



Examining service participation and outcomes from a population-level telephone-coaching service supporting changes to healthy eating, physical activity and weight: A comparison of participants with and without a mental health condition

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ABSTRACT

Population-level telephone coaching services provide accessible behaviour change support for modifiable health risk behaviours. The NSW Get Healthy Information and Coaching Service® (GHS) is a free telephone-based coaching service in Australia, supporting improvements in healthy eating, physical activity and achieving or maintaining a healthy weight. This study compared measures of participation (such as program completion) and outcomes achieved immediate post-program (including changes in fruit and vegetable consumption, physical activity and weight) for GHS participants with and without a self-identified mental health condition (MHC). Secondary data analysis was conducted on service data collected at program intake and completion for individuals who enrolled in a coaching program between January 2018 and October 2019 ($n = 5,629$); 33% identified as having had an MHC. While those with and without an MHC had similar rates of completion, those with an MHC were less likely to complete a coaching program (31% vs 36%, $p = .003$). Participants with an MHC made significant positive changes to their fruit and vegetable consumption, physical activity (walking and moderate), weight and BMI, but not to waist circumference or vigorous physical activity. When comparing the magnitude of change for those with and without an MHC, individuals without made greater improvements to their weight (adjusted mean difference -0.623 kg, $p = .034$) and daily vegetable intake (adjusted mean difference -0.199 serves; $p = .01$). There were no differences for other variables. The GHS is an effective means of supporting behaviour change for people with an MHC who complete a coaching program. Further research should consider means of improving retention rates.

1. Introduction

People with a mental health condition experience a reduced life expectancy (Firth et al., 2019; Walker et al., 2015; Erlangsen et al., 2017; Lawrence et al., 2013), the majority of which has been attributed to a higher prevalence of chronic physical health conditions such as cardiovascular disease and cancers (Firth et al., 2019; Erlangsen et al., 2017; Lawrence et al., 2013). Such conditions are linked to modifiable

health risks, which also have a greater prevalence among people with a mental health condition. People with a mental health condition are: more likely to smoke (Lê Cook et al., 2014; Morris et al., 2014; Szatkowski and McNeill, 2014), less likely to engage in healthy eating (Bonnet et al., 2005; Roick et al., 2007; McCreddie, 2003; Payne et al., 2012) or physical activity (Nyboe and Lund, 2013; Daumit et al., 2005; Chwastiak et al., 2011) and more likely to be overweight or obese (Daumit et al., 2005; Chwastiak et al., 2011; Rajan and Menon, 2017; De

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Hert et al., 2011). Improving the physical health of this population and addressing health risk behaviours is a policy priority (Firth et al., 2019; National Mental Health Commission, 2016; Department of Health, 2017; World Health Organization, 2018).

Population-level telephone health coaching is an approach to address risk factors for chronic health conditions that can provide broad reach across the community (Matkin et al., 2019; O'Hara et al., 2012). Quitlines are widely available internationally, and provide individually-tailored support for smoking cessation. Cochrane review evidence indicates that individuals engaging with Quitlines are up to 10% more likely to have quit than those using self-help material alone (Matkin et al., 2019). International evidence suggests that 20–40% of Quitline users have a mental health condition (Kerkvliet et al., 2015; Hebert et al., 2011; Nair et al., 2020; Lien et al., 2016; Railton, 2015), and gain benefit from the Quitline, although sustained cessation may be more difficult for this group (Railton, 2015). Contributing factors may include higher nicotine dependence (Bowden et al., 2011; R  ther et al., 2014), as well as social determinants impacting behaviour change including lack of social support, poorer physical health and lower self-efficacy (R  ther et al., 2014; Hughes, 2006).

Despite trials indicating that telephone-delivery can also be acceptable and effective in supporting change in behaviours other than smoking (Goode et al., 2012), limited research has evaluated telephone services delivered at a population-level for other risk behaviours. Among such research has been an examination of a free Australian service that offers support for improving healthy eating, physical activity and achieving a healthy weight utilising a six month coaching program; the New South Wales (NSW) Get Healthy Information and Coaching Service® (GHS) (O'Hara et al., 2012). A pre-post study undertaken soon after commencement of the service in 2009 suggested that participants who completed the program (26%) made significant beneficial changes to their daily fruit (0.3 serves) and vegetable (1 serve) consumption, weekly physical activity including number of 30-minute walking sessions (1), 30-minute moderate activity sessions (0.5), and 20-minute vigorous physical activity sessions (0.5), weight (mean -3.9 kg), waist circumference (-5 cm), and BMI (-1.4 units) (O'Hara et al., 2012).

Recent research has explored use of the GHS by people with a mental health condition. Among over 11,000 individuals who enrolled in coaching during 2015–17, 26% self-reported on service enrolment having had a mental health condition that required treatment from a health professional. These participants reported higher health risks relating to healthy weight upon enrolment (weight $+7$ kg, BMI $+0.68$ units, waist circumference $+5$ cm), and lower confidence in ability to make health behaviour changes compared to participants without a mental health condition (Bradley et al., 2020). Other research suggests that additional difficulties faced by people with a mental health condition in achieving a healthy weight can arise from use of psychoactive medications, which often have weight gain as a side effect (Kivimaki et al., 2010; Tschoner et al., 2007). We could identify no research that has further examined how people with a mental health condition engage with population-level telephone services targeting healthy eating, physical activity, or weight reduction, nor the effectiveness of such services for this group.

This study compared measures of participation (such as program completion) and outcomes achieved (including changes in fruit and vegetable consumption, physical activity and weight) for GHS coaching participants with and without a self-identified mental health condition.

2. Methods

2.1. Setting & design

The GHS provides telephone support to individuals interested in making improvements in healthy eating, physical activity and achieving or maintaining a healthy weight, and/or reducing their alcohol consumption. Individuals 16 years and over residing in the states of NSW

and Queensland, or 18 and over in South Australia, can self-refer to the service or be referred by a health professional to receive a coaching program providing support over a period of up to six months. Participants are enrolled in one of several modules determined by their health status and preference: general support (Standard Module), support tailored for a specific health concern (Type 2 Diabetes Prevention, Alcohol Reduction), or population subgroups (Aboriginal and Torres Strait Islander (Quinn et al., 2017), Pregnancy). All modules provide behaviour change support based on components such as goal-setting, identifying barriers and enablers, and problem solving. Completion of a coaching program occurs at graduation, which entails receipt of between 10 and 13 calls depending on the module, or through early graduation from receipt of four or more calls if a participant has achieved their goals and elects to complete the program early. Coaching is provided by university qualified health coaches (exercise physiology, dietetics or nursing), and call duration is typically 15 min.

The study involved secondary analysis of data routinely collected by the service during 2018–19, consisting of: information collected from participants during an initial intake assessment, and on completion or withdrawal from coaching; and data collected from service records. Approval was obtained from the University of Newcastle Human Research Ethics Committee: H-2016-0270.

2.2. Participants

Data were extracted in October 2019 for all participants who enrolled in a coaching program between January 2018 and October 2019 and provided consent for their data to be analysed for research purposes. Participants who provided a response to a mental health question in the initial intake assessment were included, with the exception of those allocated to the pregnancy module (Department of Health, 2019). If a participant enrolled in a coaching program more than once during the study period, only information from their first enrolment was included.

2.3. Measures

2.3.1. Mental health status (on intake)

Participants were asked "Have you had a significant mental health problem that required treatment from a health professional?" (Yes / No). For the purpose of this analysis, those who responded yes to this question were classified as participants with a mental health condition. Only those responding Yes were then asked "Are you taking medication for your mental health condition?" (Yes / No).

2.3.2. Demographics, referral and goals (on intake)

Information collected included: date of birth, gender, identification as Aboriginal and/or Torres Strait Islander, postcode, highest education level (Year 10 or below, Year 11 or 12, Certificate/Diploma, Degree) and employment status (Unemployed, Employed, Home Duties, Retired, Other). To determine referral source, participants were asked "Can you confirm how you heard about our service?" (Open response). Participants elected a primary health goal relating to: weight, physical activity, diet, waist circumference or alcohol.

2.3.3. Health behaviours and anthropometric measures (intake and completion)

Validated self-report questions were used to assess fruit and vegetable intake (number of fruit servings consumed per day, number of vegetable servings consumed per day) (Rutishauser et al., 2001) and physical activity (number of times per week various levels of activity were engaged in: 30 min of walking, 30 min of moderate physical activity, 20 min of vigorous physical activity) (Smith et al., 2005). Participants reported their waist circumference (cm), as well as their weight (kg) and height (for calculating Body Mass Index (BMI)).

2.3.4. Service delivery / participation

Information obtained from service records included: module allocation; coaching status at the time of data extraction (graduation, early graduation, withdrawn (actively withdrew prior to completion), lost to follow up (could not be re-contacted after 10 calls), or still active (part way through coaching); and the number of calls received (for those who were not still active). Participants who withdrew were asked to indicate their main reason (open response).

2.4. Statistical analysis

2.4.1. Coding/grouping

Data were analysed using SPSS (IBM SPSS Statistics for Windows). Participant postcode was used to calculate geographic remoteness (Department of Health and Aged Care, 2001) and socio-economic index of disadvantage (Australian Bureau of Statistics, 2008). Referral sources were grouped as: referral from a health practitioner e.g. via service referral form or joint call to service with the participant (Form / joint call); referrals through health promotion campaigns, health services or research studies (Study or service referral); GHS advertising such as web, radio and mail out information (Advertising); workplace promotions (Work); and Other. Withdrawal reason was dichotomously grouped as related to either participant circumstances (e.g. unwell, unavailable for program duration, not ready to change behaviour), or perceptions of the service (e.g. not meeting needs, not satisfied). Differences in pre- and post-program weight were used to calculate whether participants achieved at least 5% weight loss at program completion, an amount considered to be clinically significant (Jensen et al., 2014).

2.4.2. Analysis

Descriptive statistics were used to summarise demographics, participation and program completion for the sample as a whole, as well as for participants with a mental health condition (MHC) and without a mental health condition (No-MHC) separately. For demographics (Table 1) and participation (Table 2), chi-squared analyses were conducted to compare MHC and No-MHC participants for categorical variables, and a *t*-test compared mean age and number of coaching calls received. The assessment of completion rates was carried out using logistic regression and effect sizes were determined as odds ratios (a relative effect size). To provide risk differences (absolute effect size), a generalised linear model with binomial distribution and identity link function was used.

For continuous outcome variables (fruit serves, vegetable serves, walking, moderate physical activity, vigorous physical activity, weight, waist circumference, and BMI), linear mixed models were used to determine the key effect of change over time and whether the changes over time differed between MHC and No-MHC participants. Residual covariance structures were used to model correlation between repeated measurements, the most appropriate structure for each variable being unstructured based on lowest Akaike Information Criterion (AIC) among the structures examined.

The final model results were based on models in which covariates were added to the base model to adjust the effect sizes for differences between groups and time periods i.e. two way interactions between the intake covariate and time, and three way interactions between intake covariate, time and MHC (Supplementary Table 1).

Chi-squared analyses were conducted to determine if likelihood of program completion among participants with a mental health condition differed depending on whether they were taking medication for their condition or not. Subgroup analyses were carried out for the MHC group using mixed models to determine if outcomes achieved at program completion differed depending on if participants indicated taking medication for their mental health condition (Supplementary Table 2). Significance was set at the 0.05 level.

Table 1

Demographics by presence of a mental health condition.^a

| | ALL (N = 5,629) | No-MHC (N = 3754) | MHC (N = 1875) | <i>p</i> ^b |
|--|-----------------|-------------------|----------------|-----------------------|
| Age ^c | N = 5626 | N = 3751 | N = 1875 | |
| Mean (SD) | 52.22 (15.02) | 53.13 (15.28) | 50.40 (14.32) | <0.001 |
| Gender | N = 5623 | N = 3749 | N = 1874 | |
| Female | 4135 (73.5%) | 2672 (71.3%) | 1463 (78%) | <0.001 |
| Aboriginal and/or Torres Strait Islander | N = 5503 | N = 3754 | N = 1875 | |
| Yes | 383 (6.8%) | 223 (6.1%) | 160 (8.7%) | 0.034 |
| Education | N = 5441 | N = 3635 | N = 1806 | |
| Yr 10 or below | 1046 (19.2%) | 657 (18.1%) | 389 (21.5%) | <0.001 |
| Yr 11 or 12 | 814 (15%) | 500 (13.8%) | 314 (17.4%) | |
| Cert/Diploma | 1280 (23.5%) | 804 (22.1%) | 476 (26.4%) | |
| Degree ^d | 2301 (42.3%) | 1674 (46.1%) | 627 (34.7%) | |
| Employment | N = 5626 | N = 3751 | N = 1875 | |
| Unemployed | 755 (13.4%) | 332 (8.9%) | 423 (22.6%) | <0.001 |
| Employed | 3003 (53.4%) | 2165 (57.7%) | 838 (44.7%) | |
| Retired / Home duties | 1512 (26.9%) | 1053 (28.1%) | 459 (24.5%) | |
| Other | 356 (6.3%) | 201 (5.4%) | 155 (8.3%) | |
| Geographic Location (ARIA) | N = 5629 | N = 3754 | N = 1875 | |
| Major City | 3866 (68.7%) | 2634 (70.2%) | 1232 (65.7%) | <0.001 |
| Regional/Rural | 1763 (31.3%) | 1120 (29.8%) | 643 (34.3%) | |
| Index of Disadvantage | N = 5568 | N = 3713 | N = 1855 | |
| 1st Quintile ^e | 1026 (18.4%) | 641 (17.3%) | 385 (20.8%) | <0.001 |
| 2nd Quintile | 1308 (23.5%) | 850 (22.9%) | 458 (24.7%) | |
| 3rd Quintile | 1297 (23.3%) | 866 (23.3%) | 431 (23.2%) | |
| 4th Quintile | 820 (14.7%) | 542 (14.6%) | 278 (15%) | |
| 5th Quintile | 1117 (20.1%) | 814 (21.9%) | 303 (16.3%) | |
| Medication use ^e | | | N = 1875 | |
| Yes | | | 1178 (62.8%) | |

^a N's varied across measures due to missing data from participants.

^b Significance based on comparison between MHC and No-MHC participants.

^c Eligible age varies across the three Australian states due to different funding criteria.

^d Degree includes undergraduate and postgraduate studies.

^e 1st quintile indicates greatest level of disadvantage.

3. Results

3.1. Sample description

Of the 10,701 participants enrolled in a coaching program, 1,871 were allocated to the pregnancy module and were removed. A further 3,201 did not provide a response to the mental health question and were removed. The final sample consisted of 5,629 individuals who enrolled in a coaching program, of whom 1,340 had completed a coaching program (Fig. 1).

One third (33%) of individuals enrolled in a coaching program identified as having had a mental health condition; of whom 62.8% indicated taking medication for their condition (Table 1). Participants with a mental health condition were younger than those without, and there was a greater representation of females, those who were unemployed, residents of regional/rural areas, residents from an area with

Table 2
Service participation by presence of a mental health condition.

| | ALL | No MHC | MHC | p | Adjusted Odds Ratio (95% CI) | Adjusted Risk Difference (%) (95% CI) |
|---|-----------------|-----------------|-----------------|--------|----------------------------------|---------------------------------------|
| All participants with intake data (n = 5629) | | | | | | |
| Referral Source | N = 5547 | N = 3708 | N = 1839 | | | |
| Form / Joint call | 2263 (40.8%) | 1519 (41%) | 744 (40.5%) | <0.001 | | |
| Service or study Referral | 1094 (19.7%) | 731 (19.7%) | 363 (19.7%) | | | |
| Advertising | 1181 (21.3%) | 758 (20.4%) | 423 (23%) | | | |
| Work | 522 (9.4%) | 392 (10.6%) | 130 (7.1%) | | | |
| Other | 487 (8.8%) | 308 (8.3%) | 179 (9.7%) | | | |
| Primary Goal | N = 5619 | N = 3746 | N = 1873 | | | |
| Weight | 3969 (70.5%) | 2619 (69.9%) | 1350 (72.1%) | 0.179 | | |
| Waist Circumference | 168 (3%) | 124 (3.3%) | 44 (2.3%) | | | |
| Nutrition | 790 (14%) | 537 (14.3%) | 253 (13.5%) | | | |
| Physical Activity | 640 (11.4%) | 434 (11.6%) | 206 (11%) | | | |
| Alcohol | 52 (0.9%) | 32 (0.9%) | 20 (1.1%) | | | |
| Module | N = 5629 | N = 3754 | N = 1875 | | | |
| Alcohol | 81 (1.4%) | 45 (1.2%) | 36 (1.9%) | <0.001 | | |
| Aboriginal and Torres Strait Islander ^a | 326 (5.8%) | 192 (5.1%) | 134 (7.1%) | | | |
| Diabetes Prevention | 1873 (33.3%) | 1219 (32.5%) | 654 (34.9%) | | | |
| Standard | 3349 (59.5%) | 2298 (61.2%) | 1051 (56.1%) | | | |
| Coaching status | N = 5629 | N = 3754 | N = 1875 | | | |
| Active (still receiving coaching) | 1790 (31.8%) | 1139 (30.3%) | 651 (34.7%) | | | |
| No longer active in the program | N = 3839 | N = 2615 | N = 1224 | | | |
| Completed program | 1340 (34.9%) | 953 (36.4%) | 387 (31.6%) | 0.003 | 0.88 (0.76 to 1.03) ^d | -3.4 (-6.7 to -0.2) ^d |
| Withdrawn ^b | 1066 (27.8%) | 709 (27.2%) | 357 (29.2%) | | | |
| Lost to follow up ^c | 1433 (37.3%) | 953 (36.4%) | 480 (39.2%) | | | |
| Participants who withdrew or were lost to follow up (N = 2,499) | | | | | | |
| Withdrawn | N = 1066 | N = 709 | N = 357 | | | |
| Withdrawal reason ^e | | | | | | |
| Participant related | 948 (87.6%) | 635 (89.6%) | 313 (87.7%) | 0.859 | | |
| Service Related | 118 (12.4%) | 74 (10.4%) | 44 (12.3%) | | | |
| Coaching calls completed prior to withdrawal (M, SD) | 4.07 (1.78) | 4.07 (1.77) | 4.07 (1.79) | 0.829 | | |
| Lost to follow up | N = 1429 | N = 950 | N = 479 | | | |
| Coaching calls completed (M, SD) | 3.46 (1.96) | 3.41 (1.90) | 3.59 (2.07) | 0.042 | | |
| Participants who completed a coaching program (N = 1340) | | | | | | |
| All completers | N = 1340 | N = 953 | N = 387 | | | |
| Calls completed (M, SD) | 8.94 (2.78) | 8.68 (2.80) | 9.56 (2.63) | <0.001 | | |
| Graduators | N = 813 | N = 536 | N = 277 | | | |
| % of all completers | 60.7% | 56.2% | 71.6% | | | |
| Calls completed (M, SD) | 10.67 (1.51) | 10.58 (1.51) | 10.82 (1.51) | 0.004 | | |
| Early graduators | N = 527 | N = 417 | N = 110 | | | |
| % of all completers | 39.3% | 43.8% | 28.4% | | | |
| Calls completed (M, SD) | 6.27 (2.08) | 6.24 (2.07) | 6.38 (2.12) | 0.642 | | |

^a Includes Aboriginal and Torres Strait Islander Standard module & Aboriginal and Torres Strait Islander Diabetes Prevention module..

^b Withdrawal includes participants who enrolled in a program and actively withdrew from the program.

^c Lost to follow up includes participants who enrolled in a program but could not be contacted after 10 call attempts.

^d Reference category = No-MHC participants.

^e Examples of withdrawal reasons for each category include too unwell or not ready for change (participant related), program not meeting needs or not satisfied with program (service related).

greater socio-economic disadvantage, and identified as Aboriginal and/or Torres Strait Islander.

3.2. Service participation

Differences were found between participants with and without a mental health condition on referral sources and module ($p < .001$), but not primary health goal (Table 2). Within both groups, the majority

(~70%) had weight as their primary health goal (Table 2.) A slightly larger proportion of participants with a mental health condition had heard of the service through advertising, and a slightly lower proportion through work. Participants with a mental health condition were less likely to be allocated to the standard module.

Participants with a mental health condition were less likely to complete a coaching program (31.6% vs 36.4%, Table 2.). Of participants who did complete a program, participants with a mental health

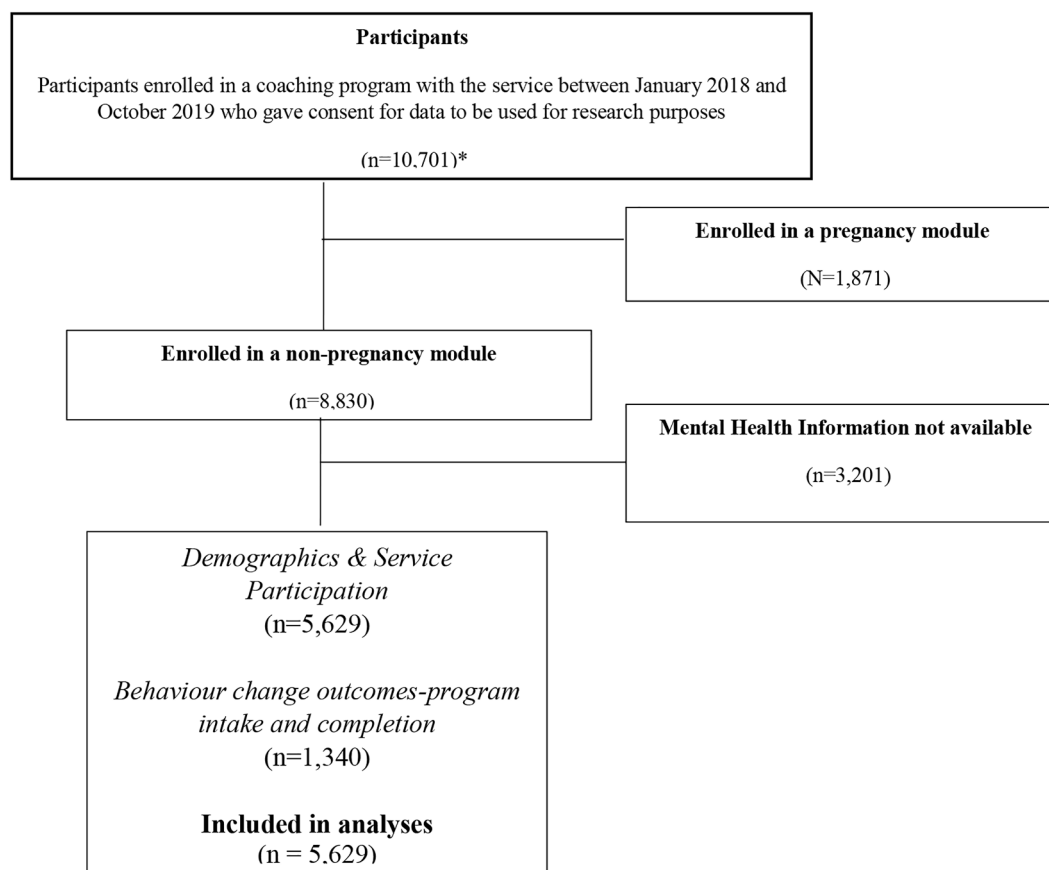


Fig. 1. Flow Diagram *553 of these clients had multiple enrolments during the data extraction period and only data for first enrolment used.

condition were more likely to do so via graduation (71.6%) rather than early graduation, when compared to participants without a mental health condition (56.2%). There was no difference between groups in the mean number of calls received for those who withdrew from the program, and a small but significant difference for those lost to follow-up, with the mental health condition group receiving a slightly higher number of calls. Among those who completed the program, there was a small but significant difference between groups in calls received for all completers and gradulators (higher average calls received for those with a mental health condition), but no difference for those who completed via early graduation. No differences between groups were found for reasons for withdrawal.

3.3. Program outcomes by presence of a mental health condition

There were significant improvements for all eight continuous measures among those without a mental health condition, and for 6 of 8 measures among those with a mental health condition – all measures except waist circumference and vigorous physical activity showed significant improvement.

From the mixed models where all available intake assessment scores were used (i.e. pre when there was no post, for an analysis consistent with the intention to treat principle of including all data) to estimate the mean at intake and compare to the means at completion for those with and without a mental health condition, no significant differences were seen for 7 of 9 outcome variables (Table 3). At program completion, participants with a mental health condition had made significantly smaller improvements compared to participants without in terms of mean weight loss and daily vegetable intake.

3.4. Medication subgroup analysis

When exploring outcomes among mental health condition participants by medication use, no differences were found in proportions of the sample completing a program ($p = .47$) or achieving 5% weight loss ($p = .90$) (Supplementary Table 2). Significant differences were found for 2 of 8 continuous outcomes. Compared to participants with a mental health condition who were not taking medication, participants taking medication made smaller improvements to their waist circumference (-1.53 cms, 95% CI 0.24 to 2.81, $p = .02$), and greater improvements to the number of 30 min moderate physical activity sessions per week (0.59 sessions, 95% CI 0.17 to 1.00, $p < .01$) (Supplementary Table 2).

4. Discussion

This is the first study to compare measures of participation and outcomes achieved from a population-level telephone coaching service providing support for improving healthy eating, physical activity and achieving a healthy weight, for people with and without a mental health condition. Participants with a mental health condition were slightly less likely to complete the GHS coaching program compared to those without, and also less likely to reach graduation in fewer calls than the maximum number typically available. Both groups made significant improvements on six of the eight variables assessed on program completion - fruit and vegetable consumption, walking sessions, moderate physical activity sessions, weight and BMI, however weight and vegetable consumption changes were smaller for those with a mental health condition. Participants without a mental health condition also made significant improvements to waist circumference and vigorous physical activity. Those taking medication for their mental health condition made smaller improvements to waist circumference and greater

Table 3
Changes in health measures at program completion, by presence of a mental health condition.^a

| | All | | | | | No-MHC | | | | | MHC | | | | | Adjusted Difference (ES) ^b | (95% CI) | p |
|--|----------------------------------|--------------------------------------|----------------------|--------------------|--------|----------------------------------|-------------------------------------|----------------------|----------------------|--------|----------------------------------|------------------------------------|----------------------|----------------------|--------|---------------------------------------|---------------------|-------|
| | Intake | Completion | Adjusted effect size | (95% CI) | p | Intake | Completion | Adjusted effect size | (95% CI) | p | Intake | Completion | Adjusted effect size | (95% CI) | p | | | |
| | Mean (SD) N = 5575 | N = 1349 | | | | Mean (SD) N = 3717 | N = 956 | | | | Mean (SD) N = 1858 | N = 393 | | | | | | |
| Weight (kgs) | 90.45 (24.1) | 84.89 (22.38) | -1.77 | -2.56 to -0.98 | <0.001 | 87.7 (22.67) | 82.27 (19.95) | -2.08 | -2.89 to -1.27 | <0.001 | 95.96 (26.05) | 91.27 (26.37) | -1.46 | -2.32 to -0.59 | <0.001 | -0.623 | -0.046 to -1.20 | 0.034 |
| Proportion with 5% weight loss | | 347 / 1330 (26.1%) N = 5575 | | | | | 252 / 943 (26.7%) N = 3707 | | | | | 95 / 387 (24.5%) N = 1850 | | | | | | 0.412 |
| BMI | 32.58 (8.28) | 30.67 (7.63) | -0.716 | -1.02 to -0.415 | <0.001 | 31.58 (7.73) | 29.75 (6.93) | -0.80 | -1.11 to -0.49 | <0.001 | 34.57 (8.96) | 32.90 (8.71) | -0.63 | -0.96 to -0.30 | <0.001 | -0.165 | -0.381 to 0.051 | 0.133 |
| Waist circumference (cms) | N = 4311 103.79 (17.53) | N = 1211 | -1.27 | -2.73 to 0.195 | 0.089 | N = 2901 102.15 (16.62) | N = 860 | -1.53 | -3.02 to -0.04 | 0.044 | N = 1410 107.18 (18.82) | N = 351 | -1.01 | -2.56 to 0.541 | 0.202 | -0.521 | -1.335 to 0.293 | 0.210 |
| Fruit serves (daily) | N = 5608 1.51 (1.17) | N = 1353 | 0.33 | 0.28 to 0.38 | <0.001 | N = 3737 1.60 (1.16) | N = 960 | 0.28 | 0.23 to 0.33 | <0.001 | N = 1871 1.33 (1.16) | N = 393 | 0.38 | 0.29 to 0.46 | <0.001 | 0.097 | 0.196 to -0.001 | 0.052 |
| Vegetable serves (daily) | N = 5607 2.69 (1.71) | N = 1353 | 0.83 | 0.746 to 0.90 | <0.001 | N = 3736 2.79 (1.67) | N = 960 | 0.92 | 0.84 to 1.0 | <0.001 | N = 1871 2.49 (1.77) | N = 393 | 0.73 | 0.59 to 0.86 | <0.001 | -0.199 | -0.356 to -0.041 | 0.013 |
| Physical activity – walking (weekly) ^c | N = 5609 2.36 (2.68) | N = 1353 | 0.82 | 0.59 to 0.96 | <0.001 | N = 3737 2.52 (2.71) | N = 960 | 0.87 | 0.72 to 1.02 | <0.001 | N = 1872 2.03 (2.57) | N = 393 | 0.78 | 0.55 to 1.01 | <0.001 | -0.087 | 0.184 to -0.359 | 0.529 |
| Physical activity – moderate (weekly) ^c | N = 5609 1.11 (1.90) | N = 1353 | 0.59 | 0.47 to 0.71 | <0.001 | N = 3737 1.19 (1.95) | N = 960 | 0.64 | 0.51 to 0.77 | <0.001 | N = 1872 0.97 (1.78) | N = 393 | 0.54 | 0.34 to 0.74 | <0.001 | -0.097 | 0.141 to -0.335 | 0.425 |
| Physical activity – vigorous (weekly) ^d | N = 5610 0.33 (1.08) | N = 1353 | 0.12 | 0.04 to 0.21 | 0.004 | N = 3738 0.34 (1.09) | N = 960 | 0.18 | 0.08 to 0.27 | <0.001 | N = 1872 0.30 (1.06) | N = 393 | 0.07 | -0.05 to 0.19 | 0.273 | -0.111 | 0.026 to -0.248 | 0.111 |

^a Pre and post scores reported as raw data. For adjusted effect sizes, models are adjusted for covariates found to be significant for each variable, see supplementary Table 1.

^b Positive values indicate greater improvement for MHC group compared to No-MHC group, negative values indicate smaller improvement for MHC group compared to No-MHC group.

^c Number of 30 min sessions.

^d Number of 20 min sessions.

improvements to moderate physical activity than those who were not.

Participants with a mental health condition represented approximately one third of the study sample; a majority of whom were currently taking medication for their mental health condition. Other characteristics in which groups differed, such as employment, reflected socioeconomic disadvantage: a factor likely to contribute to greater difficulty in achieving behaviour change success. Information on the presence of a mental health condition was not available however, for approximately one-third of participants otherwise eligible for the study, and it is not possible to gauge anything about the mental health status of this sizeable sub-group.

At the time of data extraction, approximately one third of participants were still receiving coaching. Of those no longer active in the program, participants with a mental health condition were less likely to have completed a coaching program than those without (31% vs 36%). Little research has similarly compared retention rates for health behaviour coaching programs between participants with and without a mental health condition, although some Quitline research suggests rates to be similar (Nair et al., 2020). In the current study, there was no difference between participants with and without a mental health condition in terms of the proportions giving a service-related versus participant-related reason for electing to withdraw. Comparison of the number of calls that had occurred prior to electing to withdraw indicated no difference between the two groups and although the mean number of calls received before being lost to follow-up was significantly higher for those with a mental health condition, this difference was very small (0.18 of a call). In further understanding retention, additional quantitative exploration of the characteristics of those who complete the program as compared to those who do not would be of value, and qualitative data from participants would likely add to a richer understanding of factors related to retention (O'Hara et al., 2016). Previous research exploring factors contributing to low retention rates in healthy lifestyle interventions for people with a mental health condition, as well as barriers to achieving health behaviour change, identified factors including low motivation, physical health concerns, and poor mental health, as well as external barriers such as lack of support and accessibility (Hoffmann et al., 2015; Roberts and Bailey, 2011; Shor and Shalev, 2016; Firth et al., 2016).

When participants with a mental health condition did complete coaching, they were less likely than those without such a condition to do so via 'early graduation' (using fewer than the maximum number of calls available). Whilst this finding is consistent with suggestions that behaviour change may require more time or support for this group (Vickerman et al., 2015), and it might be speculated that the interactions between participant and coach may differ, we are unsure if such interpretations are accurate. The finding highlights the value of further exploration and possibly the incorporation of not only participant but also coach perspectives.

Participants with a mental health condition showed small but significant improvements to both fruit and vegetable consumption, with the adjusted mean increases of 0.38 daily fruit serves and 0.7 vegetable serves. With respect to physical activity, there were significant improvements for walking and moderate physical activity sessions, but not for vigorous physical activity. The findings may reflect a preference for walking as a form of physical activity among people with a mental health condition (Chapman et al., 2016; Fraser et al., 2015; Ussher et al., 2007), and a focus within the coaching program on achievable and sustainable goals, possibly more aligned with walking and moderate activity domains. The present study was not able to capture any changes in sedentary behaviour as a result of program engagement, a health risk factor acknowledged to be lacking in behavioural interventions delivered to people with mental health conditions (Ashdown-Franks et al., 2018).

The most commonly noted coaching goal identified by participants with a mental health condition was weight (72%). The mean adjusted difference in weight between program intake and completion of -1.46

kg was small but consistent with meta-analyses examining the effect of lifestyle interventions for people with serious mental illness (Olker et al., 2016; Singh et al., 2018; Lydia, 2018; Naslund et al., 2017). A quarter of participants achieved at least 5% weight reduction, considered a clinically significant weight loss (Williamson et al., 2015). Perhaps contrary to what might have been anticipated, the study showed no difference in either mean weight reduction or proportion losing at least 5% body weight between those currently taking medication for their mental health condition and those who were not. The waist circumference results however, are more consistent with previous research suggesting that mental health medications can be associated with increases in both weight and waist circumference (Hiles et al., 2016; Zhang et al., 2020), in that participants taking medication made significantly smaller improvements to their waist circumference. While the results suggest positive changes in response to coaching were achieved for participants with a mental health condition, there would be value in further understanding whether such effects were maintained, how challenges associated with medication use and mental well-being emerged within and were dealt with in the coaching process, patterns of improvement (e.g. did participants improve on one or more outcomes), and the characteristics of participants who did and did not achieve improvements.

This study has strengths including a large sample size, comprehensive analysis approach, and consideration of variations in outcomes based on medication usage among mental health participants. A number of limitations to note, in addition to the missing data for the mental health questions, include the use of only a single broad item as part of intake to identify the mental health condition subgroup. Due to the lack of specificity regarding mental health diagnosis and medication used, the current study is unable to comment on the influence such factors may have in health behaviour change in this program. It is important to acknowledge diversity across diagnosis, symptomology and treatment among people with mental health conditions, as well as the impact of such factors on the capacity to make health behaviour change. We were also unable to examine the maintenance of outcomes, or the possible influence of repeat enrolments (Allen et al., 2019; Wilson et al., 2010). Outcomes were collected via self-report to the coaches involved in delivering the service, and may be influenced by social desirability bias as well as inaccurate recall (Taylor et al., 2006). As the study was based on one population-level service in Australia, its applicability to other services is unknown.

5. Conclusions and directions for further research

This study represents a first step in examining participation in and outcomes of a population-level health coaching service providing support for improving healthy eating, physical activity and achieving a healthy weight for individuals with a mental health condition. The findings suggest that people with a mental health condition utilising a service such as the GHS and who complete the program can make improvements. The study suggests some differences in measures of participation with the program for those with and without a mental health condition, including possibly lower retention. It also suggests that people with a mental health condition may find achieving some outcomes such as reduction in waist circumference more difficult, and that use of psychiatric medications may play a part here. Improvements to data capture around mental health conditions and research which goes beyond service data is required to explore outcomes more fully. Further quantitative and qualitative research would be valuable to explore elements of the program most beneficial for participants with a mental health condition, and help ensure that this high risk group gains optimal benefit from a service such as the GHS. For example, further quantitative analysis of service data could explore whether demographic and other variables are related to program retention, and whether outcomes for participants differ by module allocation or referral source. Qualitative interviews with participants who have completed coaching programs, as well as coaches, could provide further insight into the experience and

value of the GHS for consumers with a mental health conditions or the coaches, particularly if a qualitative approach was employed. The engagement of a number of stakeholders in further research, including consumers and coaches, may prove valuable in exploring whether service delivery changes may be of value (Morris et al., 2009; Segan et al., 2017; Segan et al., 2011).

CRedit authorship contribution statement

Tegan Bradley: Conceptualization, Formal analysis, Writing – original draft, Writing – review & editing. **Kate Bartlem:** Conceptualization, Writing – review & editing, Supervision. **Kim Colyvas:** Formal analysis, Writing – review & editing. **Paula Wye:** Conceptualization, Writing – review & editing, Supervision. **Elizabeth Campbell:** Conceptualization, Writing – review & editing, Supervision. **Kate Reid:** Resources, Writing – review & editing. **Jenny Bowman:** Conceptualization, Writing – review & editing, Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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