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Abstract

Objective:

Identifying who participates in chronic disease management programs yields insights into program reach and appeal. This study investigated sustained participation in a remotely-delivered weight loss maintenance program offered to Australian private health insurance members.

Methods:

All participants completing an initial 18-week weight loss program were eligible for a maintenance phase. A pre- and post-test design was used and socio-demographic and anthropometric characteristics of those who did and did not opt in were compared using binary logistic regression.

Results:

Maintenance phase participants lost more weight during the initial weight loss program (-2.2 kg, $p<0.001$; BMI: -0.8 kg/m^2, $p<0.001$) than those who did not opt in. Participants who were obese (vs overweight) on initial weight loss program completion were less likely to opt in to the maintenance phase (AOR=1.76, 95% CI: 1.35-2.30, $p<0.001$) and participants ≥55 years were more likely to opt in (AOR=0.59, 95% CI: 0.44-0.80, $p<0.001$) than those <55 years.

Conclusions:

Understanding why health insurance members opt in to maintenance programs can assist the development of strategies to improve program reach. Younger participants and those who remain obese following a weight loss program may be targeted by private health insurers and service providers to increase weight loss maintenance program participation.

Key question summary:

1. What is known about the topic?

Australian private health insurers offer chronic disease management programs to support members to manage obesity-related chronic disease. An 18-week weight loss and lifestyle modification program was extended to assist participants maintain weight loss and health benefits resulting from the initial program. This weight loss maintenance phase is novel in the private health insurance setting and is thought to be important to sustained health improvement. Although program reach is important to benefit those most in need, little is known about who sustains the use (or does not) of such programs.

2. What does this paper add?

This study provides an insight to the characteristics of participants more likely to opt in to a weight loss maintenance program. It highlights the socio-demographic and anthropometric characteristics associated with maintenance program uptake, identifying the subgroups less likely to opt in. These study findings are novel as they report on participation in a chronic disease management program with a focus on maintenance of weight loss.

3. What are the implications for practitioners?

These results will benefit private health insurers and service providers implementing maintenance programs for weight loss, providing an awareness of which participant groups to target to increase maintenance and reach. Additionally, they offer avenues for future exploration such as the generalisability and sustainability of chronic disease management programs. Although a difficult-to-access group, a qualitative study of reasons for not opting in to such a program would provide further information for program design, recruitment and retention.

BACKGROUND (allowed max 3000 words, currently 2949)

Overweight and obesity contributes 7% of the Australian health burden, with 84% of this burden experienced by those aged 45 to 84 years.[1] Cardiovascular disease accounts for 38% of the weight-related health burden, type 2 diabetes for 17% and osteoarthritis for 12%.[1] Sustained intentional weight loss is associated with clinically-relevant and health-beneficial change in individuals experiencing these conditions.[2] Many Australian private health insurers offer chronic disease management programs (CDMPs) including addressing weight change to help their members manage the chronic disease and reduce resulting complications.[3] Lifestyle programs that achieve sustained weight loss management can reduce cardiovascular disease, type 2 diabetes and osteoarthritis incidence and morbidity. As 57.1% of the Australian population have some level of private health insurance and more than half of all Australians who are overweight (53.6%) or obese (58.7%) have private health insurance,[4] the potential reach of CDMPs for obesity-related chronic disease management is noteworthy.

Currently, the main challenge of overweight and obesity prevention programs is not so much the initial weight loss, but weight loss maintenance.[5, 6] While weight regain following completion of a weight loss program is common, the maintenance of intentional weight loss is possible.[7] Although global evidence relating to weight loss maintenance as part of weight management is still emerging,[8] extending support beyond the duration of a weight loss program is a 'viable and efficacious solution' to long-term weight loss maintenance.[9] Healthy Weight for Life (HWFL), a CDMP program, recently added a maintenance phase, the Long-Term Maintenance Program (LTMP) which is novel in the Australian private health insurance setting.[10] Research about the implementation and evaluation of CDMPs in Australia in general,[11] and weight loss maintenance programs in particular is still developing. While baseline participant characteristics of most weight loss maintenance programs are reported, the characteristics of those who decline to participate are seldom described.

Recognising those less likely to engage in a weight loss maintenance program is central to understanding to whom such a program may or may not appeal.[12] It is also relevant for identifying program limitations and providing information on the generalisability of program evaluation findings.[13] One study investigating retention of participants in a US weight loss intervention with a subsequent maintenance phase, reported younger participants were more likely to drop out before starting the weight loss maintenance phase.[14] Regarding health-related outcomes, successful weight loss maintenance has been associated with greater initial weight loss,[15, 16] higher levels of physical activity, healthier eating, and self-monitoring behaviours.[16]

The aim of this study is to build an understanding of weight loss maintenance program participation (and non-participation) in the Australian private health insurance context. To this end, we compare the socio-demographic characteristics and risk factor profile of participants who opted in and those who did not opt in to the LTMP of the HWFL program using data from the initial weight-loss program phase.

METHODS

The intervention

The HWFL program is an intensive weight loss and lifestyle modification program offered by some Australian private health insurers to adult members who have a Body Mass Index (BMI) ≥ 28 kg/m^2 and either osteoarthritis, type 2 diabetes or cardiovascular disease. Referral to the 18-week program is by health insurance invitation or medical referral, and participation requires general practitioner or medical specialist approval. HWFL focuses on portion-controlled eating and recommendations for physical activity. Program delivery is by the HWFL support team who have experience providing lifestyle behaviour change support to overweight and obese individuals in three 6-week phases.[17] A fourth phase, the LTMP, was introduced in July 2017 and is funded by a health insurer for members for a period of 24 months. It provides support to HWFL program graduates to maintain the weight loss and health benefits achieved. All participants who complete the initial 18-week program are

eligible for the LTMP and are invited by email to express their interest. Formative research for the LTMP development is described elsewhere.[18]

Participants, study design and measures

The HWFL support team contacts eligible participants to provide further information, arrange registration to the LTMP and request informed consent for their data to be used for evaluation. A pre- and post-test study design was used and all data analysed were de-identified. Ethics approval was granted by the Human Research Ethics Committee at The University of Sydney (2017/760).

All participants provided data at the time of HWFL program enrolment by phone or by entering it directly into the HWFL online portal. Baseline socio-demographic data collected included gender, date of birth, and residential postcode. The type of HWFL program (osteoarthritis, cardiovascular disease and type 2 diabetes) enrolled in was recorded for each participant. Self-reported anthropometric data included weight (kg), height (m), and waist circumference (cm). Participants were asked to weigh themselves each week, wearing no shoes and only light clothing or underwear. They also provided weekly waist circumference measurements using a tape measure and standardised instructions.

Statistical analysis

Age was calculated from date of birth and participants was categorised into two groups: under 55 years and 55 years and older, similar to the standard age grouping used in Australia. Measures of social disadvantage (Socio-Economic Indexes for Areas – SEIFA, Index of Relative Socio-economic Disadvantage - IRSD)[19] and geographical social disadvantage and accessibility to services and opportunities for social interactions (Accessibility-Remoteness Index of Australia Plus – ARIA) [20] were derived from responder's residential postcode. SEIFA IRSD was categorised into quintiles: 1st quintile = most disadvantaged and 5th quintile = least disadvantaged. ARIA was categorised as major cities, inner regional, outer regional, remote and very remote.

For all participants, BMI at start and end of the HWL program was calculated from weight (kg) / height $(m)^2$ and categorised as healthy weight (18.5-24.99 kg/m^2), overweight (25-29.99 kg/m^2), and obese (≥30 kg/m^2); as no participants were underweight (>18.5 kg/m^2) this category was excluded.[21] Participants who provided waist circumference measurements, were recoded into no health risk (men: <94 cm; women: <80cm), increased (men: ≥94 and <102cm; women: ≥80 cm and <88cm), or greatly increased (men: ≥102 cm; women: ≥88 cm) health risk.[22] Changes in weight, waist circumference and BMI from HWFL baseline to the end of the HWFL program (week 18) were calculated by subtracting the baseline from the18-week values.

Socio-demographic and anthropometric characteristics of participants by LTMP registration status (i.e., whether they opted in to the LTMP or not) were analysed descriptively and are presented as counts and proportions. Differences in socio-demographic and anthropometric characteristics by opt-in status were tested using Chi-square analysis. Within-group (opt-in and non-opt-in) change in anthropometric measures from baseline to 18 weeks, stratified according to program type, were analysed using independent samples t-tests. Binary logistic regression was used to investigate the independent association of BMI (reference: overweight) with not opting in to the LTMP. The model was adjusted for program type (reference: osteoarthritis), gender (reference: female), age group (reference: under 55 years), SEIFA IRSD (reference: most disadvantaged), ARIA (reference: major cities), and waist circumference (reference: increased risk) as these factors have been shown to be associated with health promotion program participation.[23, 24] Participants with missing data (n=45, 2.9%) were excluded from the logistic regression analysis. The socio-demographic characteristics of these participants were similar to the participants included in the analysis as shown in Supplementary Table 1.

All data analyses were completed using SPSS Statistics 25.[25] Significance was set at $p<0.05$.

RESULTS

Socio-demographic and risk factor characteristics

During the first 18 months of the LTMP (July 2017 to December 2018), 1567 participants completed the HWFL program and were therefore eligible to opt in to the LTMP. Of these, 373 (23.8%) opted to join the LTMP and 1194 (76.2%) did not. The LTMP uptake for participants with osteoarthritis was 27.1%, for cardiovascular disease participants was 22.4% and for type 2 diabetes participants was 16.9%.

The socio-demographic and risk factor characteristics of participants at the end of the HWFL program who did and did not opt in to the LTMP are compared in Table 1. Briefly, more osteoarthritis participants opted to join the maintenance program (55.2%) than those who did not (46.3%, p=0.003). There appeared to be different opt-in patterns according to age. Further testing showed that participants who were 55 years or older were more likely to opt in than those younger than 55 years (p<0.001) (data not shown). Regarding weight-related risk, participants who were obese (p<0.001) or had a greatly increased waist circumference risk (p=0.005) were less likely to join the maintenance program.

Table 1: Socio-demographic and risk factor characteristics of HWFL participants who did and did not opt in to the LTMP

	Opted in (n=373)		Did not opt in (n=1194)		Total (n=1567)		p-value*
	n	%	n	%	n	%	
Program							0.003
Osteoarthritis	206	55.2	553	46.3	759	48.4	
Cardiovascular Disease	125	33.5	434	36.3	559	35.7	
Type 2 Diabetes	42	11.3	207	17.3	249	15.9	
Gender							NS
Female	228	61.1	691	57.9	919	58.6	
Male	145	38.9	503	42.1	648	41.8	
Age Group							0.002
Under 35	1	0.3	11	0.9	12	0.8	
35-44	13	3.5	77	6.4	90	5.7	
45-54	59	15.8	264	22.1	323	20.6	
55-64	119	31.9	376	31.5	495	31.6	
65-74	135	36.2	363	30.4	498	31.8	
75 and over	46	12.3	103	8.6	149	9.5	
SEIFA IRSD[a]							NS
1st Quintile (most disadvantaged)	51	13.7	146	12.2	197	12.6	
2nd Quintile	68	18.2	201	16.8	269	17.2	
3rd Quintile	63	16.9	243	20.4	306	19.5	
4th Quintile	71	19.0	242	20.3	313	20.0	
5th Quintile (least disadvantaged)	120	32.2	362	30.3	482	30.8	
ARIA [b]							NS
Major city	244	65.4	811	67.9	1055	67.3	
Inner regional	92	24.7	267	22.4	359	22.9	
Outer regional/Remote/Very remote	37	10.0	116	9.8	153	9.7	
BMI [c]							<0.001
Healthy	12	3.2	18	1.5	30	1.9	
Overweight	177	47.5	402	33.7	579	36.9	
Obese	184	49.3	774	64.8	958	61.1	
Waist circumference risk [#d]							0.005
No risk	32	8.6	80	6.9	112	7.3	
Increased risk	78	21.0	168	14.5	246	16.1	
Greatly increased risk	262	70.4	907	78.5	1169	76.6	

*Significance at $p<0.05$. NS, not significant. Data collected at the end of the 18-week HWFL program.

[a] SEIFA IRSD provides a summary of people living in an area representing the general level of socio-economic disadvantage of all people in that area.

[b] ARIA is calculated and based on the road distance from a locality to the closest service centre.

[c] Healthy weight (≤24.99 kg/m^2), overweight (25–29.99 kg/m^2) and obese (≥30 kg/m^2).

[#] For waist circumference risk, n=45 participants (2.9%) had missing data (n=2, 0.5% of registrants; n=43, 3.6% of non-registrants).

[d] No risk, <80 cm for women and <94 cm for men; increased risk, 80-<88cm for women, 94-<102cm for men , greatly increased risk, ≥88cm for women and ≥102 cm for men.

198 *Anthropometric change during the HWFL program*

199 The mean weight of all participants who completed the HWFL program was 92.1kg (female:
200 91.0kg and male: 93.7 kg), mean waist circumference was 103.9 cm (female: 102.9 cm and
201 male: 105.2 cm), and mean BMI was 32.5 kg/m^2 (female: 32.7 kg/m^2 and male: 32.3 kg/m^2).
202 Participants completing the HWFL program lost, on average 7.2% of their initial body weight
203 after 18 weeks. Approximately one third (32.4%, n=387) of non-opt-in participants (vs 15.5%,
204 n=58 of opt-in participants) lost less than 5% and 18.8% (n=224, vs 38.1%, n=142) lost more
205 than 10% (non-opt-in participants vs opt-in participants respectively, data not shown).
206
207 Changes in weight, waist circumference and BMI from baseline to 18 weeks, by program
208 type are shown in Table 2. All within group anthropometric changes were statistically
209 significant ($p<0.001$). On average, LTMP participants lost 2.2 kg more weight ($p<0.001$), lost
210 2.4 cm more from their waist circumference ($p<0.0001$) and reduced their BMI by 0.8 kg/m^2
211 more ($p<0.001$) than those who did not opt in. The opt-in status differences for all weight-
212 related measures were also significant within the osteoarthritis- and cardiovascular disease-
213 specific programs, but only for weight in the type 2 diabetes program. More than a quarter of
214 LTMP participants moved from the obese to overweight category (28.2%) and 15.7% moved
215 from a 'greatly increased' to an 'increased' waist circumference-related health risk. The
216 corresponding proportions for those who did not opt in were 17.6% and 10.9% respectively.
217
218 *Factors associated with registration for the LTMP program*

219 Participants who were obese on completion of the HWFL program were 1.8 times less likely
220 to opt in to the LTMP after adjusting for covariates in the logistic regression model
221 (AOR=1.76, 95% CI: 1.35 to 2.30, $p<0.001$) than those who were overweight (Table 3).
222 Those 55 years and older were more likely to opt in (AOR=0.59, 95% CI: 0.44 to 0.80,
223 $p<0.001$) than those under 55 years. Type 2 diabetes program participants were more likely
224 to decline registration than those on the osteoarthritis program (AOR=1.56, 95% CI 1.07 to
225 2.00, $p=0.02$). Gender and level of social and geographic disadvantage were not associated
226 with LTMP registration.

Table 2: Change in anthropometric measures of HWFL participants during the 18-week HWFL program by LTMP opt-in status

		Participants who opted in to the LTMP (n=373)			**Participants who did not opt in to the LTMP (n=1194)**			**Between group difference #**
		HWFL baseline Mean (SD)	HWFL 18-weeks Mean (SD)	Change Mean (SD)	HWFL baseline Mean (SD)	HWFL 18-weeks Mean (SD)	Change Mean (SD)	Mean (SE)
OA	Weight (kg)	94.1 (18.8)	85.4 (17.5)	-8.7 (4.5)	97.6 (18.3)	91.0 (17.2)	-6.6 (4.0)	2.1 (0.3) **
	Waist circumference (cm)	109.6 (13.7)	98.9 (13.3)	-10.7 (5.9)	112.2 (12.6)	103.8 (12.5)	-8.5 (5.8)	2.3 (0.5) **
	BMI (kg/m^2)	34.3 (6.2)	31.2 (5.9)	-3.2 (1.6)	35.0 (5.5)	32.6 (5.2)	-2.3 (1.4)	0.8 (0.1) **
CVD	Weight (kg)	99.7 (20.7)	90.1 (19.3)	-9.6 (5.0)	102.1 (18.1)	95.1 (16.8)	-7.0 (4.9)	2.7 (0.5) **
	Waist circumference (cm)	112.1 (12.9)	100.6 (13.0)	- 11.5 (5.9)	113.3 (12.2)	104.9 (12.3)	-8.3 (5.7)	3.1 (0.6) **
	BMI (kg/m^2)	34.7 (6.2)	31.3 (5.9)	-3.4 (1.7)	35.2 (5.8)	32.8 (5.5)	-2.4 (1.6)	1.0 (0.2) **
T2D	Weight (kg)	107.0 (18.0)	98.9 (17.5)	- 8.0 (4.6)	101.6 (18.2)	95.2 (16.8)	-6.4 (4.9)	1.6 (0.8) *
	Waist circumference (cm)	120.5 (11.9)	110.0 (12.4)	-10.5 (5.8)	116.7 (13.3)	107.8 (12.9)	-8.9 (6.6)	1.6 (1.1)
	BMI (kg/m^2)	36.6 (5.7)	33.9 (5.8)	-2.7 (1.5)	35.4 (5.9)	33.2 (5.5)	-2.2 (1.6)	0.5 (0.3)
ALL	Weight (kg)	97.5 (19.8)	88.5 (18.6)	-8.9 (4.7)	99.9 (18.3)	93.2 (17.1)	-6.7 (4.5)	2.2 (0.3) **
	Waist circumference (cm)	111.7 (13.6)	100.7 (13.5)	-10.9 (5.9)	113.4 (12.6)	104.9 (12.6)	-8.5 (5.9)	2.4 (0.4) **
	BMI (kg/m^2)	34.7 (6.2)	31.5 (5.9)	-3.2 (1.6)	35.1 (5.7)	32.8 (5.4)	-2.3 (1.5)	0.8 (0.1) **

OA (Osteoarthritis), T2D (Type 2 diabetes) and CVD (cardiovascular disease)

For change within each group, a negative sign (-) indicates a loss (i.e. weight loss, decreased waist circumference and decreased BMI)

All changes from baseline to 18 weeks $p<0.001$ (paired samples test, not shown)

Between group difference = registrant mean change minus non-registrant mean change

** $p<0.001$; * $p<0.05$

Table 3: Factors associated with LTMP registration

		Did not opt in to the LTMP program				
		N	n	%	AOR (95%CI)	p-value *
BMI [a]	Overweight [#] (ref)	589	401	68.1	1.00	
	Obese	933	750	80.4	1.76 (1.35-2.30)	<0.001
Waist circumference [b]	Increased risk (ref)	246	168	68.3	1.00	
	Greatly increased risk	1169	907	77.6	1.31 (0.92-1.86)	NS
	No risk	112	80	71.4	1.21 (0.73-2.00)	NS
Program	Osteoarthritis (ref)	737	533	72.3	1.00	
	Type 2 diabetes	241	199	82.9	1.56 (1.07-2.29)	0.022
	Cardiovascular disease	544	419	77.0	1.08 (0.82-1.43)	NS
Gender	Female (ref)	892	665	74.6	1.00	
	Male	630	486	77.1	1.16 (0.88-1.53)	NS
Age Groups	Under 55 (ref)	414	341	82.4	1.00	
	55+ years	1108	810	73.1	0.59 (0.44-0.80)	<0.001
SEIFA IRSD [c]	1st, 2nd, 3rd quintile – most disadvantaged (ref)	758	572	75.4	1.00	
	4th & 5th-quintile – least disadvantaged	764	579	75.8	1.01 (0.92-1.11)	NS
ARIA [d]	Major Cities (ref)	1021	778	76.1	1.00	
	Other	501	373	74.5	1.01 (0.84-1.23)	NS

Data collected at the end of the 18-week HWFL program. Missing waist circumference data (n=45) excluded from the analysis, N=1522 cases included in analysis.

[#] Reference group for BMI combines healthy and overweight participants as <2% had a healthy BMI.

[*] Significance at p<0.05. NS, not significant.

[a] Healthy weight (≤24.99 kg/m^2), overweight (25–29.99 kg/m^2) and obese (≥30 kg/m^2).

[b] No risk, ≤80 cm for women and ≤94 cm for men; increased risk, 81-88cm for women, 95-102cm for men , greatly increased risk, >88cm for women and >102 cm for men.

[c] SEIFA IRSD provides a summary of people living in an area representing the general level of socio-economic disadvantage of all people in that area.

[d] ARIA is calculated and based on the road distance from a locality to the closest service centre.

DISCUSSION

This study showed age and anthropometric differences between HWFL participants who enrolled in the LTMP and those who did join the LTMP after completing the HWFL program. Firstly, although all HWFL participants made significant weight-related improvements during the initial program, those who opted in had achieved greater weight-related change than those who did not. More participants with higher chronic disease risk (i.e. were obese) opted not to join the LTMP. Systematic review evidence has found that factors relating to lifestyle program adherence in adults with obesity included early weight loss success and older age,[26] which is consistent with our findings.

In a program similar to HWFL, motivation for weight loss was shown to be predictive of program adherence and to reduce over time for participants who did not reach 5% weight loss.[27] Accordingly, in our study those who achieved less than 5% weight loss and those who remained obese were less likely to join the LTMP. The weight loss profile of these obese participants indicates that although they did lose weight, those who did not opt in had not lost as much weight than those who did (mean 6.8kg, SD 4.7kg vs mean 9.9kg, SD 5kg) (data not shown). Positive self-efficacy during weight loss has been shown to be predictive of weight loss maintenance.[26, 28] One explanation for these participants not opting in to the LTMP is that they may have been less motivated and had lower self-efficacy as they experienced lower (albeit meaningful) weight loss during the initial HWFL program than those who opted in to the LTMP. Another possible explanation is that the LTMP design and/or communication did not appeal to this group of participants. As such, further qualitative investigation would be required to attempt to identify more specific reasons why the LTMP did not appeal to the subgroup of participants who were obese to inform marketing of the current LTMP program or the design and marketing of a tailored LTMP for this subgroup.

The study also found that older participants and those with a better weight-related risk profile tended to be, on average, more likely to opt in than those who did not opt in to the

maintenance phase. The association between older age and LTMP registration is supported by other research, including a US epidemiological study which found successful long term weight loss maintenance to be more common among older adults.[29] This is encouraging, as a large proportion of older people bear a greater burden of obesity-related chronic diseases in Australia and the effective maintenance of weight loss can improve the health and quality of life of many individuals living with osteoarthritis, type 2 diabetes and cardiovascular disease. However, there are important benefits for weight loss maintenance for middle-aged and young adults and the reasons proportionately fewer of these groups join a weight loss maintenance program need to be explored further. It is possible that higher work and family commitments at these ages limits full participation in an ongoing program.[23]

The LTMP aims to provide ongoing support to *all* participants completing the initial HWFL program. Maintenance program uptake was 23.8%, substantially lower than 43% for a pilot weight loss maintenance trial among US middle-aged women [30] and 53% for a behavioural weight loss maintenance program for US obese individuals.[31] It should be noted that the setting and recruitment methods for these studies were not directly comparable to the LTMP, which recruits participants directly from the preceding HWFL program. It is also difficult to compare this real-world LTMP with other Australian programs targeting weight loss maintenance for chronic disease management as the few published studies are randomised controlled trials.[32, 33] Recruitment for the LTMP is 'passive' with a single communication sent to eligible participants. Follow-up, or reminder communication may increase program uptake.

Overall, the HWFL program has successfully assisted overweight and obese participants who have a chronic disease with meaningful weight loss. Weight loss of at least 5% is considered to result in health benefits,[34] including improved pain and function for overweight and obese individuals with knee osteoarthritis.[35] Health-related improvements have also been demonstrated in overweight and obese individuals with type 2 diabetes starting at 2.5% weight loss, with significant improvements in cardiovascular disease risk factors associated

297 with 5-10% weight loss.[34, 36] Furthermore, *ongoing* participation in a CDMP has been shown
298 to reduce hospital admissions and cost burden on the health system.[37, 38] The role of private
299 health insurers in providing effective and evidence-based weight loss *maintenance* support
300 is further supported by the cost benefits, health and quality of life improvements to be gained
301 from participation in a program such as the LTMP.[2, 39, 40] There is therefore, scope for the
302 health insurer to more extensively promote the use of the LTMP and the ongoing health
303 benefits of avoiding weight re-gain following the HWFL program.
304
305 The real-world nature and remote delivery of the HWFL LTMP is a strength of this study as it
306 has applicability to a broad target population for ongoing weight loss maintenance. This
307 study identifies those who are more likely to enrol in the LTMP, not only broadening our
308 understanding of participation over demographic and health sub-groups, but where
309 promotion may need to be supplemented or appeal (or lack thereof) better understood. It
310 also provides information for future improvements to the generalisability and sustainability of
311 the program.
312
313 Study weaknesses include the use of self-reported anthropometric measures. Self-reported
314 weight and height however, have been found to be valid when classifying BMI [41] and waist
315 circumference measures were not significantly different from objective measurements of a
316 comparable group of older Australian adults.[42] Although the lack of qualitative data
317 examining the motivating factors or barriers to participation in the maintenance phase is a
318 study weakness, accessing participants who discontinue program participation is an ongoing
319 challenge in program evaluation.[26] There may be reasons specific to an individual's
320 circumstances which have influenced their interest in or motivation for weight loss
321 maintenance. Other considerations for program uptake and long-term behavioural
322 adherence include vitality (enthusiasm, vigour, energy and alertness),[43] coping strategies
323 and resilience,[16] flexible cognitive restraint,[44] and self-monitoring behaviours.[45] Future
324 research into characteristics of participants who choose to join a weight loss maintenance

program could include an assessment of mental health, psychosocial and behavioural factors. Additionally, Moroshko et al [46] have suggested the development of a standardised screening instrument to assess dropout risk. Assessing these factors may assist the service provider to offer individually tailored measures within younger and obese participant subgroups to improve maintenance program uptake.

CONCLUSION

Maintaining the health and cost benefits resulting from a program such as HWFL is important and the LTMP aims to do this. This study draws attention to groups less likely to advance from the initial weight loss program to the maintenance program, presenting opportunities for increasing LTMP reach. Further research to assess optimal strategies for recruitment and retention in weight loss maintenance programs is warranted.[14] Such strategies could be developed through better understanding the specific reasons that younger and high weight-related risk HWFL participants decline to join the maintenance program. More broadly, there is potential for health insurers to promote the benefits of weight loss maintenance for chronic disease management among their members.

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