain from alcohol for a period of three to twelve months. Within this platform, participants relate their experiences with alcohol and their changing relationship with alcohol. This involves both a public commitment, for example, a period of abstinence or reduced alcohol use, and a supportive environment where others have encountered similar challenges in changing their use of alcohol. In addition to potential benefits of peer-to-peer support (Ziebland and Wyke, 2012), Hello Sunday Morning also provided an evidence-based set of resources in the background. These resources encourage and support participants in learning and implementing new skills, for example in developing resilience to setbacks.

A recent evaluation of the original Hello Sunday Morning combined blog platform, supportive online community and learning resources, reported on the three-month outcomes for nearly 2000 participants (Kirkman et al., 2018). Notably, there were significant reductions in alcohol risk scores (Alcohol Use Disorders Identification Test (Babor et al., 2001)), including for those in the highest risk category. In addition, those who were more engaged in the program (e.g. sign-ins, posts, comments) showed greater reductions in their risk scores. In August 2018 the 'legacy' version of the Hello Sunday Morning web program was closed, having registered over 100,000 members since 2010. New participants now join the Daybreak program, which is accessible via a smartphone app on both Apple

and Android devices and a web platform. The Daybreak program aims to support individuals to change their relationship with alcohol

The objectives of the following project were to evaluate, i) participants' overall engagement in the program, ii) the changes in alcohol risk and alcohol consumption together with changes in psychosocial outcomes and iii) the role of engagement with online coaching in these changes. As all participants entering the study would have been identified as having risky patterns of alcohol use by a screening survey, it was deemed unethical to randomise them to a 'no treatment' control condition. Therefore, all participants received the Daybreak program, but with some people randomised to be able to access online coaching too. As such, the main study analysis planned to assess the effect of adding online coaching to the Daybreak model.

The aim of the study was to evaluate:

- 1) Engagement with the Daybreak program assessed in terms of i) engagement with online coaching, ii) engagement with peer support (sharing and commenting on the blog page), iii) length of engagement, and, iv) number of experiments completed.
- 2) Change in key outcome measures i) alcohol risk, ii) alcohol consumption, iii) psychosocial distress, and iv) quality of life.
- 3) The effect of engagement with online coaching on the key outcomes.

## 2.0 METHOD

### 2.1 Participants

We recruited participants who self-referred through the publicly available Daybreak program. To be eligible for inclusion, participants were required to be 18 years or older, reside in Australia, have a valid email address and score more than seven on the 10-item Alcohol Use Disorders Identification Test (AUDIT) (Saunders et al., 1993). Those scoring 8 to 19 are categorised in the ‘hazardous/harmful’ range and those scoring 20 to 40 are classified as ‘probably dependent’ on alcohol. Due to the increased risk during alcohol withdrawal for those with cardiovascular disease, anyone reporting a history of cardiovascular disease (CVD) was excluded (Kähkönen et al., 2011). We also screened for suicide risk (classified as ‘minimal’, ‘lower’ or ‘higher’) with the P4 survey (Dube et al., 2010): participants were not excluded on the basis of their risk level, but those in the lower or higher categories were provided with additional helpline information. Recruitment commenced in February 2018 and closed in November 2018.

### 2.2 Randomisation

As detailed in the protocol (Tait et al., 2018) the study was designed as a randomised control trial. However, due to a programming error, some (n=48, 11.9%) participants in the Control group were able to access online coaching, which was meant to be restricted to just those in the Intervention group (bar instances of participant safety, such as reported suicide ideation). Therefore, the study outcomes also had to control for those who did or did not access the online coaching service.

### 2.3 Intervention

The Daybreak program consists of online peer support plus behavioural experiments that encourage and guide participants in developing new skills on topics such as mindfulness, connectedness, resilience, and situational strategies (see the protocol for further details). In addition to the standard program, the Intervention group (and some others) had access to online coaching. The coaching service was available through real-time chat-based messaging on a secure platform. The health coaches drew on a range of therapeutic techniques (e.g. cognitive behavioural therapy, motivational interviewing, acceptance and commitment therapy) to address the needs of participants.

### 2.4 Outcome measures

The primary outcome measure was:

The Alcohol Use Disorders Identification Test-Consumption measure (AUDIT-C; items 1, 2 and 3 from the full 10-item AUDIT (Bradley et al., 2016)). Change in AUDIT-C scores was assessed from baseline to three months. Scores on the AUDIT-C test range from 0 to 12, with higher scores showing greater risk of alcohol-related problems. Values of 0–4 were classified as ‘low risk’, 5–8 as ‘moderate risk’ and  $\geq 9$  as ‘high risk’.

The secondary outcome measures were:

The Kessler-10 was used to assess psychological distress (range 10–50 with lower scores showing lower distress (Kessler et al., 2002)). The scores are generally interpreted as 10–19 = low, 20–24 = mild, 25–29 = moderate and 30–50 = severe distress (Australian Mental Health Outcomes and Classifications Network; AMHOCN (AMHOCH, 2005)).

Seven-day alcohol use, measured in standard drinks, was recorded with a drinking diary (Redman et al., 1987; Sobell et al., 1988). The current Australian guidelines for both men and women recommend no more than two standard drinks per day on average (and no more than four on a single occasion). There are further guidelines for sub-groups, such as those younger than 18 years (National Health and Medical Research Council, 2009). Adjusting for non-

drinkers, the population average consumption is estimated at 2.6 standard drinks per day (18.2 per week) (Australian Bureau of Statistics, 2018)

We assessed quality of life (QoL) with the eight-item EUROHIS-QoL. This measure has been validated in Australia (da Rocha et al., 2012) and is recommended for use in alcohol- and other drug treatment services (Network of Alcohol and other Drugs Agencies, 2012). Scores range from 1 to 5 with higher scores showing better QoL.

#### Other outcome measures:

Days out of role, either completely or partially, in the past 30 days, and whether these days were due to alcohol use, was evaluated with Kessler's days-out-of-role measure (Kessler and Frank, 1997). For those with alcohol dependence, the mean number of days out of role is 3.8 days (Slade et al., 2009).

The Pittsburgh Sleep Quality Index was used to categorise sleep quality on a four-point scale (0 = very good, to 3 = very bad) in the previous month (Buysse et al., 1989).

We assessed time engaged in exercise with the Godin Leisure-Time Exercise questionnaire to quantify total exercise in the last seven days (Godin and Shephard, 1997). The Godin survey was used to derive metabolic equivalents (METs) from different types of exercise, by multiplying the weekly frequencies of strenuous, moderate and light exercise by 9, 5 and 3 respectively. One MET is defined as the energy used while sitting at rest (Jette et al., 1990).

The use of health services was assessed via a checklist of medical and other health professionals consulted in the last eight weeks, and was based on an existing checklist (Wade et al., 2008).

Alcohol-related adverse events (assessed at baseline only) were quantified with the Core survey (Presley et al., 1994). This scale lists 19 events ranging from hangovers to having seriously tried to commit suicide. Potential scores range from 0 to 95 depending on the frequency of each type of adverse event in the previous 6 months (never, to more than 10 times).

We defined 'engagement with online coaching' as at least one message sent from the participant to the online coach.

## 2.5 Analysis

The initial analysis reports the descriptive statistics such as means and standard deviations (SD) or medians and inter-quartile ranges (IQR) together with inferential statistics reporting the between-group differences at each time point. We also assessed change for the whole cohort, from baseline to each time point. To test if the frequency distribution of AUDIT-C categories (low, moderate and high risk) had changed, we compared the outcomes at one and three months with the baseline distribution (low = 1.5%, moderate = 33%, high = 65.5%) with a one-sample chi square test.

We used generalised estimating equations to model the relationships between predictors (age, sex, engagement with online coaching, number of blog comments, number of blog shares and time (baseline, one month, three months)) and the key study outcomes of i) AUDIT-C, ii) alcohol consumption, iii) K-10 scores, and iv) EUROHIS scores. In each model we used an independent correlation matrix structure with a linear model and log link, except for alcohol consumption, where a Poisson loglinear distribution was used.

## 3.0 RESULTS

### 3.1 Baseline characteristics

Overall, 2616 people viewed the invitation page of whom 1278 (49%) looked at the further details page and 978 (77%) completed the consent form (ticked box). There were 61 people who reported a prior diagnosis of CVD and 28 people scored below the AUDIT threshold, plus 36 who did not complete the AUDIT (or other surveys). We identified 50 people who had multiple attempts to enter the study having failed on one of the criteria (e.g. age, AUDIT score, CVD). These cases were also excluded, together with a further 22 cases who were not randomised due to a programming error, leaving an eligible cohort of 793 people or 81.1% of those who consented. (Twelve people failed more than one of the eligibility criteria).

Of these 793 people, 398 (50.2%) were randomised to the Intervention group and 395 (49.8%) to the Control group. The baseline demographic characteristics are shown in Table 1. More than 70% of participants were female, and overall there was a high level of educational attainment, with three-quarters (77%) of participants having at least some university education. The mean age was 40.1 (SD 10.0) years. More than one-third of participants were currently on psychoactive medications (274, 35%) and 53 (6.7%) were taking a medication for their alcohol use (e.g. Acamprosate, Naltrexone, Disulfiram). The mean K-10 scores show moderate levels of mental distress (overall mean 24.8, SD 7.0). None of the between-group comparisons was statistically significant, except for days completely out of role due to alcohol use (the Intervention group had more days out of role).

Notably, nearly 70% of participants were classified in the highest risk group ('probably dependent') on the AUDIT, and overall, the mean alcohol consumption was 37.1 (SD 28.3) standard drinks per week. In terms of individual types of alcohol-related adverse events, 65% had been in an argument or fight, 15% reported that they had damaged property, 33% had driven a car while intoxicated and 38% had been hurt or injured. Nineteen people (2.4%) reported that they had seriously tried to commit suicide and nearly 30% were in the highest risk category on the P4 suicide screening test.

Table 1: Demographic characteristics at baseline

Variable		Intervention (N=398)	Control (N=395)	p value
Sex (female) ‡	n (%)	285 (72)	276 (70)	0.510
Age (years)	mean (SD)	40.9 (10.0)	41.0 (10.1)	0.887
Marital status ‡				
Single / divorced	n (%)	139 (35)	129 (33)	0.737
Married	n (%)	162 (41)	174 (44)	
De-facto	n (%)	87 (22)	80 (20)	
Re-married	n (%)	10 (3)	12 (3)	
Highest education level ‡				
Primary / high school / trade	n (%)	88 (22)	97 (25)	0.713
Some / complete university	n (%)	191 (48)	185 (47)	
Some / complete higher degree	n (%)	119 (30)	113 (29)	
Suicide risk (highest category) ‡	n (%)	119 (30)	109 (28)	0.295
Kessler-10	mean (SD)	24.5 (7.0)	25.0 (7.1)	0.321
Kessler-10 category ‡				
low	n (%)	35 (9)	36 (9)	0.615
mild	n (%)	106 (27)	91 (23)	
moderate	n (%)	154 (39)	168 (43)	
severe	n (%)	103 (26)	100 (25)	
EUROHIS	mean (SD)	3.2 (0.7)	3.1 (0.7)	0.698
Sleep Quality	mean (SD)	1.7 (0.7)	1.7 (0.8)	0.698
Exercise (METS) †	median (IQR)	36 (17-56)	35 (16-56)	0.755
Health service use †	median (IQR)	2 (0-6)	2 (0-5)	0.597
Core adverse events	mean (SD)	27.5 (11.3)	26.5 (12.1)	0.242
Alcohol days out of role †	median (IQR)	1 (0-2)	0 (0-1)	<b>0.019*</b>
	mean (SD)	1.8 (4.1)	1.4 (2.8)	
Alcohol part days out of role †	median (IQR)	1 (0-5)	1 (0-4)	0.468
	mean (SD)	3.6 (5.5)	3.5 (5.6)	
AUDIT (10 items)	mean (SD)	23.0 (6.0)	23.0 (6.5)	0.611
AUDIT 10 category ‡				
8 – 19 'hazardous/harmful'	n (%)	117 (29)	126 (32)	0.445
20 – 40 'dependent'	n (%)	281 (71)	269 (69)	
AUDIT-C (3 items)	mean (SD)	9.0 (1.9)	9.2 (1.9)	0.288
AUDIT-C (risk category) ‡				
low	n (%)	7 (2)	5 (1)	0.651
moderate	n (%)	136 (34)	126 (32)	
high	n (%)	255 (64)	264 (67)	
7-day standard drinks	mean (SD)	37.5 (31.1)	36.8 (25.3)	0.736

‡ Assessed with chi-square test

† Note large SD compared with mean: assessed with non-parametric Mann-Whitney U:

\* Statistically significant between group difference,  $p < .05$ :

METS = metabolic equivalents

## 3.2 Engagement with Daybreak

### 3.2.1 Online coaching

Engagement with coaching was defined as at least one message sent by the participant to the coach. On this basis, 160 participants engaged with coaching, including 68 from the Intervention and 38 from the Control group (Table 2). A significantly greater proportion of those in the Intervention group engaged with an online coach (17.1% versus 9.6%). There were also a further 54 people who received contacts from the coaches but who did not respond.

Table 2: Online coaching and other engagement indicators

Variable		Intervention (N=398)	Control (N=395)	p value
Engaged with coaching (yes)	n (%)	68 (17)	38 (10)	<b>0.002*</b>
Blog shares	median (IQR)	1 (0-4)	1 (0-10)	0.128
Blog comments	median (IQR)	1 (0-10)	2 (0-10)	0.737
Experiments†	mean (SD)	1.9 (1.4)	2.3 (3.0)	0.127
Time in study (days)	median (IQR)	32 (6 – 87)	30 (4-90)	0.509

\* Statistically significant between group difference,  $p < .05$

† Mean calculated for those with at least 1 experiment

### 3.2.2 Daybreak peer support

There were 526 people who shared information on the blog, with 258 (65%) from the Intervention and 268 (68%) from the Control group. A similar pattern was seen for participants who commented on the shares posted by others, with 457 participants commenting, including 230 (58%) in the Intervention and 227 (58%) in the Control group. There were no significant differences in terms of either the median number of shares or comments (Table 2).

### 3.2.3 Daybreak ‘experiments’

Overall, 281 (35%) participants accessed the Daybreak ‘experiments’ (Intervention 147 (37%): Control 134 (34%):  $\chi^2 p = .375$ ). The number of experiments ranged from 1 to 27 (Intervention mean 1.9 (SD 1.4): Control mean 2.3 (SD 3.0)).

## 3.3 One-month follow-up

At one month we collected follow-up data from 334 people (42.1%), with 179 (53.6%) from the Intervention group and 155 (46.4%) from the Control group. Table 3 shows the outcomes for the alcohol use and psychosocial measures at one month. There were no significant between-group differences at this time except that those in the Control group reported more exercise than those in the Intervention group.

We also assessed change between baseline and one month. On all the variables there were significant improvements in outcomes. That is, there were lower K-10 scores, sleep quality scores<sup>1</sup>, reduced days wholly and partially out of role, reduced AUDIT-C scores and alcohol consumption. There were significant increases in quality-of-life scores and exercise. Health service use was lower at follow-up than baseline: this measure is ambiguous as engaging with treatment services could be regarded as a

<sup>1</sup> Lower scores equate to better sleep

positive development for those with high levels of alcohol use. Conversely, reduced alcohol consumption should reduce the need to seek help for acute events. In terms of AUDIT-C category, 106 (32%) were in the low-risk group, with 189 (57%) people improving by one or two categories: the distribution was significantly different to baseline (one sample  $\chi^2 p < .001$ ).

Table 3: One-month outcome measures compared between groups, plus change since baseline

Variable		Intervention (N=179)	Control (N=155)	p value (between)	p value (change)
Kessler-10	mean (SD)	19.4 (6.8)	20.3 (6.7)	0.214	<.001 <sup>b</sup>
EUROHIS	mean (SD)	3.5 (0.7)	3.5 (0.8)	0.831	<.001 <sup>b</sup>
Sleep Quality	mean (SD)	1.3 (0.7)	1.2 (0.8)	0.174	<.001 <sup>b</sup>
Exercise (METS) †	median (IQR)	38 (19-56)	43 (25-68)	<b>0.045*</b>	<.001 <sup>b</sup>
Health service use †	median (IQR)	2 (0-6)	2 (0-5)	0.464	<b>0.003<sup>b</sup></b>
Alcohol days out of role †	median (IQR)	0 (0-0)	0 (0-0)	0.170	<.001 <sup>b</sup>
	mean (SD)	0.8 (3.2)	0.3 (1.0)		
Alcohol part days out of role †	median (IQR)	0 (0-1)	0 (0-1)	0.199	<.001 <sup>b</sup>
	mean (SD)	1.5 (3.9)	1.2 (3.5)		
AUDIT-C (3 item)	mean (SD)	6.2 (3.0)	5.8 (3.0)	0.275	<.001 <sup>b</sup>
AUDIT-C (risk category) ‡	low n (%)	54 (30)	52 (34)	0.310	<.001 <sup>b</sup> ‡‡
	moderate n (%)	79 (44)	74 (48)		
	high n (%)	46 (26)	29 (19)		
7-day standard drinks †	median (IQR)	12 (0-25)	10 (0-26)	0.306	<.001 <sup>b</sup>
	mean (SD)	17.5 (19.9)	16.4 (23.4)		

‡ Assessed with chi-square test: ‡‡ tested with a one sample chi-square test

† Note large SD compared with mean: assessed with non-parametric Mann-Whitney U

\* Statistically significant between group difference,  $p < .05$ : <sup>b</sup> Statistically significant pre-post change,  $p < .05$

### 3.4 Three-month follow-up

At three months we collected follow-up information from 293 (37.0%) people with 150 (51.2%) from the Intervention group and 143 (48.9%) from the Control group. None of the between-group differences were significant at three months, bar the number of days partially out of role due to alcohol use (the Intervention group had more partial days out of role: at baseline they had more whole days out of role due to alcohol use). At three months, 33% of participants were in the low-risk AUDIT-C category.

#### 3.4.1 Change from one month to three months

Change was also assessed from one month to three months: there were continuing significant improvements in alcohol risk score (AUDIT-C) and mental health (K-10) with both measures continuing to decline from the levels found at 1 month (Table 4). In terms of risk category, 39 (27%) people moved to a lower risk group than they were in at one month, 122 (65%) remained in the same group and 27 (14%) moved to a higher risk group. Overall, the frequency distribution for risk categories was similar at one and three months ( $p=0.633$ ).

Table 4: Three-month outcome measures compared between groups, plus change from 1 month to 3 months

Variable		Intervention (N=150)	Control (N=143)	p value (between)	p value (change)
Kessler-10	mean (SD)	18.5 (6.6)	19.4 (6.6)	0.237	<b>0.009<sup>b</sup></b>
EUROHIS	mean (SD)	3.6 (0.7)	3.6 (0.7)	0.845	0.187
Sleep Quality	mean (SD)	1.3 (0.8)	1.2 (0.7)	0.211	0.377
Exercise (METS) †	median (IQR)	38 (19-64)	38 (20-67)	0.954	0.729
Health service use †	median (IQR)	2 (0.8-5)	1 (0-4)	0.119	0.901
Alcohol days out of role †	median (IQR)	0 (0-0)	0 (0-0)	0.160	0.359
	mean (SD)	0.7 (2.1)	0.3 (0.8)		
Alcohol part days out of role †	median (IQR)	0 (0-1)	0 (0-1)	<b>0.016*</b>	0.059
	mean (SD)	1.3 (2.9)	0.9 (3.1)		
AUDIT-C (3 items)	mean (SD)	5.8 (3.0)	5.8 (3.1)	0.992	<b>0.014<sup>b</sup></b>
AUDIT-C (risk category) ‡	low n (%)	50 (33)	47 (33)	0.979	<b>&lt;.001<sup>b</sup> ‡‡</b>
	moderate n (%)	70 (47)	66 (46)		
	high n (%)	30 (20)	30 (21)		
7-day standard drinks †	median (IQR)	13 (6-24)	11 (0-25)	0.212	0.557
	mean (SD)	18.2 (18.2)	16.7 (19.6)		

‡ Assessed with chi-square test: ‡‡ tested with a one sample chi-square test

† Note large SD compared with mean: assessed with non-parametric Mann-Whitney U

\* Statistically significant between group difference,  $p < .05$ : <sup>b</sup> Statistically significant pre-post change,  $p < .05$

### 3.4.2 Change from baseline to three months

Compared to baseline levels, at three months there were significant improvements in AUDIT-C scores, quality of life, mental distress, sleep quality, total alcohol consumed, and days both wholly or partially out of role ( $p < .001$ ). Use of health services was lower at three months than at baseline ( $p = 0.031$ ) while the level of exercise did not differ from that at baseline ( $p = 0.249$ ). Over three months, AUDIT-C categories had improved for 181 (62%) people, 106 (36%) were in the same category and 6 (2%) in a higher risk category, with the frequency distribution of risk categories being significantly different to baseline (one sample  $\chi^2 p < .001$ ). As shown in Table 4, 33% of participants were in the low-risk category at three months, and only 20% were in the highest risk group – this compared to about 65% at baseline.

Figure 1 shows the reduction in AUDIT-C scores and standard drinks during the study. Figure 2 shows the change in K-10 and EUROHIS scores. It should be noted in interpreting Figure 2 that lower K-10 scores show better outcomes, while higher EUROHIS scores show increased quality of life. Figure 3 shows the reduction in the number of days either completely out of role or partially out of role due to alcohol use over the three-month period.

Figure 1: Change in alcohol-related measures (AUDIT-C and standard drinks per 7 days)

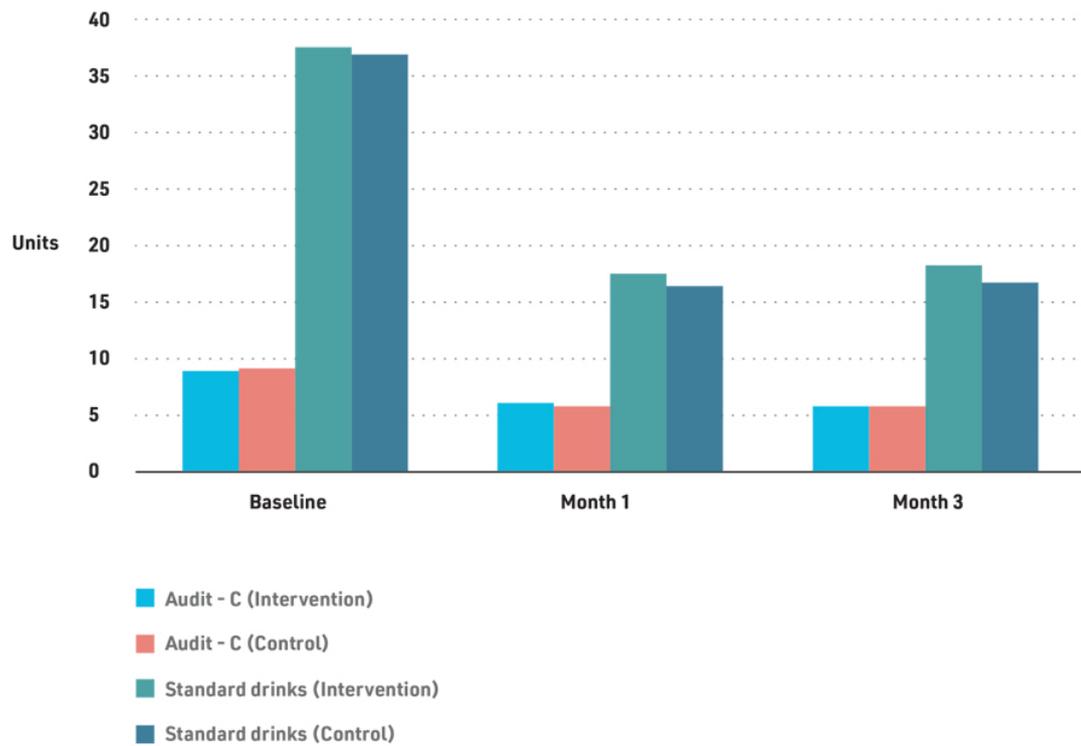


Figure 2: Change in psychological distress (K-10) and quality of life (EUROHIS)

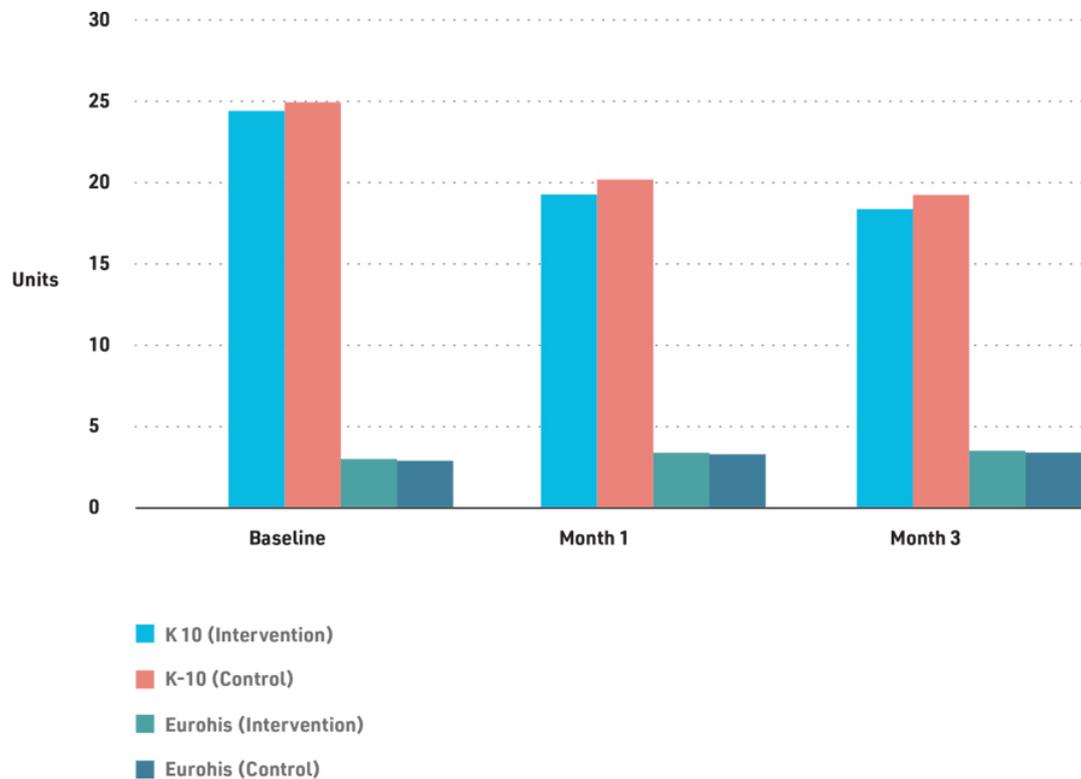
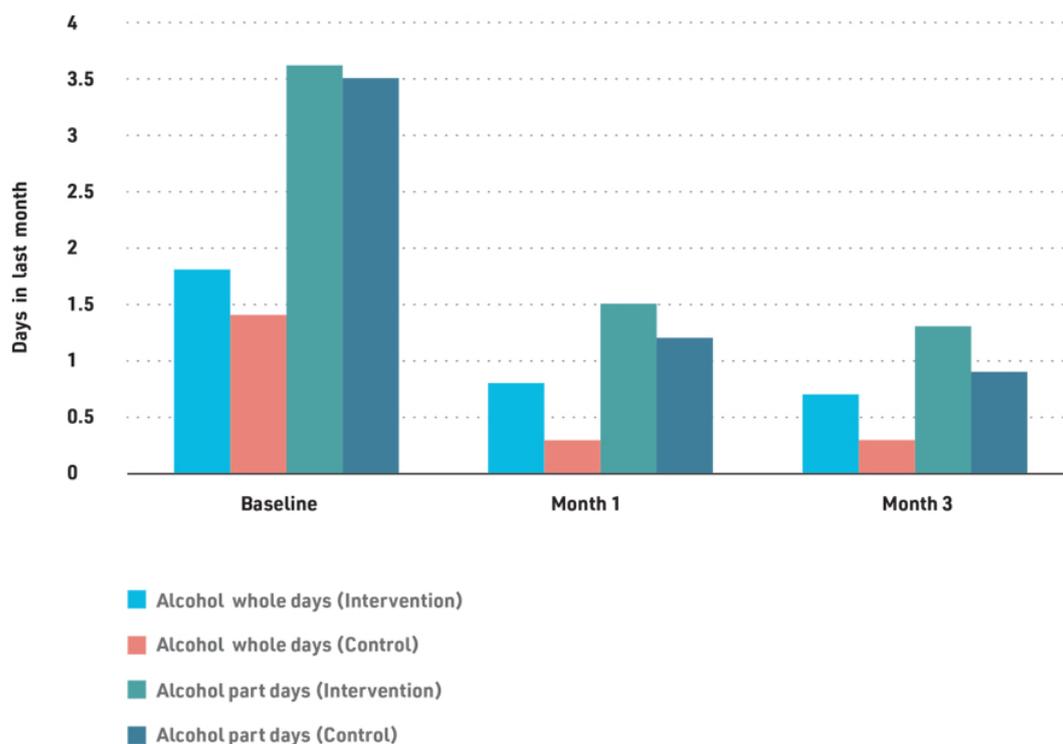


Figure 3: Days out of role due to alcohol



### 3.5 Impact of ‘engagement with coaching’ on outcomes

The impact of ‘engagement with coaching’ on change scores (e.g. baseline values – three-month values) on key variables is shown in Table 5. There was no significant difference in the extent of change, for those who did or did not engage with online coaching, on any of these four variables.

Table 5: Change scores for key outcome measures, baseline to 3 months

Variable		Engaged (N=106)	Did not Engage (N=687)	p value
K-10	mean (SD)	4.7 (7.4)	5.1 (5.5)	0.697
EUROHIS	mean (SD)	-0.4 (0.6)	-0.4 (0.5)	0.873
AUDIT-C (3 items)	mean (SD)	3.1 (2.8)	3.3 (3.0)	0.721
7-day standard drinks †	median (IQR)	14 (3-30)	10 (-3‡-27)	0.236

† Note large SD compared with mean: assessed with non-parametric Mann-Whitney U

‡ Negative value shows increase alcohol consumption over time

### 3.6 Multilevel model

To assess the overall outcomes in terms of AUDIT-C scores and K-10 scores we used generalised estimating equations (Table 6a and 6b). We also assessed, but do not report in detail on, alcohol consumption and EUROHIS scores. For the AUDIT-C there were significant main effects of gender (males had higher scores), engagement with coaching (those who engaged had higher scores) and age

(increasing scores with age). In addition, AUDIT–C scores showed a significant decline with time. Importantly, neither the ‘time by group’ nor ‘time by engagement’ interaction terms were significant.

For the K-10, only time and age were significant. Compared with baseline, K-10 scores were lower at both one and three months. K-10 scores declined with increasing age of participants. As with the AUDIT-C scores, neither the ‘time by group’ nor ‘time by engagement’ interaction terms were significant.

We also modelled the outcomes for alcohol consumption (using a Poisson loglinear distribution) and EUROHIS scores. None of the critical interaction terms was significant.

*Table 6a and 6b: Generalised estimating equation outcomes: AUDIT-C and K-10*

Variable (reference category)	B	Wald (DF)	$\chi^2$	P value	B	Wald (DF)	$\chi^2$	P value
	<b>AUDIT-C</b>				<b>K-10</b>			
Group (Control)	-.174	1.6 (1)	.202	.202	-.582	1.4 (1)	.241	.241
Sex (female)	.742	15.7 (1)	<.001*	<.001*	.691	1.9 (1)	.173	.173
Engaged (no)	.602	10.7 (1)	.001*	.001*	1.2	2.7 (1)	.101	.101
Time								
3 months	-3.49	166.6 (1)	<.001*	<.001*	-5.5	99.9 (1)	<.001*	<.001*
1 month	-3.34	200.3 (1)	<.001*	<.001*	-4.7	79.8 (1)	<.001*	<.001*
(Baseline)								
Age (years)	.019	5.4 (1)	.021*	.021*	-.079	10.3 (1)	.001*	.001*
Blog comments	.000	.026 (1)	.873	.873	.006	1.1 (1)	.296	.296
Blog shares	.000	.000 (1)	.983	.983	-.029	2.3 (1)	.130	.130

\* Statistically significant difference,  $p < .05$

## 4.0 DISCUSSION

This report provides the findings of a three-month evaluation of the Daybreak program. Although the failure to separate the participants completely, on the basis of their randomisation code, means that the findings are less robust than anticipated, they still provide useful information. In terms of alcohol risk, at three months, one-third of participants were in the low-risk category of the AUDIT-C, compared with only 1.5% at the start of the study – a significant change in the level of risk classification. Further, at three months, 65% had moved to a lower risk category, only 20% were in the highest risk category compared with 65% at baseline, and only six people moved to a higher risk category. Self-reported alcohol consumption declined by about 20 standard drinks per week, to a mean of about 17 drinks – less than the Australian national average, but still above the NHMRC recommendation of no more than two standard drinks per day (National Health and Medical Research Council, 2009). Therefore, using the Daybreak program is associated with a statistically significant and clinically important change in alcohol risk and consumption. These changes were accompanied by reduced psychological distress and improved quality of life.

However, we are unable to attribute changes in alcohol risk and consumption to online coaching. In addition, as all participants had access to an active treatment (Daybreak) and research assessments, we do not know how much of this change related to the natural course of alcohol use, regression to

the mean (McCambridge et al., 2014) or reactivity to research questions on alcohol use (McCambridge and Kypri, 2011).

We did note (Table 6a) that those who engaged with online coaching had higher levels of alcohol use. There are two probable explanations. First, those with higher levels of alcohol use may have sought help and initiated contact. Alternatively, the online coaches may have identified characteristics, including high levels of alcohol use, and initiated the first contact. Nevertheless, to be defined as having engaged with coaching, there also had to be at least one message from the participant. Notably this engagement did not relate to mental distress (see Table 6b), with K-10 scores not significantly associated with engagement.

In addition to improvements in the primary and secondary outcomes, there were also improvements on other measures. The number of days completely out of role due to alcohol use reduced over the study. At three months the number of whole days out of role in the last 30 days was less than one day, which is well below the level reported in national data for those with alcohol disorders ('dependence' 3.8 days: 'abuse' 2.4 days) (Slade et al., 2009). Similarly, there were improvements in reported quality of sleep. Given the inter-relationship between mental health, particularly depression, insomnia and alcohol use (Staner, 2010), definitive claims about the direction of causality cannot be made, but reduced alcohol use and reduced levels of mental distress would be expected to be associated with improved sleep.

With nearly 800 participants, the study recruited a substantial sample by international comparison. For example, a systematic review of mobile-based alcohol applications reported a mean of 177 people per study (Fowler et al., 2016) while a meta-analysis of internet-based interventions for alcohol use had a mean of 350 people per study (Riper et al., 2014). Over three-quarters of the study cohort were female. It has previously been noted that online interventions tend to attract a greater proportion of women than traditional face-to-face services (White et al., 2010), whereas national figures show that about two-thirds of clients whose principal drug of concern is alcohol, are male, with a modal age of 40–49 years (Australian Institute of Health and Welfare, 2018). Therefore, Daybreak may provide treatment to a group who do not normally seek face-to-face treatment.

Surprisingly, 35% of the sample reported that they were currently using prescribed medications for mental health problems and 6.7% were using medications for their alcohol use (e.g. naltrexone). This sub-group of people using alcohol pharmacotherapy reported a mean of 51 drinks per week, meaning that they were still well above the national guideline for consumption despite their use of pharmacotherapy (National Health and Medical Research Council, 2009). By three months this had declined to a mean of 22 standard drinks. While this sub-analysis was not a focus of the study, brief interventions have long been reported as generally not effective with heavy consumers of alcohol (Bien et al., 1993). While Daybreak does not claim to be a brief intervention, changing behaviour in this sub-group rather than referring them for traditional treatment, as set out in the SBIRT rubric, opens a potentially new option for treatment.

Daybreak contains many elements that could contribute to the improved outcomes. Firstly, as described in the study protocol (Tait et al., 2018), Daybreak contains 'experiments' to assist in addressing alcohol related issues such as 'triggers' and 'cravings'. Second, the value of peer-to-peer online support and creating health information (e.g., blogging) has been recognised (Ziebland and Wyke, 2012). Third, public commitment to behaviour change is one of the critical components of increasing motivation (Michie et al., 2012). This study was planned to evaluate the unique contribution of online coaching beyond these components, but was unable to establish its importance.

## 5.0 CONCLUSIONS

This evaluation of the Daybreak program provides some promising outcomes in terms of reducing alcohol risk levels and consumption, especially considering that at baseline, 70% of participants were classified as 'probably dependent' on alcohol. Achieving clinically important changes in behaviour in a population with this extent of alcohol problems, is most notable. However, these findings need to be tempered with the acknowledgement that even at three months, only one-third of participants were retained, hence limiting the generalisations that can be made about the target population.

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