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Evaluation of the CSIRO Total Wellbeing Diet Online System: Highlights report

Understanding the reach, effectiveness and predictors of weight loss using 5 years of member data

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1 Background

1.1 Obesity and diet as a risk factors

Obesity is a global public health challenge, with significant health, social, and economic impacts for those implicated. In Australia, two thirds of adults are considered to be overweight or obese [1], and this is expected to increase to more than three quarters of the adult population by 2030 [2]. The costs to the Australian economy attributable to overweight and obesity were estimated to be \$11.8 billion in 2018, meaning there is significant impetus to reduce the number of people affected. Obesity is also a risk factor for several other chronic diseases such as type 2 diabetes and cardiovascular disease [1]. There is growing recognition that nutrition plays a crucial role in the aetiology of chronic diseases, and that, once identified, dietary-related risk factors of chronic disease may also be preventable [3]. Poor dietary choices are one of the leading modifiable risk factors for obesity, resulting in an overconsumption of energy relative to output from activity, and weight gain [4]. With most Australians struggling to control their weight, there is a need for more self-management programs that support healthy diet and lifestyle patterns to promote longer term, sustained weight loss [5].

1.2 Background to the Total Wellbeing Diet Online

The CSIRO Total Wellbeing Diet (TWD) is a weight loss program which has been developed and substantiated through many years of clinical research. The first clinical trials underpinning the program were conducted over 20 years ago and explored the dietary composition most effective for fat loss while maintaining lean muscle mass, and optimising disease management in overweight and obese individuals [6, 7]. Subsequent clinical trials testing the dietary pattern reported an average weight loss of 8kg over 12 weeks, of which 7kg was fat loss [8, 9]. Later, the dietary pattern was transformed into a lifestyle program and published as a series of book publications, which were hugely popular with the Australian public, selling over one million copies. An evaluation study conducted in 2010, estimated that the TWD was adopted in some way by about 10 per cent of Australian households and delivered weight loss benefits to 290,700 Australians, with an average weight loss of 5.7kg [10].

In 2015, CSIRO partnered with a digital health company (SP Health Co. Pty Ltd) to launch the CSIRO Total Wellbeing Diet Online System, which delivers the same substantiated dietary pattern through a digital platform, allowing for several enhancements. For example, the TWD Online System provides a more personalised eating plan, customised weekly meal plans, food and exercise diaries, the ability to record and see progress of weight loss, a member forum and supportive correspondence via email. The CSIRO Total Wellbeing Diet Online System launched in the market in 2015 and this is the first comprehensive evaluation of the digital platform to be conducted.

1.3 Aims of study

Therefore, the aim of this study was to utilise data from the Total Wellbeing Diet Online System to determine the reach of the program and weight loss results of members over the past 5 years.

More specifically we aimed to:

1. Describe the characteristics of members
2. Determine the weight loss results of members over this time
3. Understand the features of the platform that members use most
4. Examine the user and usage characteristics that are associated with greater weight loss.

2 Method

2.1 Participants and design

Participants of this study included all adults who joined the CSIRO Total Wellbeing Diet (TWD) Online and had data in the TWD Online System between October 2014 and September 2019 (N=61,164, referred to as members). In the registration and setup processes, individuals who were younger than 18 years of age or had a Body Mass Index (BMI) that placed them in the underweight category (BMI <18.5kg/m²) were automatically excluded. Pseudo members (i.e. platform testers and/or affiliated staff) were removed from this analysis, as well as those whose membership was paid for by their employer, members living outside of Australia, and members without a subscription.

2.2 Data collection

A digital health company (SP Health Co. Pty Ltd) manages the CSIRO TWD Online System, including the collection and storage of registration details, subscription plans, and all user activity/interactions with the platform. Information collected at the time of joining included date of birth, sex, ethnicity, postcode, as well as body measurements such as height, weight, and waist circumference, and program details such as paid membership duration and refund status.

Members' usage of the platform was captured including entries into the food diary, views of the menu plans, views of exercise plans, views of program content information, forum visits, searches of the food database, and weight entries.

These data were provided to the CSIRO research team by SP Health in a de-identified format with each individual member assigned a unique identifier. Ethics approval was received from CSIRO Health and Medical Human Research Ethics Committee (CHMHREC), approval number: 2019_090_LR.

2.3 Data cleaning and management

All data were inspected for invalid/unreliable records through a systematic and previously used data cleaning process based on erroneous height (<1m or >3m) or weight values (<13kg or >250kg), and extreme BMI values (<13kg/m² or >97 kg/m²).

Members were removed from analysis if a total weight loss could not be calculated (N=1451), weight was the contributing factor to an invalid BMI (N=14), or if age at registration (calculated from date of program setup date and date of birth) was calculated as less than 18 years or above 100 years (N=7). After these exclusions, 59,688 members were included the analysis.

Members were split into two groups for analysis:

- *Stayers* were defined as members with paid membership equal to or greater than 84 days (12-week program duration) AND days between their first and last entered weight was equal to or greater than 77 days (provides one-week grace for first or last weigh-in). There were 22,408 members who were categorised as stayers.

- *Starters* did not meet the above criteria therefore had a shorter duration of paid membership AND/OR a last entered weight that was less than 77 days. There were 37,280 members who were categorised as starters.

2.4 Study outcomes

2.4.1 Primary outcome

The primary outcome of this study was weight loss. Weight loss was calculated as the difference in kilograms between the last and first weight entered in the platform, where a larger number represented greater weight loss. Weight loss was also calculated as a percentage of starting body weight, and categorised into 4 groups: weight gain, 0-<5% weight lost, 5-<10% weight lost, and ≥10% weight lost. 'Super star' members were also identified as those losing ≥15% of their starting weight.

2.4.2 Other outcomes

Other outcomes of interest were platform usage, which was examined as overall usage and usage for each of the seven platform features:

- food diary entries
- views of the menu plans
- views of exercise plans
- views of program content information
- forum visits
- searches of the food database
- weight entries

Usage of the platform was examined in several ways and is explained in Table 1. To understand low and high usage, user activity was categorised into quintiles (creating 5 groups) of users from the lowest activity through to the highest activity.

Table 1. Definitions of usage variables

Variable name	Definition
Absolute total user activity	Sum of all activity (including repeated activities per category per day)
Total user activity capped	Activity in each category only counted once per day (capped)
Days active	Activities per day only counted once, regardless of repeated activity across categories per day
Percent active days	Active days divided by duration of paid membership days * 100
User intensity	Absolute total user activity divided by duration of paid membership days

3 Results

3.1 Characteristics of the TWD online members

Table 2 shows the demographic and membership characteristics of the sample of members included in this analysis (N=59,688).

- Overall, 82% of members were female with an average age of 50 years (SD=12.6, Range 18-99.7 years).
- 40.2% of members were aged between 31-50 years and 48.7% between 51-70 years. A higher proportion of stayers were aged in the 51-70 years old category.
- 31.8% of members were overweight and 57.3% of members were obese when they started the program. Within the obese category, 30.8% were classified as Class 1 (low risk), 16.1% as Class 2 (moderate risk) and 10.4% as Class 3 (high risk).
- 56.1% of starters were obese when they joined the program compared to 59.3% of stayers.
- While the online program had national reach, most members were from NSW (32.9%), Victoria (22.6%) or Queensland (20.1%).
- 25% of members were from areas of lower than average socioeconomic status, and 54.5% were from areas of higher than average socioeconomic status.
- It was most common for members to want to lose weight for health reasons (82.5%) such as being advised by their doctor, or intrinsic/personal reasons (77.7%) such as to feel good.

Table 2. Demographic and membership characteristics of the sample (N=59,688) for starters, stayers and all members

		Starters		Stayers		All members	
		N	%	N	%	N	%
Total	Total	37280	100	22408	100	59688	100
Sex	Male	6219	16.7	4488	20.0	10707	17.9
	Female	31061	83.3	17920	80.0	48981	82.1
Age group (years)	18-30	2318	6.2	998	4.5	3316	5.6
	31-50	15863	42.6	8108	36.2	23971	40.2
	51-70	17236	46.2	11832	52.8	29068	48.7
	71 +	1863	5.0	1470	6.6	3333	5.6
	Missing/invalid						
Starting BMI category	Normal weight	3902	10.5	1343	6.0	5245	8.8
	Overweight	11233	30.1	7725	34.5	18958	31.8
	Obese	20918	56.1	13277	59.3	34195	57.3
	Class 1	10967	29.4	7386	33.0	18353	30.8
	Class 2	5975	16.0	3638	16.2	9613	16.1
	Class 3	3976	10.7	2253	10.1	6229	10.4
	Missing/invalid	1205	3.2	46	0.2	1251	2.1
State	NSW	12347	33.1	7298	32.6	19645	32.9
	VIC	8483	22.8	5012	22.4	13495	22.6
	QLD	7434	19.9	4579	20.4	12013	20.1
	SA	2800	7.5	1913	8.5	4713	7.9
	WA	3179	8.5	1803	8.0	4982	8.3
	TAS	805	2.2	507	2.3	1312	2.2
	NT	375	1.0	234	1.0	609	1.0
	ACT	1335	3.6	861	3.8	2196	3.7
	Missing/invalid	522	1.4	201	0.9	723	1.2
SEIFA	1 Lowest	3679	9.9	2308	10.3	5987	10.0
	2	5616	15.1	3403	15.2	9019	15.1
	3	7011	18.8	4406	19.7	11417	19.1
	4	8094	21.7	4832	21.6	12926	21.7
	5 Highest	12346	33.1	7253	32.4	19599	32.8
	Unknown	534	1.4	206	0.9	740	1.2
	Missing/invalid						
Ethnicity	Aboriginal/TSI	295	0.8	145	0.6	440	0.7
	Asian	374	1.0	252	1.1	626	1.0
	British or European	29233	78.4	19139	85.4	48372	81.0
	Indian	454	1.2	214	1.0	668	1.1
	Maori, Pacific Islander, Polynesian	216	0.6	79	0.4	295	0.5
	Other	412	1.1	189	0.8	601	1.0
	Missing	6296	16.9	2390	10.7	8686	14.6
	Missing/invalid						
Weight loss reason	Health	29916	80.2	19326	86.2	49242	82.5
	Appearance	20450	54.9	12040	53.7	32490	54.4
	Family/ friend persuasion	4146	11.1	2421	10.8	6567	11.0
	Intrinsic or personal	28660	76.9	17695	79.0	46355	77.7
Refund status	Refund claimed	119	0.3	4612	20.6	4731	7.9
	Cash refund	117	0.3	4501	20.1	4618	7.7
	Program 2 offer	1	0.0	79	0.4	80	0.1
	Loyalty points	1	0.0	32	0.1	33	0.1
	Health Fund Rebate	129	0.3	296	1.3	425	0.7
	No refund claimed	37032	99.3	17500	78.1	54532	91.4
	Missing/invalid						
Program type	12 week program	32444	87.0	14072	62.8	46516	77.9
	24 week program	1281	3.4	7447	33.2	8728	14.6
	12 weeks + dietitian	946	2.5	398	1.8	1344	2.3
	24 weeks + dietitian	41	0.1	365	1.6	406	0.7
	4 week boost only	2429	6.5	54	0.2	2483	4.2
	4 week boost + program	139	0.4	72	0.3	211	0.4

3.2 Weight loss achieved

Table 3 shows the average weight loss in kilograms and as a percentage of starting body weight by demographic and membership characteristics. A summary of results for stayers is presented in Figure 1.

- On average, stayers lost more weight than starters (4.9kg vs 1.6kg; 5.3% of starting body weight vs 1.7% of starting body weight).
- Among stayers, weight loss increased incrementally with increasing weight status. Stayers who were overweight at the start of the program lost 4.9% of their starting body weight, compared to 5.5%, 5.7% and 6.0% of starting body weight for the three obesity levels.
- Stayers in the lowest SEIFA quintile (most disadvantaged group) lost 5.8% of their body weight compared to 4.9% for those in the highest SEIFA (least disadvantaged). These members also had a higher starting weight and higher BMI at the start of the program (data not shown).
- Stayers who claimed the refund lost 6.9% of their body weight compared to 4.8% for those who did not claim the refund. Of members who claimed the refund, those that used it to purchase an additional 12 weeks lost 8% of their starting body weight (although the number of people who did this was small, N=80), compared to 6.9% for those that claimed a cash refund.
- Weight loss was slightly higher for stayers who purchased the 24-week program with dietitian support (5.7% of starting body weight), followed by those who purchased the 24-week program without dietitian support (5.5%), then the 12-week program (5.2%) and the 12-week program with dietitian support (5.0%).

Table 3. Mean (SD) weight loss (in kilograms) and percentage of body weight lost by demographic and membership characteristics for starters, stayers and all members

		Starters		Stayers		All members	
		Weight loss (kg)	% body weight lost	Weight loss (kg)	% body weight lost	Weight loss (kg)	% body weight lost
Total	Total	1.6 (3.5)	1.7 (3.4)	4.9 (5.6)	5.3 (5.6)	2.8 (4.7)	3.1 (4.7)
Sex	Male	2.3 (4.4)	2.1 (3.8)	6.9 (6.2)	6.5 (5.4)	4.2 (5.7)	4.0 (5)
	Female	1.5 (3.3)	1.7 (3.3)	4.4 (5.3)	5.0 (5.5)	2.5 (4.4)	2.9 (4.5)
Age Group	18-30	1.6 (2.7)	1.8 (3)	4.5 (6.2)	5.0 (6.3)	2.5 (4.3)	2.8 (4.5)
	31-50	1.6 (3.2)	1.7 (3.2)	4.5 (5.7)	4.8 (5.6)	2.6 (4.5)	2.8 (4.4)
	51-70	1.6 (3.7)	1.8 (3.4)	5.1 (5.6)	5.6 (5.5)	3.1 (4.9)	3.3 (4.8)
	71 +	1.4 (4.6)	1.6 (4.6)	5.4 (4.6)	6.0 (4.7)	3.2 (5)	3.5 (5.2)
Starting BMI category	Normal weight	0.8 (2.4)	1.2 (3.9)	2.5 (3)	3.7 (4.5)	1.2 (2.7)	1.8 (4.2)
	Overweight	1.4 (2.7)	1.8 (3.5)	3.9 (4.1)	4.9 (5.1)	2.4 (3.5)	3.1 (4.5)
	Obese	1.9 (4.0)	1.9 (3.2)	5.7 (6.3)	5.7 (5.9)	3.4 (5.4)	3.3 (4.8)
	Class 1	1.8 (2.5)	1.9 (2.7)	5.1 (5.3)	5.5 (5.6)	3.1 (4.2)	3.4 (4.5)
	Class 2	1.9 (3.2)	1.8 (3)	5.9 (6.2)	5.7 (5.8)	3.4 (4.9)	3.3 (4.7)
	Class 3	2.4 (7.1)	1.9 (4.4)	7.5 (8.8)	6.0 (6.5)	4.2 (8.1)	3.3 (5.6)
	Missing/invalid	0.6 (3.2)	0.6 (2.4)	7.6 (14.7)	7.5 (8.8)	0.8 (4.4)	0.8 (3.2)
State	NSW	1.6 (3.5)	1.8 (3.2)	4.8 (5.4)	5.2 (5.6)	2.8 (4.6)	3 (4.6)
	VIC	1.6 (3.5)	1.7 (3.2)	4.9 (5.6)	5.3 (5.5)	2.8 (4.6)	3.1 (4.6)
	QLD	1.6 (3.8)	1.7 (4)	4.9 (5.7)	5.3 (5.6)	2.9 (4.9)	3.1 (5)
	SA	1.7 (3.1)	1.9 (2.8)	5.1 (5.2)	5.5 (5.2)	3.1 (4.4)	3.3 (4.4)
	WA	1.5 (3.7)	1.7 (3.6)	5.1 (6)	5.5 (5.6)	2.8 (4.9)	3.1 (4.8)
	TAS	1.7 (2.5)	1.8 (2.6)	5.4 (5.7)	5.7 (5.5)	3.1 (4.5)	3.3 (4.4)
	NT	1.6 (2.6)	1.8 (2.9)	5 (5.4)	5.1 (5.1)	2.9 (4.2)	3 (4.2)
	ACT	1.6 (3.9)	1.7 (3.1)	4.7 (5.7)	5.1 (5.8)	2.8 (4.9)	3.1 (4.7)
		Missing/invalid	0.8 (1.7)	0.9 (1.8)	3.4 (9.2)	3.7 (8.2)	1.6 (5.2)
SEIFA	1 Lowest	1.8 (4.8)	1.8 (4.1)	5.6 (6.1)	5.8 (5.8)	3.3 (5.6)	3.4 (5.2)
	2	1.7 (2.7)	1.8 (2.6)	5.2 (5.8)	5.6 (5.6)	3 (4.5)	3.2 (4.4)
	3	1.7 (4.1)	1.8 (4.0)	5.0 (5.5)	5.4 (5.6)	3 (5)	3.2 (5)
	4	1.6 (3.7)	1.7 (3.6)	5.0 (5.6)	5.4 (5.5)	2.9 (4.8)	3.1 (4.8)
	5 Highest	1.5 (2.9)	1.7 (2.9)	4.4 (5.3)	4.9 (5.4)	2.6 (4.2)	2.9 (4.3)
		Unknown	0.8 (1.7)	0.9 (1.8)	3.5 (9.1)	3.8 (8.2)	1.6 (5.1)
Ethnicity	Aboriginal/TSI	2 (6.2)	1.8 (4.2)	5.6 (6)	5.6 (5.9)	3.2 (6.4)	3.1 (5.1)
	Asian	1.2 (2.1)	1.5 (2.8)	4 (3.9)	5.2 (5)	2.3 (3.3)	3 (4.2)
	British or European	1.7 (3.5)	1.8 (3.4)	4.9 (5.6)	5.3 (5.5)	3 (4.7)	3.2 (4.7)
	Indian	1.1 (1.8)	1.4 (2.2)	4.8 (6.5)	5.5 (6.9)	2.3 (4.3)	2.7 (4.7)
	Maori, Pacific Islander, Polynesian	2.3 (7.6)	2.1 (4.4)	5.8 (6)	5.7 (5.5)	3.3 (7.4)	3.1 (5)
	Other	1.8 (5.6)	1.9 (4)	4.8 (5.2)	5.3 (5.2)	2.7 (5.6)	3 (4.7)
	Missing	1.3 (3.3)	1.4 (3)	4.6 (5.9)	5 (5.9)	2.2 (4.5)	2.4 (4.3)
		Health	1.7 (3.5)	1.8 (3.4)	5 (5.7)	5.4 (5.6)	3 (4.8)
Weight loss reason	Appearance	1.6 (3.4)	1.8 (3.1)	4.7 (5.5)	5.1 (5.6)	2.7 (4.6)	3 (4.5)
	Family/ friend persuasion	1.9 (3.5)	1.9 (2.9)	5.5 (6.3)	5.5 (6)	3.2 (5)	3.2 (4.6)
	Intrinsic or personal	1.6 (3.5)	1.8 (3.3)	4.8 (5.5)	5.2 (5.5)	2.8 (4.6)	3.1 (4.6)
Refund status	Refund claimed	2.6 (2.7)	3 (3.1)	6.3 (5.2)	6.9 (5)	6.2 (5.2)	6.8 (5)
	Cash refund	2.6 (2.7)	3.1 (3.1)	6.3 (5.2)	6.9 (5)	6.2 (5.2)	6.8 (4.9)
	Program 2 offer			7.6 (5.9)	8.0 (5.8)	7.5 (5.9)	7.9 (5.9)
	Loyalty points			6.1 (3.9)	6.6 (4)	5.9 (3.9)	6.4 (4)
	Health Fund Rebate	1.7 (2.3)	2 (2.7)	5.7 (5.3)	6.2 (5.4)	4.5 (5)	4.9 (5.1)
	No refund claimed	1.6 (3.5)	1.7 (3.4)	4.5 (5.7)	4.8 (5.6)	2.5 (4.5)	2.7 (4.5)
Program type	12 week program	1.6 (3.5)	1.8 (3.3)	4.8 (5.3)	5.2 (5.2)	2.6 (4.4)	2.8 (4.3)
	24 week program	2.4 (3.6)	2.6 (3.7)	5.1 (6.1)	5.5 (6.2)	4.7 (5.9)	5 (6)
	12 weeks + dietitian	1.7 (4.1)	1.8 (3.1)	4.8 (4.8)	5 (4.8)	2.6 (4.5)	2.7 (3.9)
	24 weeks + dietitian	3.3 (5.2)	3.2 (4.9)	5.6 (6.5)	5.7 (6.2)	5.3 (6.4)	5.4 (6.1)
	4 week boost only	0.8 (3.4)	1 (4.3)	3.2 (14.7)	3.1 (10.1)	0.8 (4)	1.1 (4.5)
	4 week boost + program	1.5 (2.2)	2.1 (3.2)	1.8 (3.3)	2.7 (4.7)	1.6 (2.7)	2.3 (3.8)

*Where data is missing, the cell count is small or zero

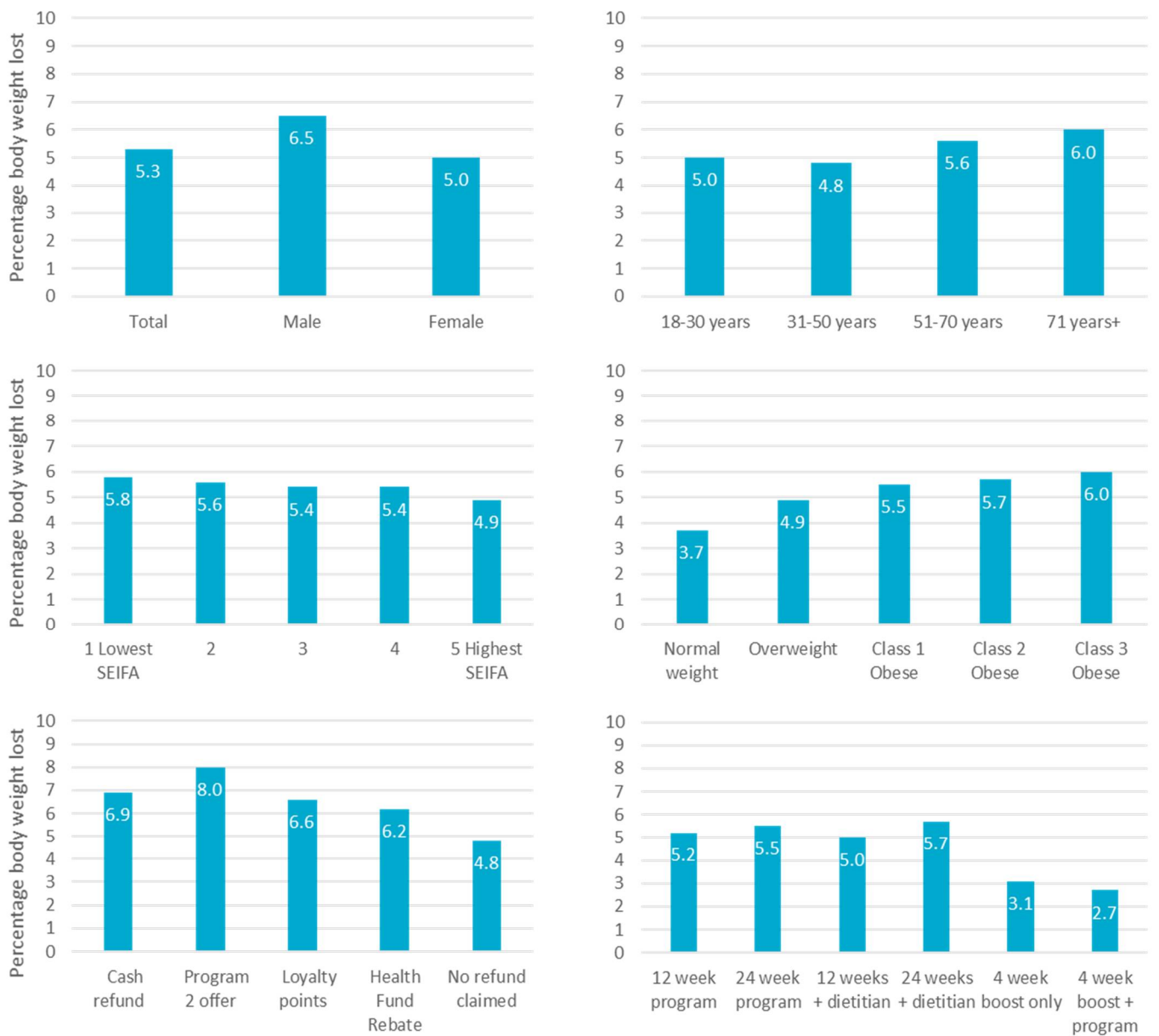


Figure 1. Summary of percentage body weight lost among stayers for a selection of demographic and membership characteristics

Table 4 and Figure 2 show the proportion of starters and stayers within categories of percentage body weight lost.

- Overall 24.4% of all members lost 5% or more of their starting body weight.
- 49.2% of stayers lost 5% or more of their starting body weight compared to 9.5% of starters.
- 33.6% of stayers lost between 5-<10% of body weight and 15.6% of stayers lost 10% or more of their starting body weight.

Table 4. Categories of percentage body weight lost by starters, stayers and all members

Weight loss categories	Starters		Stayers		All members	
	N	%	N	%	N	%
Weight gain	2282	6.1	2464	11.0	4746	8.0
0-<5% body weight lost	31470	84.4	8926	39.8	40396	67.7
5-<10% body weight lost	3199	8.6	7524	33.6	10723	18.0
10%+ body weight lost	329	0.9	3494	15.6	3823	6.4

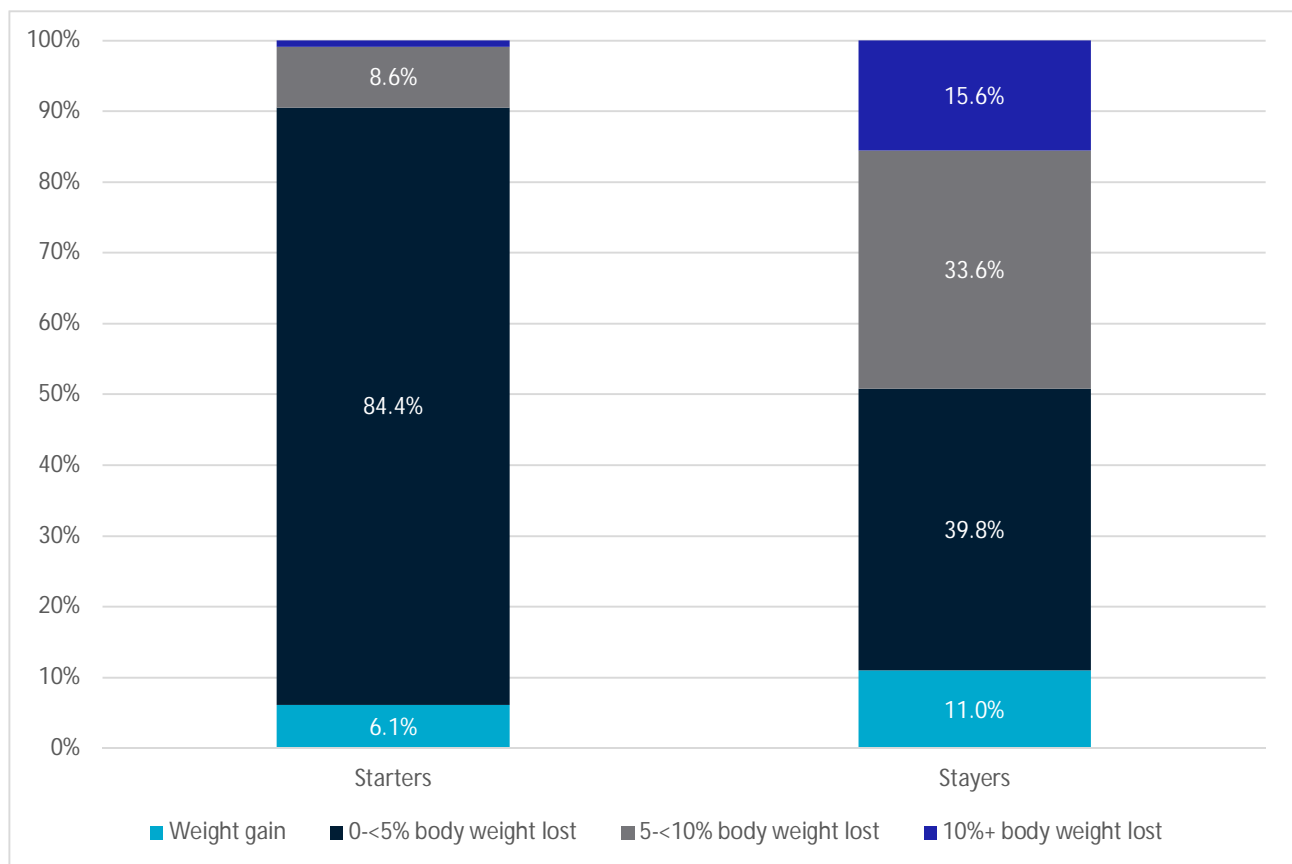


Figure 2. Proportion of members within categories of body weight lost for starters and stayers

Table 5 shows the proportion of the members within categories of percentage body weight lost by demographic and membership characteristics.

Sub-groups of stayers who were more likely to have lost 10% or more of their starting body weight included:

- Males: 22.5% of male stayers lost 10% or more of their starting body weight.
- Class 3 Obese: 19.7% of stayers who were classified as Class 3 obese when they started lost 10% or more of their starting body weight.
- Lowest SEIFA quintile: 17.7% of stayers who lived in areas classified within the lowest SEIFA quintile lost 10% or more of their starting body weight.
- Refunded members: 22.6% of stayers who claimed the refund lost 10% or more of their starting body weight.
 - 30.4% of stayers who used their refund to purchase another 12-week program lost 10% or more of their starting body weight (but the number of people who did this was small, N=80).
- Purchasing a 24-week program: 19.7% of stayers who purchased the 24-week program, and 23% of those who purchased the 24-week program with dietitian support lost 10% or more of their starting body weight.

Table 5. Percentage of the sample within categories of body weight lost by demographic and membership characteristics for starters, stayers and all members

		Starters				Stayers				All members				
		Weight gain	0-<5%	5-<10%	>=10%	Weight gain	0-<5%	5-<10%	>=10%	Weight gain	0-<5%	5-<10%	>=10%	
Total	Total	6.1	84.4	8.6	0.9	11.0	39.8	33.6	15.6	8.0	67.7	18.0	6.4	
Sex	Male	4.7	80.6	13.1	1.6	6.9	33.0	37.5	22.5	5.6	60.7	23.3	10.4	
	Female	6.4	85.2	7.7	0.7	12.0	41.5	32.6	13.9	8.5	69.2	16.8	5.5	
Age groups (years)	18-30	6.9	82.0	9.5	1.6	13.1	37.4	34.9	14.6	8.8	68.5	17.1	5.5	
	31-50	6.8	84.1	8.3	0.8	13.8	40.8	31.7	13.8	9.1	69.4	16.2	5.2	
	51-70	5.5	84.8	8.8	0.8	9.6	39.5	34.3	16.7	7.1	66.4	19.2	7.3	
	71+	5.2	86.2	7.7	1.0	6.0	38.9	37.8	17.3	5.6	65.3	21.0	8.2	
Starting BMI category	Normal weight	7.3	85.9	6.5	0.4	14.6	49.3	29.8	6.3	9.1	76.5	12.5	1.9	
	Overweight	6.4	83.7	8.9	0.9	11.4	40.5	34.6	13.5	8.5	66.1	19.4	6.1	
	Obese	6.0	83.9	9.1	1.0	10.4	38.5	33.4	17.7	7.7	66.3	18.5	7.5	
	Class 1	6.2	83.0	9.8	0.9	10.8	37.6	33.9	17.6	8.1	64.8	19.5	7.7	
	Class 2	6.1	84.0	9.0	0.9	10.1	39.2	33.9	16.7	7.6	67.1	18.4	6.9	
	Class 3	5.2	86.4	7.3	1.1	9.4	40.1	30.8	19.7	6.7	69.7	15.8	7.9	
	Missing/invalid	2.0	94.3	3.1	0.7	4.3	37.0	37.0	21.7	2.1	92.2	4.3	1.4	
State	NSW	5.9	84.4	8.7	0.9	11.4	40.3	32.9	15.4	7.9	68.0	17.7	6.3	
	VIC	6.2	84.4	8.5	0.8	10.2	41.1	33.7	15.1	7.7	68.3	17.9	6.1	
	QLD	6.4	84.5	8.2	0.9	11.3	38.6	34.6	15.5	8.3	67.0	18.3	6.5	
	SA	6.1	83.4	9.6	0.9	9.3	38.9	35.2	16.6	7.4	65.3	20.0	7.3	
	WA	6.4	84.1	8.7	0.7	11.2	38.5	33.8	16.5	8.2	67.6	17.8	6.4	
	TAS	4.5	85.7	8.9	0.9	11.0	36.1	35.3	17.6	7.0	66.5	19.1	7.3	
	NT	5.3	84.0	8.8	1.9	10.3	45.7	28.2	15.8	7.2	69.3	16.3	7.2	
	ACT	7.1	83.7	8.1	1.1	12.8	39.5	31.7	16.0	9.3	66.3	17.3	7.0	
		Missing/invalid	4.4	90.8	4.6	0.2	16.9	45.8	26.4	10.9	7.9	78.3	10.7	3.2
SEIFA	1 Lowest	6.0	83.3	9.7	1.0	9.8	37.5	35.0	17.7	7.5	65.6	19.4	7.4	
	2	5.7	84.5	9.0	0.8	9.9	38.0	35.4	16.6	7.3	66.9	19.0	6.8	
	3	5.9	84.1	8.9	1.1	10.5	38.8	34.4	16.3	7.7	66.6	18.7	7.0	
	4	6.4	84.7	8.1	0.8	10.9	38.6	34.4	16.1	8.0	67.5	17.9	6.5	
	5 Highest	6.4	84.4	8.3	0.9	12.1	42.7	31.4	13.8	8.5	69.0	16.9	5.6	
		Unknown	4.7	90.4	4.7	0.2	17.0	45.1	26.2	11.7	8.1	77.8	10.7	3.4
Ethnicity	Aboriginal/TSI	7.5	83.1	7.8	1.7	12.4	35.2	31.7	20.7	9.1	67.3	15.7	8.0	
	Asian	7.8	81.6	9.4	1.3	11.1	38.1	36.1	14.7	9.1	64.1	20.1	6.7	
	British or European	6.2	84.0	8.9	0.9	10.9	39.9	33.5	15.7	8.1	66.5	18.6	6.7	
	Indian	6.4	86.6	6.4	0.7	10.7	40.2	36.0	13.1	7.8	71.7	15.9	4.6	
	Maori, Pacific Islander, Polynesian	4.2	85.2	9.7	0.9	10.1	36.7	31.6	21.5	5.8	72.2	15.6	6.4	
	Others	7.5	81.3	9.7	1.5	10.6	37.0	35.4	16.9	8.5	67.4	17.8	6.3	
		Missing	5.3	86.8	7.0	0.9	11.6	40.1	34.0	14.3	7.1	73.9	14.4	4.6
		Health	6.1	84.3	8.8	0.9	10.8	39.7	33.6	15.9	7.9	66.8	18.5	6.8
Weight loss reason	Appearance	6.5	84.2	8.4	0.9	11.8	40.8	32.8	14.6	8.5	68.1	17.5	6.0	
	Family/friend persuasion	5.9	83.8	9.3	1.0	11.4	38.2	33.5	16.9	8.0	67.0	18.2	6.8	
	Intrinsic or personal	6.4	84.0	8.8	0.9	11.2	39.9	33.6	15.3	8.2	67.2	18.2	6.4	
Refund status	Refund claimed	5.0	67.2	26.9	0.8	4.1	32.4	40.9	22.6	4.1	33.2	40.6	22.1	

	Weight gain	Starters			Weight gain	Stayers			Weight gain	All members		
		0-<5%	5-<10%	>=10%		0-<5%	5-<10%	>=10%		0-<5%	5-<10%	>=10%
Cash refund	5.1	66.7	27.4	0.9	4.0	32.5	40.9	22.5	4.0	33.4	40.6	22.0
Program 2 offer	0.0	100.0	0.0	0.0	7.6	20.3	41.8	30.4	7.5	21.3	41.3	30.0
Loyalty points	0.0	100.0	0.0	0.0	0.0	43.8	37.5	18.8	0.0	45.5	36.4	18.2
Health Fund Rebate	12.4	72.9	13.2	1.6	7.1	34.1	41.2	17.6	8.7	45.9	32.7	12.7
No refund claimed	6.1	84.5	8.5	0.9	12.9	41.9	31.5	13.7	8.3	70.8	15.9	5.0
Program type												
12 week program	6.0	84.6	8.6	0.8	9.7	40.6	36.3	13.3	7.1	71.3	17.0	4.6
24 week program	5.9	74.9	16.8	2.5	13.0	38.2	29.0	19.7	12.0	43.6	27.2	17.2
12 weeks + dietitian	7.4	83.5	8.2	0.8	11.1	41.7	33.7	13.6	8.5	71.1	15.8	4.6
24 weeks + dietitian	4.9	75.6	17.1	2.4	14.5	36.4	26.0	23.0	13.5	40.4	25.1	20.9
4 week boost only	6.7	88.9	4.0	0.4	25.9	51.9	14.8	7.4	7.1	88.1	4.2	0.6
4 week boost + program	14.4	66.9	16.5	2.2	26.4	48.6	18.1	6.9	18.5	60.7	17.1	3.8

Table 6 shows the shift in weight status category as a percentage within each starting weight status group. This is also shown in Figure 3 for starters and Figure 4 for stayers.

Among starters on the program:

- 7.1% of starters who were overweight at the start of the program were within the normal weight range at the end of their membership.
- Among starters who were Class 3 obese at baseline, 13.2% achieved a shift to a lower weight status category (to Class 1 or 2 Obese, Overweight or Normal weight).
- Among starters who were Class 1 or Class 2 obese at baseline, 14.5% and 17.9% achieved a shift to a lower weight status category, respectively.

Among stayers on the program:

- 24.6% of stayers who were overweight at the start of the program moved to within the normal weight range by the end of their membership.
- Among stayers who were Class 3 obese at baseline, 36.9% achieved a shift to a lower weight status category (to Class 1 or 2 Obese, Overweight or Normal weight).
- Among stayers who were Class 1 or Class 2 obese at baseline 41.4% and 47.9% achieved a shift to a lower weight status category, respectively.

Table 6. Shift in body weight status, as a percentage of starting weight status, within starters, stayers and all members

Starting weight status category		Final weight status category				
		Normal weight	Overweight	Class 1 Obese	Class 2 Obese	Class 3 Obese
Starters	Normal weight	98.4	1.4	0.1	0.0	0.0
	Overweight	7.1	92.2	0.6	0.0	0.0
	Class 1 Obese	0.1	14.4	84.9	0.6	0.0
	Class 2 Obese	0.1	0.1	17.7	81.8	0.4
	Class 3 Obese	0.1	0.2	0.2	12.7	86.8
Stayers	Normal weight	94.6	5.1	0.1	0.0	0.0
	Overweight	24.6	73.1	2.1	0.0	0.0
	Class 1 Obese	0.8	40.6	56.9	1.5	0.1
	Class 2 Obese	0.3	2.5	45.1	50.6	1.4
	Class 3 Obese	0.2	0.4	2.8	33.5	63.2
All members	Normal weight	97.4	2.3	0.1	0.0	0.0
	Overweight	14.3	84.4	1.2	0.0	0.0
	Class 1 Obese	0.4	25.0	73.6	1.0	0.0
	Class 2 Obese	0.2	1.0	28.1	70.0	0.8
	Class 3 Obese	0.1	0.2	1.1	20.2	78.3

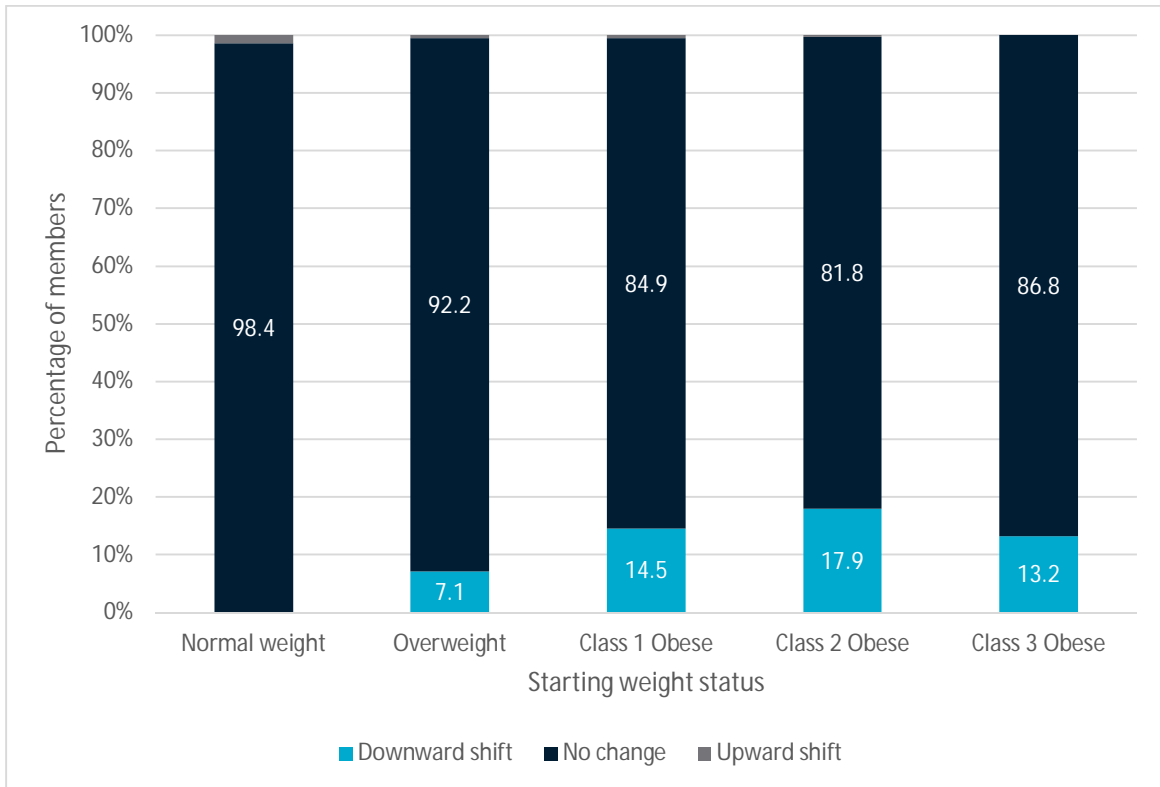


Figure 3. Shift in weight status categories from starting weight status among starters

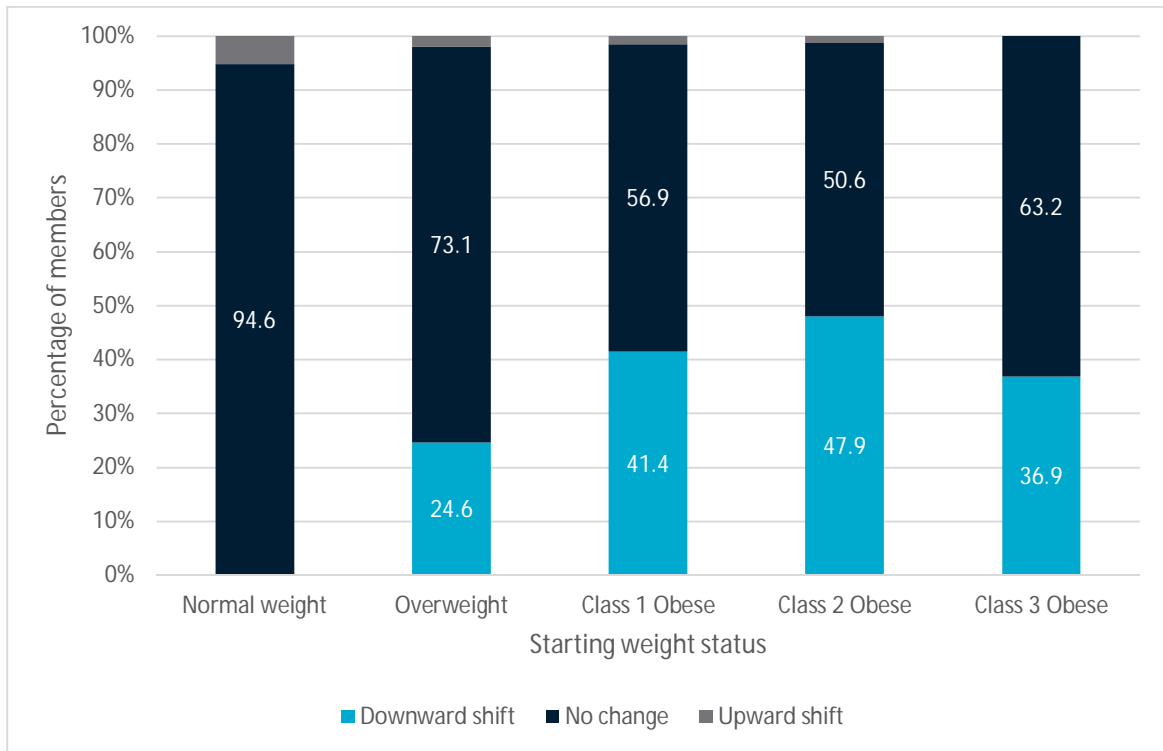


Figure 4. Shift in weight status categories from starting weight status among stayers

3.3 Engagement with platform features

Table 7 shows the percentage of members using each platform feature.

- The weigh-in feature was the most commonly used feature by members, with almost all members (99.8%) recoding their weight at some point during their membership.
- Following on from the weigh-in feature, the usage of the diary and menu plans were the next most commonly used features. About 83% of starters used the diary or menu plans at any point during their membership, compared to 93% for menu and 97% for diary features for stayers.
- Around half of the starters (47-53%) used the exercise plan and program content, and 70% of stayers used the exercise plan and program content at some point during their membership.
- The forum was used by 36% of starters and 56% of stayers.
- The food search feature was used by 26% of starters and 50% of stayers.

Table 7. Percentage of members using the platform features, for starters, stayers and all members

Feature	Starters		Stayers		All members	
	N	%	N	%	N	%
Diary	31146	83.5	21682	96.8	52828	88.5
Forum	13459	36.1	12541	56.0	26000	43.6
Menu	30872	82.8	20846	93.0	51718	86.6
Exercise Plan	19848	53.2	15802	70.5	35650	59.7
Food Search	9669	25.9	11243	50.2	20912	35.0
Program	17383	46.6	15843	70.7	33226	55.7
Weigh-in	37177	99.7	22405	100.0	59582	99.8

3.4 Weight loss by level of overall platform usage

Quintiles of platform usage were created, and the average weight loss calculated by level of usage (Table 8 and Figure 5).

- The more members used the platform, the more weight they lost on the program.
- Starters with the highest level of platform usage lost 3.2% of their starting body weight and stayers with the highest levels of platform usage lost 7.3% of their body weight.
- Stayers with the highest usage lost almost twice as much weight as stayers with the lowest usage (6.7kg (7.3%BW) vs 3.6kg (3.8%BW)).
- Among all members, those who had the highest platform usage lost 2.5 times as much body weight as those with the lowest usage (4.3kg vs 1.6kg).

Table 8. Mean (SD) absolute total user activity, weight loss in kilograms and percentage body weight by level of overall program platform usage for starters, stayers and all members

	Starters			Stayers			All members		
	Absolute total user activity	Total weight loss	Percent weight lost	Absolute total user activity	Total weight loss	Percent weight lost	Absolute total user activity	Total weight loss	Percent weight lost
1: Lowest	6.4 (6.8)	0.3 (2.6)	0.3 (3.2)	52.6 (55.7)	3.6 (5.9)	3.8 (5.8)	23.8 (41.2)	1.6 (4.5)	1.7 (4.7)
2	22.5 (19.6)	1.1 (3.7)	1.2 (3.2)	136.6 (118.2)	4.4 (5.3)	4.7 (5.2)	65.5 (92.5)	2.3 (4.6)	2.5 (4.4)
3	53.8 (36.2)	1.6 (4.3)	1.7 (3.9)	274.9 (223.8)	4.7 (5.4)	5 (5.4)	137 (176.4)	2.8 (4.9)	3 (4.8)
4	119 (63.4)	2.1 (2.9)	2.3 (2.8)	490.9 (338.7)	5.2 (5.2)	5.6 (5.2)	258.8 (279.4)	3.2 (4.2)	3.5 (4.2)
5: Highest	364.6 (254.2)	2.9 (3.3)	3.2 (3)	1250.6 (1076.7)	6.7 (5.8)	7.3 (5.5)	698.1 (813)	4.3 (4.8)	4.7 (4.6)

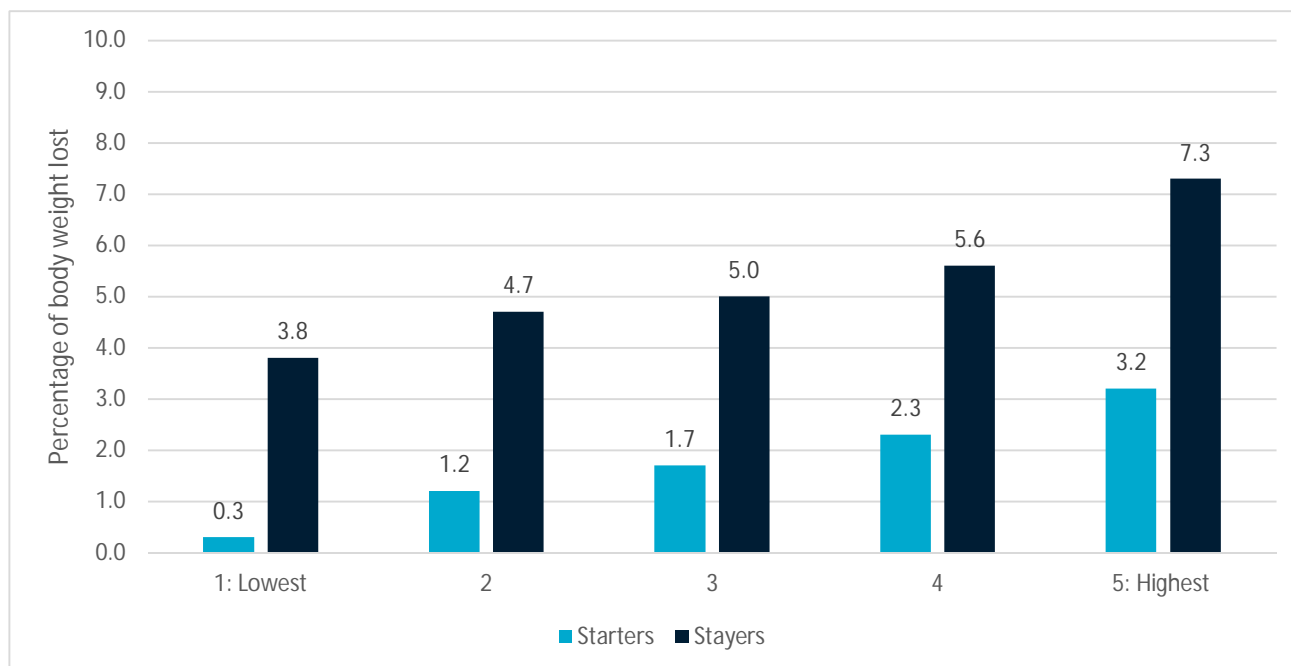


Figure 5. Percentage of body weight lost by level of platform usage, for starter and stayers

Figure 6 and Table 9 shows the proportion of members within each weight loss category by level of platform usage.

- 66% of stayers in the highest platform usage category lost 5% or more of their starting body weight compared to 37% of those who used the platform the least.
- Among stayers with highest platform usage, one in four members lost more than 10% of their starting body weight, compared to 1 in 10 of those in the lowest platform usage group.

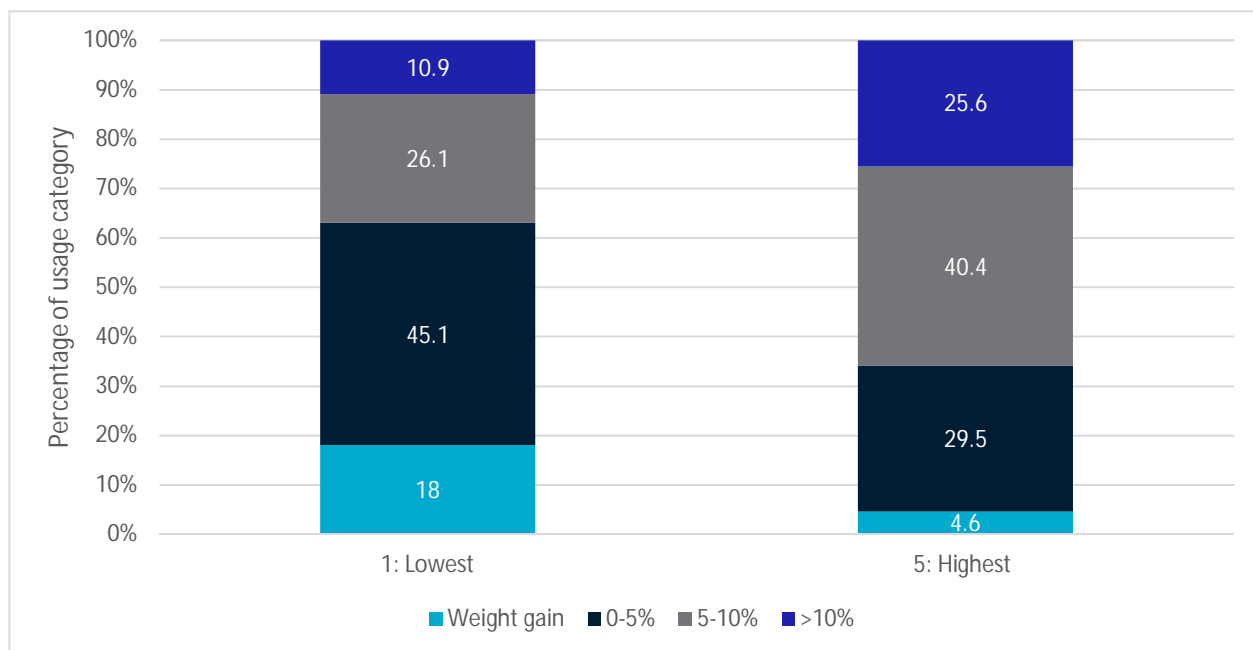


Figure 6. Weight loss in categories for those in the lowest and highest platform usage categories

Table 9. Percentage of members within weight loss categories by category of platform usage for starters, stayers and all members

Platform usage	Starters				Stayers				All members			
	weight gain	0-5%	5-10%	≥10%	weight gain	0-5%	5-10%	≥10%	weight gain	0-5%	5-10%	≥10%
1: Lowest	5.1	93.4	1.3	0.2	18.0	45.1	26.1	10.9	9.9	75.2	10.6	4.2
2	7.3	87.4	4.6	0.7	12.9	43.9	30.7	12.5	9.4	71.0	14.5	5.1
3	7.9	84.0	7.3	0.8	11.4	41.8	33.3	13.5	9.2	68.1	17.1	5.6
4	6.1	82.4	10.6	0.9	8.2	38.9	37.5	15.4	6.9	66.0	20.7	6.4
5: Highest	4.0	75.3	19.0	1.7	4.6	29.5	40.4	25.6	4.2	58.0	27.1	10.7

3.5 Weight loss by engagement with platform features

Table 10 shows the average weight loss (in kg) and percentage body weight lost among members who used or did not use each platform feature.

- In all cases, members lost more weight when they used the features of the platform compared to those who didn't use the platform features.
- The difference in weight loss between users and non-users was greatest for the diary where users of this feature lost 3.3% of their starting body weight compared to 0.9% for those who did not use the feature at all during their membership.
- Among stayers, those who used the diary, menu plans, food search, viewed the program content or forum lost a greater percentage of body weight than those who did not use these features.

Table 10. Weight loss and percentage weight loss by usage of platform features, for starters, stayers and all members

		Starters		Stayers		All members	
		Total weight loss	Percent weight lost	Total weight loss	Percent weight lost	Total weight loss	Percent weight lost
Diary	User	1.8 (3.7)	2.0 (3.5)	4.9 (5.6)	5.3 (5.5)	3.1 (4.8)	3.3 (4.7)
	Non-user	0.5 (2.2)	0.5 (2.6)	4.4 (6.2)	4.6 (6.2)	0.9 (3.2)	0.9 (3.4)
Forum	User	2.1 (3.5)	2.3 (3.2)	5.1 (5.6)	5.5 (5.5)	3.5 (4.9)	3.9 (4.7)
	Non-user	1.3 (3.5)	1.4 (3.4)	4.7 (5.6)	5.0 (5.6)	2.3 (4.5)	2.5 (4.5)
Menu	User	1.7 (3.4)	1.9 (3.3)	4.9 (5.6)	5.3 (5.6)	3.0 (4.7)	3.3 (4.7)
	Non-user	1.0 (3.9)	1.1 (3.4)	4.4 (5.6)	4.6 (5.5)	1.7 (4.5)	1.8 (4.2)
Exercise Plan	User	1.9 (3.3)	2.1 (3.3)	4.9 (5.5)	5.4 (5.5)	3.2 (4.7)	3.5 (4.7)
	Non-user	1.3 (3.7)	1.3 (3.4)	4.8 (5.9)	5.1 (5.8)	2.2 (4.7)	2.4 (4.5)
Food Search	User	2.3 (3.5)	2.5 (3.1)	5.4 (5.7)	5.8 (5.7)	4.0 (5)	4.3 (4.9)
	Non-user	1.4 (3.5)	1.5 (3.4)	4.4 (5.5)	4.7 (5.4)	2.2 (4.4)	2.4 (4.4)
Program	User	2.0 (3.5)	2.2 (3.5)	5.1 (5.5)	5.5 (5.5)	3.5 (4.8)	3.8 (4.9)
	Non-user	1.2 (3.5)	1.3 (3.2)	4.4 (5.8)	4.7 (5.7)	2.0 (4.4)	2.2 (4.2)
Weigh-in	User	1.6 (3.5)	1.7 (3.4)	4.9 (5.6)	5.3 (5.6)	2.8 (4.7)	3.1 (4.7)
	Non-user*						

*Due to the inclusion criteria few users did not use this feature.

Table 11 shows the average weight loss (in kg) and percentage body weight lost by level of engagement with self-monitoring tools for starters, stayers and all members. Figure 7 and Figure 8 are summaries showing the percentage of body weight lost by level of usage of a range of features of the platform. Overall, weight loss increased with usage of any of these features. For example,

- Stayers, who weighed in least often lost 2.9% of their starting body weight compared to 6.8% for those who weighed in most often – which was about twice per week during their membership time.
- Likewise, stayers who used the food diary least often lost 4.2% of their starting body weight compared to 6.9% for those who used the food diary most often – having almost 3 food diary entries per day of membership.

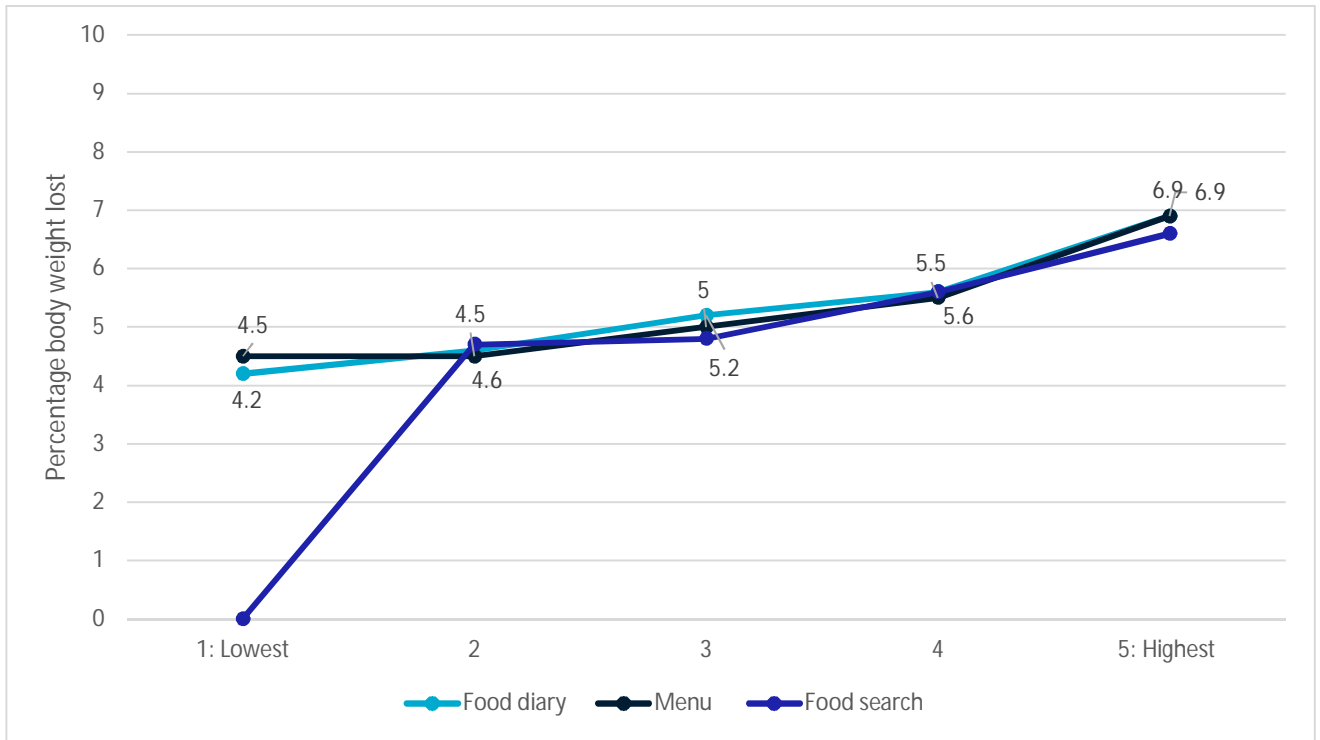


Figure 7. Weight loss by level of usage for the food diary, menu plans and food search features for stayers

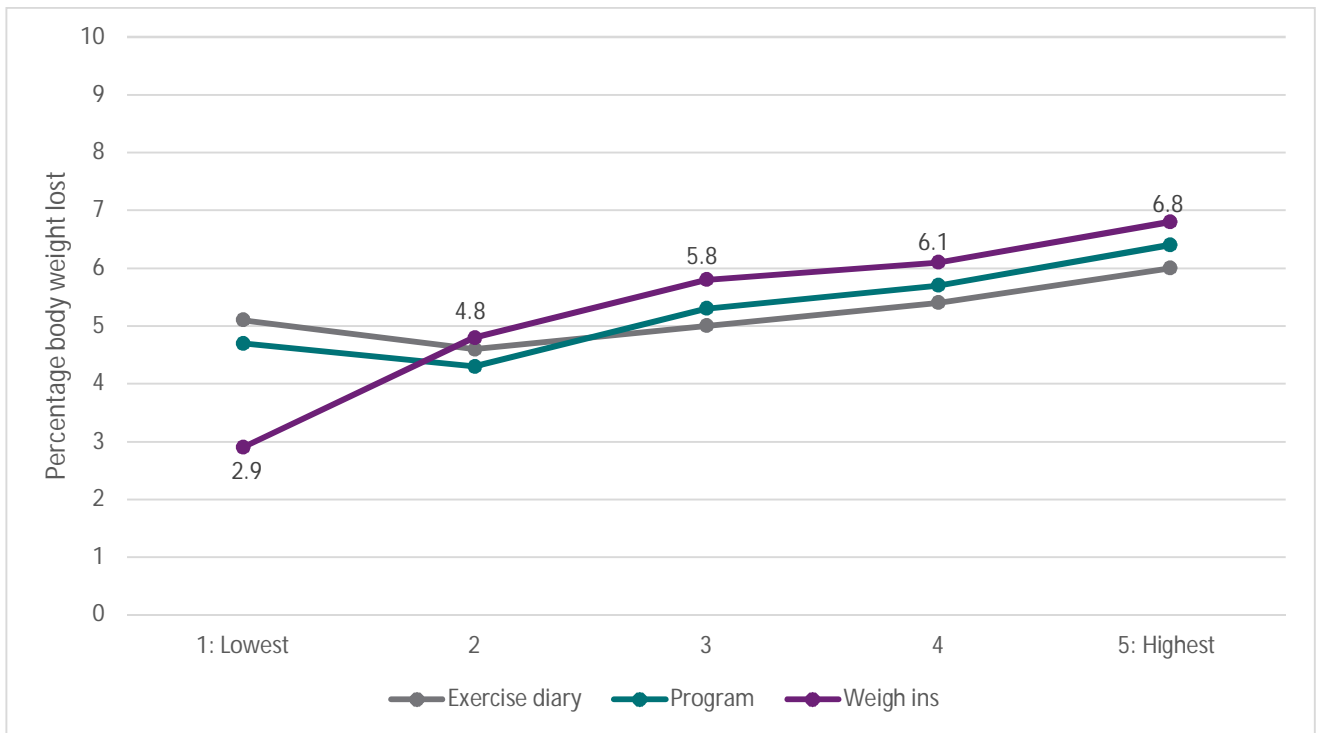


Figure 8. Weight loss by level of usage for the exercise diary, program content and weigh in features for stayers

Table 11. Weight loss in kilograms and percentage body weight by level of engagement with self-monitoring tools for starters, stayers and all members

Usage intensity		Starters		Stayers		All members	
		Total weight loss	Percent weight lost	Total weight loss	Percent weight lost	Total weight loss	Percent weight lost
All features	1: Lowest	0.3 (2.6)	0.3 (3.2)	3.6 (5.9)	3.8 (5.8)	1.6 (4.5)	1.7 (4.7)
	2	1.1 (3.7)	1.2 (3.2)	4.4 (5.3)	4.7 (5.2)	2.3 (4.6)	2.5 (4.4)
	3	1.6 (4.3)	1.7 (3.9)	4.7 (5.4)	5 (5.4)	2.8 (4.9)	3 (4.8)
	4	2.1 (2.9)	2.3 (2.8)	5.2 (5.2)	5.6 (5.2)	3.2 (4.2)	3.5 (4.2)
	5: Highest	2.9 (3.3)	3.2 (3)	6.7 (5.8)	7.3 (5.5)	4.3 (4.8)	4.7 (4.6)
Diary	1: Lowest	0.5 (2.5)	0.5 (3.1)	3.9 (6.1)	4.2 (6.1)	1.8 (4.6)	1.9 (4.8)
	2	0.9 (3.7)	1 (3.2)	4.3 (5.6)	4.6 (5.5)	2.2 (4.8)	2.3 (4.6)
	3	1.7 (3.6)	1.8 (3.2)	4.8 (5.2)	5.2 (5.3)	2.9 (4.5)	3.1 (4.4)
	4	2.2 (4.1)	2.3 (3.8)	5.1 (5.3)	5.6 (5.2)	3.3 (4.8)	3.6 (4.7)
	5: Highest	2.8 (3)	3.1 (2.8)	6.3 (5.4)	6.9 (5.2)	4.1 (4.4)	4.5 (4.3)
Forum	1: Lowest						
	2	1.3 (3.5)	1.4 (3.4)	4.7 (5.6)	5 (5.6)	2.3 (4.5)	2.5 (4.5)
	3			4.6 (5.6)	5 (5.5)	4.6 (5.6)	5 (5.5)
	4	1.9 (3.5)	2 (3.3)	4.9 (5.7)	5.3 (5.5)	3.2 (4.8)	3.5 (4.7)
	5: Highest	2.3 (3.5)	2.6 (3)	5.5 (5.5)	6 (5.4)	3.5 (4.7)	3.9 (4.4)
Menu	1: Lowest	1 (3.7)	1.1 (3.3)	4.3 (5.8)	4.5 (5.7)	2.2 (4.9)	2.4 (4.7)
	2	1.1 (3.5)	1.1 (3.4)	4.2 (5.6)	4.5 (5.5)	2.3 (4.7)	2.4 (4.6)
	3	1.4 (3.8)	1.5 (3.9)	4.7 (5.4)	5 (5.3)	2.6 (4.8)	2.8 (4.8)
	4	1.9 (3)	2.1 (2.9)	5.1 (5.5)	5.5 (5.6)	3.1 (4.4)	3.4 (4.4)
	5: Highest	2.7 (3.1)	2.9 (3)	6.3 (5.5)	6.9 (5.5)	4 (4.5)	4.4 (4.5)
Exercise plan	1: Lowest			4.8 (5.9)	5.1 (5.8)	4.8 (5.9)	5.1 (5.8)
	2	1.3 (3.7)	1.3 (3.4)	4.4 (5.6)	4.6 (5.7)	1.6 (4.1)	1.7 (3.9)
	3	1.7 (3.6)	1.7 (3)	4.7 (5.5)	5 (5.6)	3.2 (4.9)	3.4 (4.8)
	4	1.8 (3.1)	1.9 (3.3)	5 (5.6)	5.4 (5.3)	2.9 (4.4)	3.2 (4.4)
	5: Highest	2.2 (3.3)	2.5 (3.5)	5.4 (5.3)	6 (5.3)	3.4 (4.5)	3.8 (4.6)
Food Search	1: Lowest						
	2	1.4 (3.5)	1.5 (3.4)	4.4 (5.5)	4.7 (5.4)	2.2 (4.4)	2.4 (4.4)
	3			4.5 (5.4)	4.8 (5.5)	4.5 (5.4)	4.8 (5.5)
	4	2.1 (3.4)	2.3 (3.1)	5.1 (5.4)	5.6 (5.6)	4.1 (5.1)	4.5 (5.2)
	5: Highest	2.4 (3.4)	2.6 (3)	6.1 (6)	6.6 (5.7)	3.8 (4.9)	4.1 (4.7)
Program	1: Lowest			4.4 (5.8)	4.7 (5.7)	4.4 (5.8)	4.7 (5.7)
	2	1.2 (3.5)	1.3 (3.2)	4.1 (5.8)	4.3 (5.9)	1.6 (3.9)	1.7 (3.7)
	3	1.8 (5)	1.8 (4.6)	4.9 (5.3)	5.3 (5.2)	3.8 (5.4)	4 (5.3)
	4	1.9 (3.4)	2 (3.6)	5.2 (5.7)	5.7 (5.5)	3.1 (4.7)	3.4 (4.8)
	5: Highest	2.3 (2.9)	2.6 (2.9)	5.8 (5.3)	6.4 (5.3)	3.6 (4.3)	4 (4.4)
Weigh-in	1: Lowest	0.2 (2.2)	0.2 (2.3)	2.8 (6)	2.9 (6)	1.2 (4.3)	1.2 (4.3)
	2	0.7 (4.2)	0.7 (3.8)	4.4 (5.1)	4.8 (5)	2.1 (4.9)	2.2 (4.8)
	3	1.7 (4)	1.8 (3.7)	5.3 (4)	5.8 (4.1)	3.1 (4.4)	3.4 (4.3)
	4	2.4 (2.7)	2.6 (2.6)	5.6 (5)	6.1 (5)	3.6 (4)	3.9 (4)
	5: Highest	3.1 (3.2)	3.5 (3)	6.4 (6.8)	6.8 (6.5)	4.4 (5.2)	4.7 (4.9)

3.6 Characteristics and platform usage patterns of members who were most successful

This most successful group of ‘super star’ members was created based on a weight loss of 15% or more of starting body weight (N=939). The average weight loss among this group was 21.7kg or 21% of starting body weight. These members had a membership duration of 177 days which was longer than other groups.

The characteristics of members who were most successful on the program had usage platform patterns that were significantly different from other weight loss categories. The platform usage patterns of the most successful members included:

- Using the platform, on average, 5.3 times per day (nearly 4 times as much as the those who lost only a small amount of weight (<5% of starting weight)).
- The menu plans and diary features were used most commonly among the most successful members. The menu plans were looked at 2.5 times per day of membership; and the diary twice per day of membership.
- The most successful members weighed in, on average, once every 4 days or about twice per week. Likewise, the food searches were used once every 4 days.
- The most successful members checked in with the forum, exercise plans and program content on average just under once per week.

Table 12. Differences in member characteristics and platform usage intensity (per week) between weight loss categories

	Categories of body weight lost					Sig differences
	Weight gain	0 to <5%	5- to <10%	10-<15%	15% +	
n	4746	40396	10777	2830	939	
Age	48	49.6	51.2a	52.2b	51.7ab	*
Starting BMI	31.7	32.1a	32.1a	32.8	35.1	*
Weight loss (in kg)	-2.2	1.5	6.4	11.1	21.7	*
Weight loss (%BW)	-2.6	1.6	7	11.9	21	*
Duration of paid membership	155a	131	136	149a	177	*
Intensity per week						
Overall usage intensity	10.08a	9.8a	23.31	31.99	36.75	*
Diary intensity	3.71a	3.78a	9.45	12.74	13.86	*
Forum intensity	0.21a	0.14a	0.42	0.63	0.84	*
Menu intensity	4.69a	4.69a	10.85	14.98	17.43	*
Exercise plan intensity	0.21a	0.21a	0.42	0.63b	0.63b	*
Food search intensity	0.28a	0.28a	0.77	1.26	1.75	*
Program intensity	0.14a	0.14a	0.21	0.28b	0.28b	*
Weigh in intensity	0.91	0.49	1.12	1.47	1.89	*

*p<0.01. For post hoc comparison results, matching letters across a row denotes no significant difference (Level of significance P<0.05).

3.7 Characteristics of members who achieved the greatest weight loss early on the program

To examine characteristics of early weight loss success on the program, the weight loss over the first three weeks of the program was calculated. Quintiles of weight loss within the first three weeks were created to investigate differences between members who were slowest to lose weight and members who lost weight early in the program.

Figure 9 shows the total weight loss on the program of those who lost weight early in the first three weeks compared to those who were slower to start.

- Early weight loss in the first three weeks was associated with total weight loss on the program. Stayers who lost most weight in the first three weeks went on to lose more weight over the course of the program than those with slower weight loss.
- Those with greatest early weight loss had more platform activity in the first 21 days, driven largely by differences in diary and menu plan usage, and to a lesser degree weigh ins.
- Members who had early weight loss success used the platform 11 days out of their first 21 days. They used the diary on 8.6 out of 21 days and the menu on 7.5 days out of 21 days. These members weighed in 5 times over 21 days.

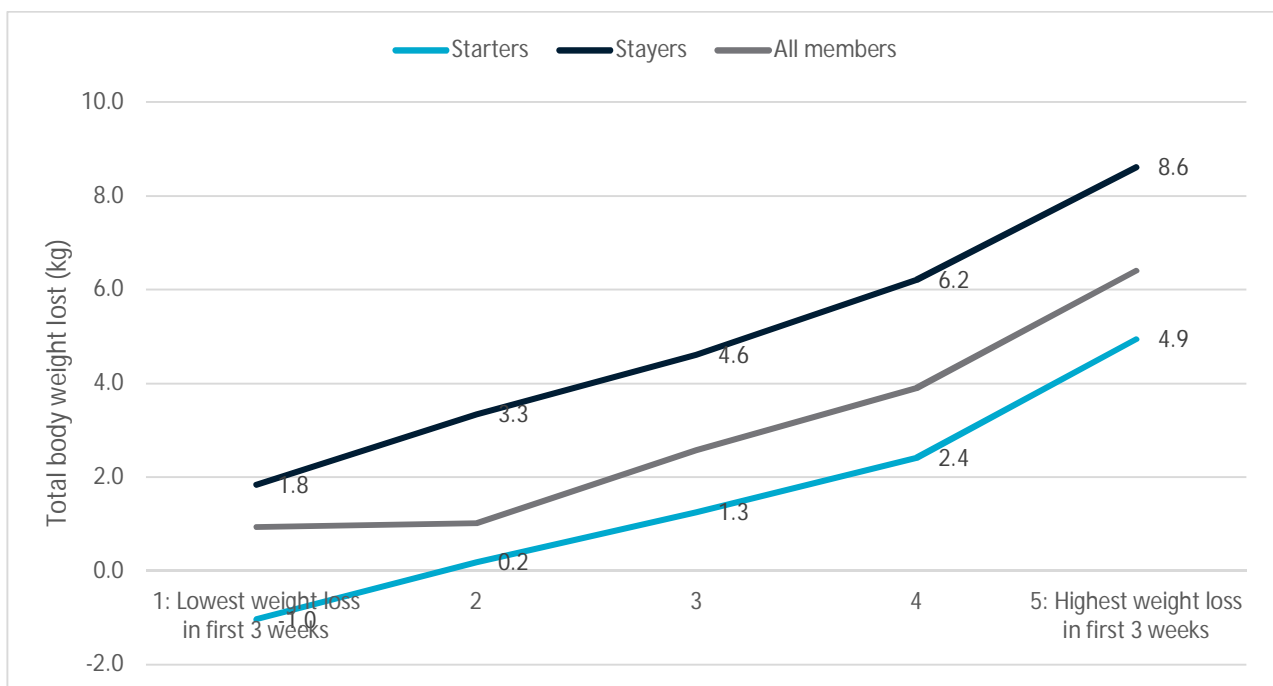


Figure 9. Total weight loss by quintiles of early weight loss, for starters, stayers and all members

Among all members

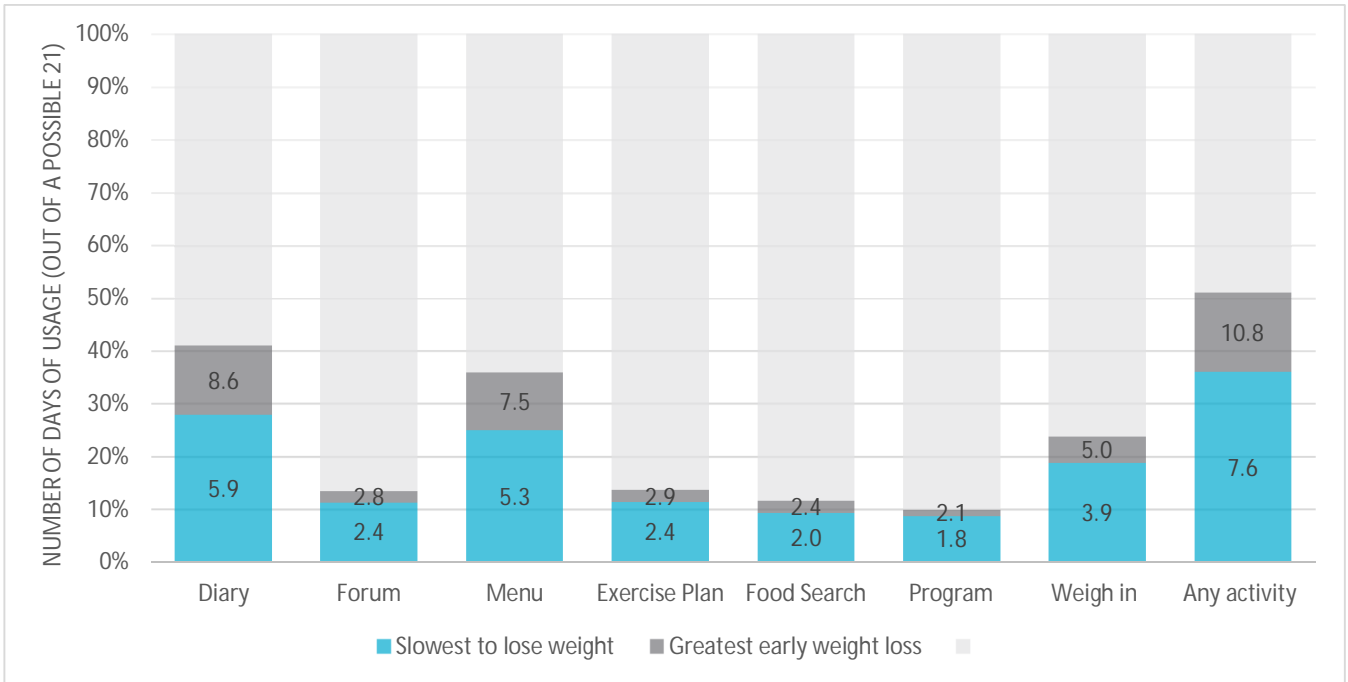


Figure 10. Days of platform feature usage in first 21 days for those who were slowest to lose weight and those with the greatest early weight loss

Among stayers

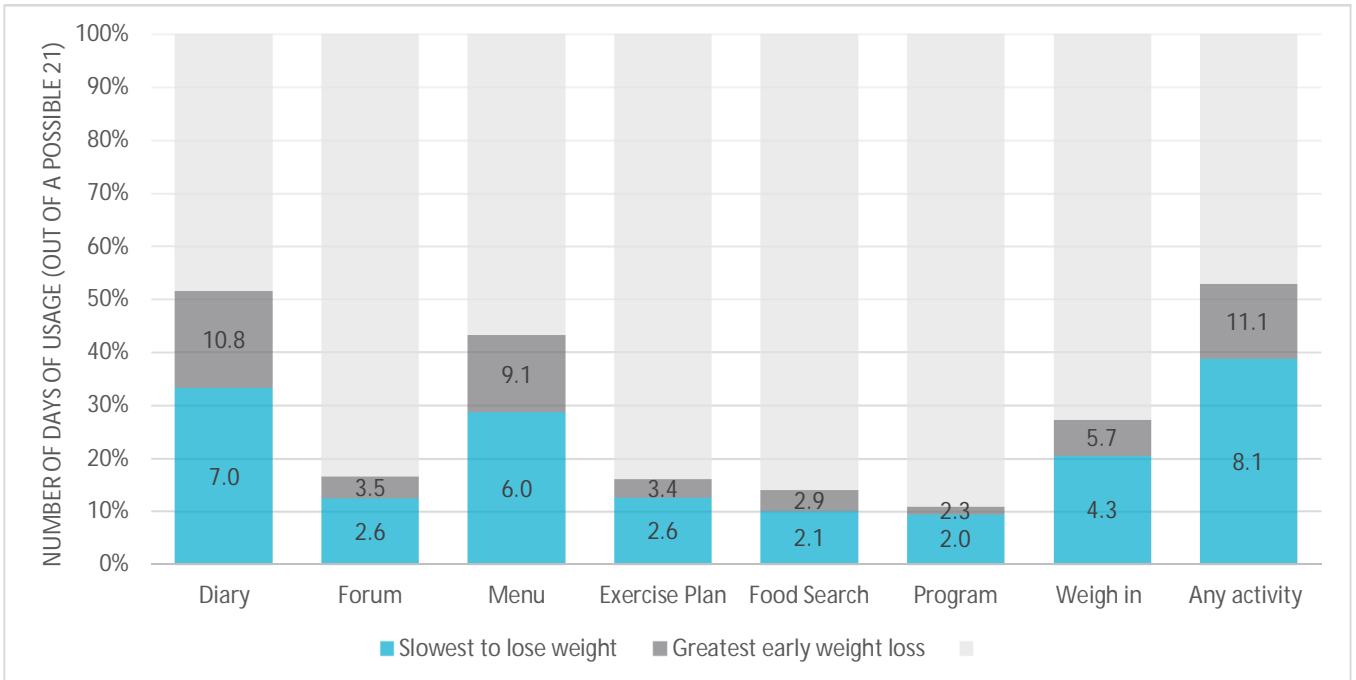


Figure 11. Days of platform feature usage in first 21 days for those who were slowest to lose weight and those with the greatest early weight loss, among stayers only

3.8 Characteristics of members who engaged with the program early

To examine characteristics of early adoption of the platform, usage over the first three weeks of the program was calculated. Quintiles of usage within the first three weeks were created to investigate differences between members who were slowest to engage with the platform and members who engage most early in the program.

- Weight loss increased with increasing early adoption of the platform. But, early usage of the platform appeared to be particularly important for starters as the increase in total weight loss with early adoption was more pronounced in these members than stayers.
- Early adopters of the platform used it for 17 out of a possible 21 days in the first 3 weeks. Higher usage of the platform was driven by usage of the menu plan and diary features. Early adopters used the diary feature of the platform for 13 out of 21 days and the menu plans for 11 out of 21 days.
- Early adopters weighed in about twice per week compared to only twice over 21 days of the program for those who are slower to engage with the platform.

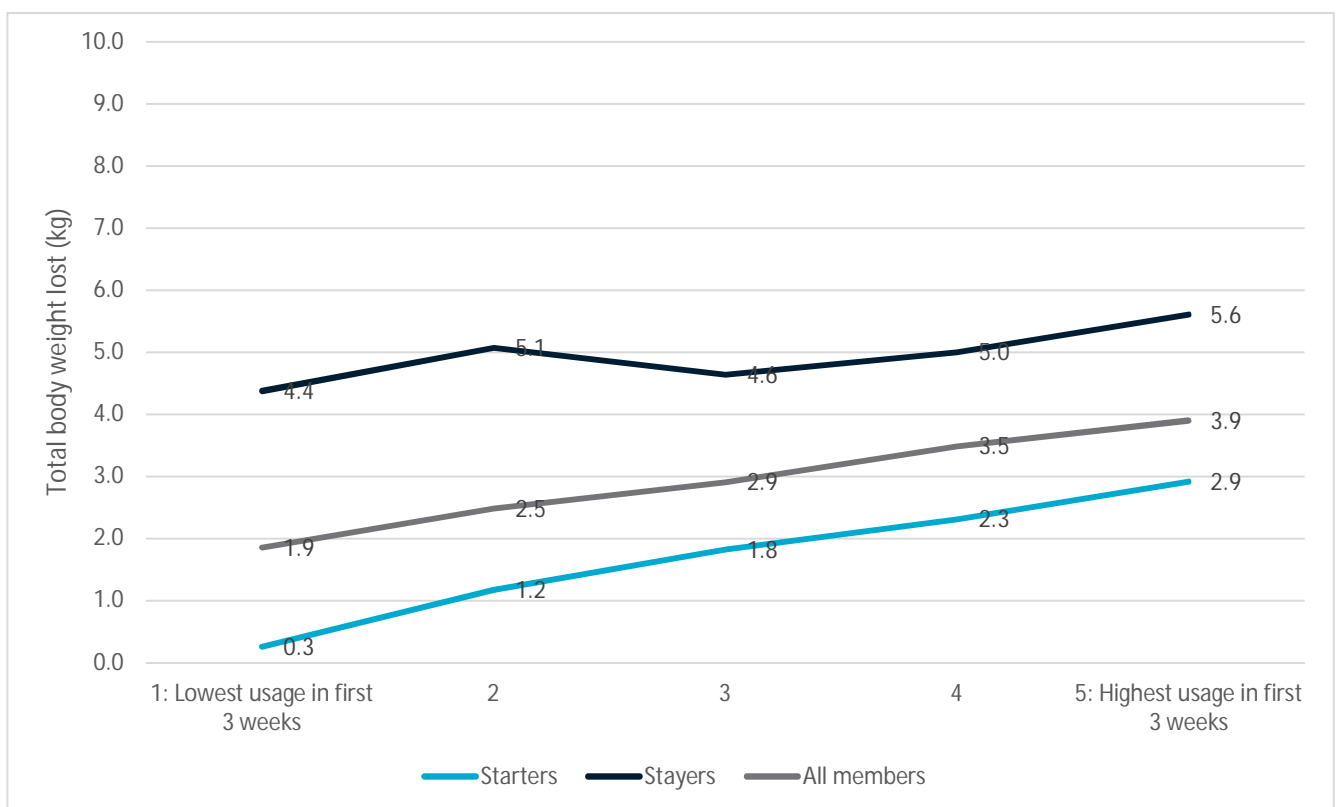


Figure 12. Total weight loss by groups of early platform usage, for starters, stayers and all members

Among all members

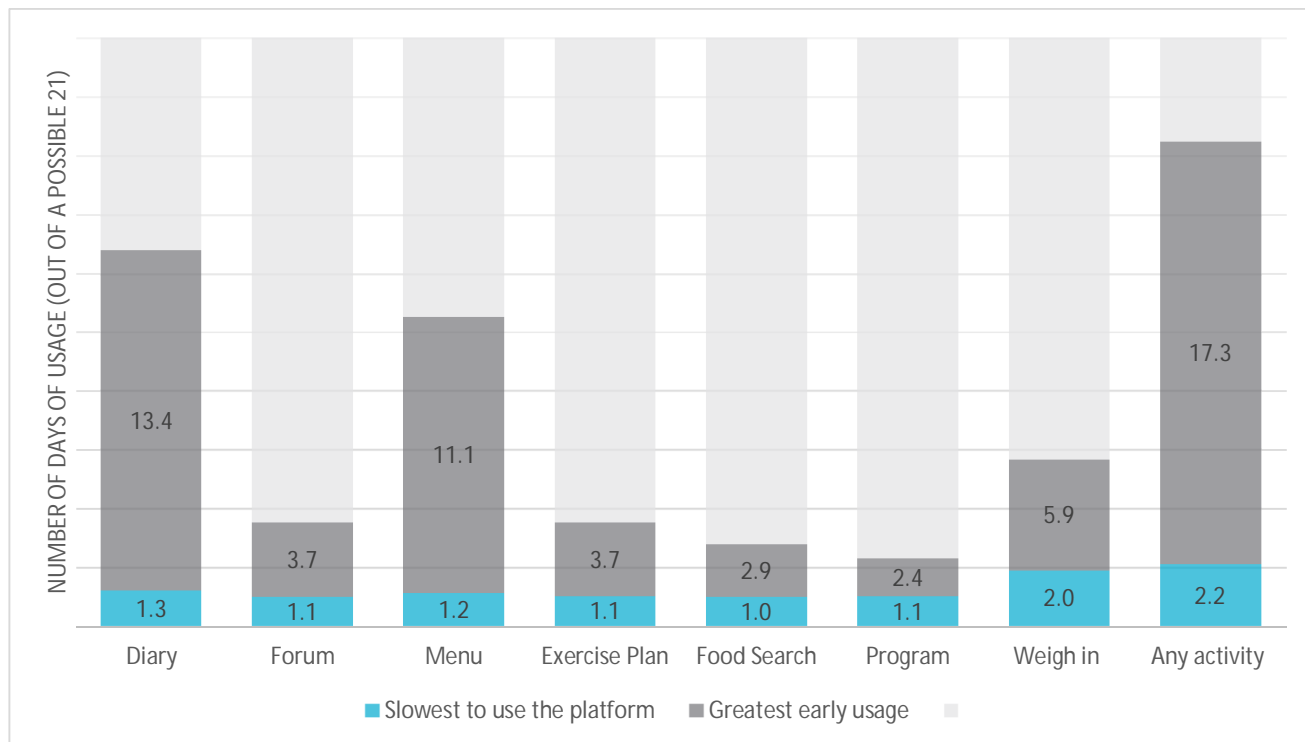


Figure 13. Days of platform feature usage in first 21 days for those who were slowest to start using the platform and those with the greatest early platform usage

Among stayers

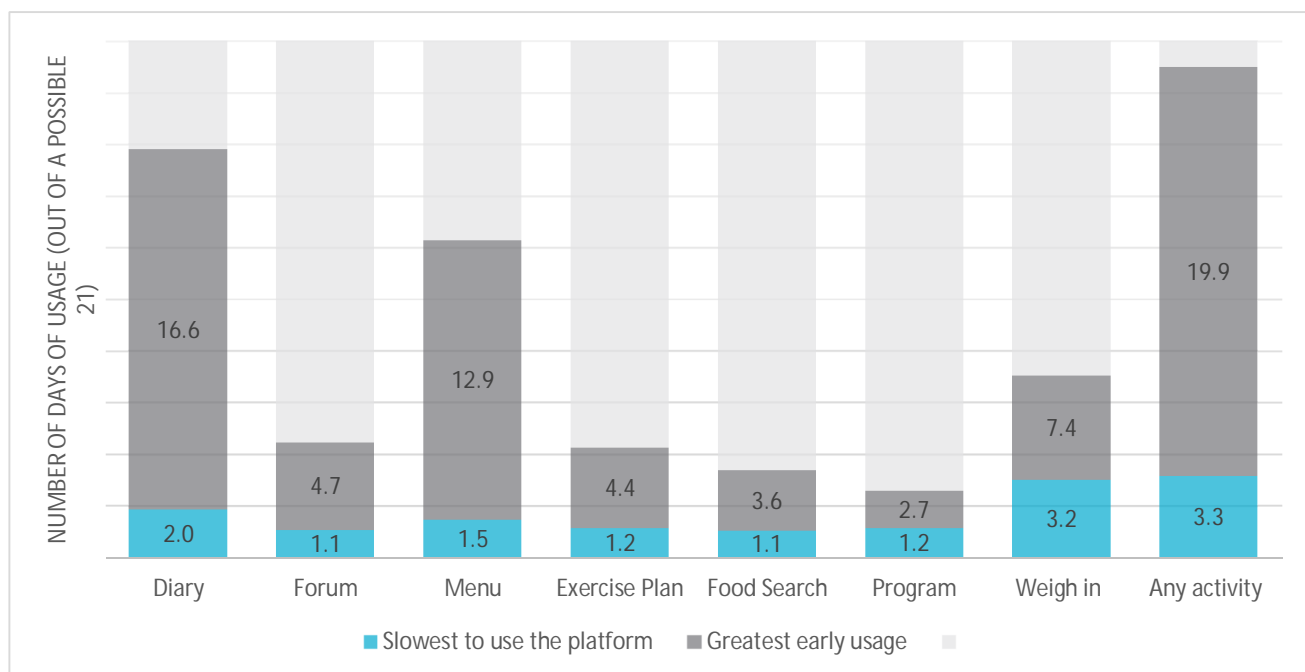


Figure 14. Days of platform feature usage in first 21 days for those who were slowest to start using the platform and those with the greatest early platform usage, among stayers only

3.9 Member weight loss over the years since the system launched

In each six-month period since the TWD Online System launched, the number of members has increased and so has the average weight loss members have achieved on the program (Figure 15).

Initially, the average weight loss of stayers who signed up in 2015 was about 3.8kg. This average weight loss has increased to 5.3kg for those who joined at the end of 2018 and 6.1kg for those who joined in the first half of 2019.

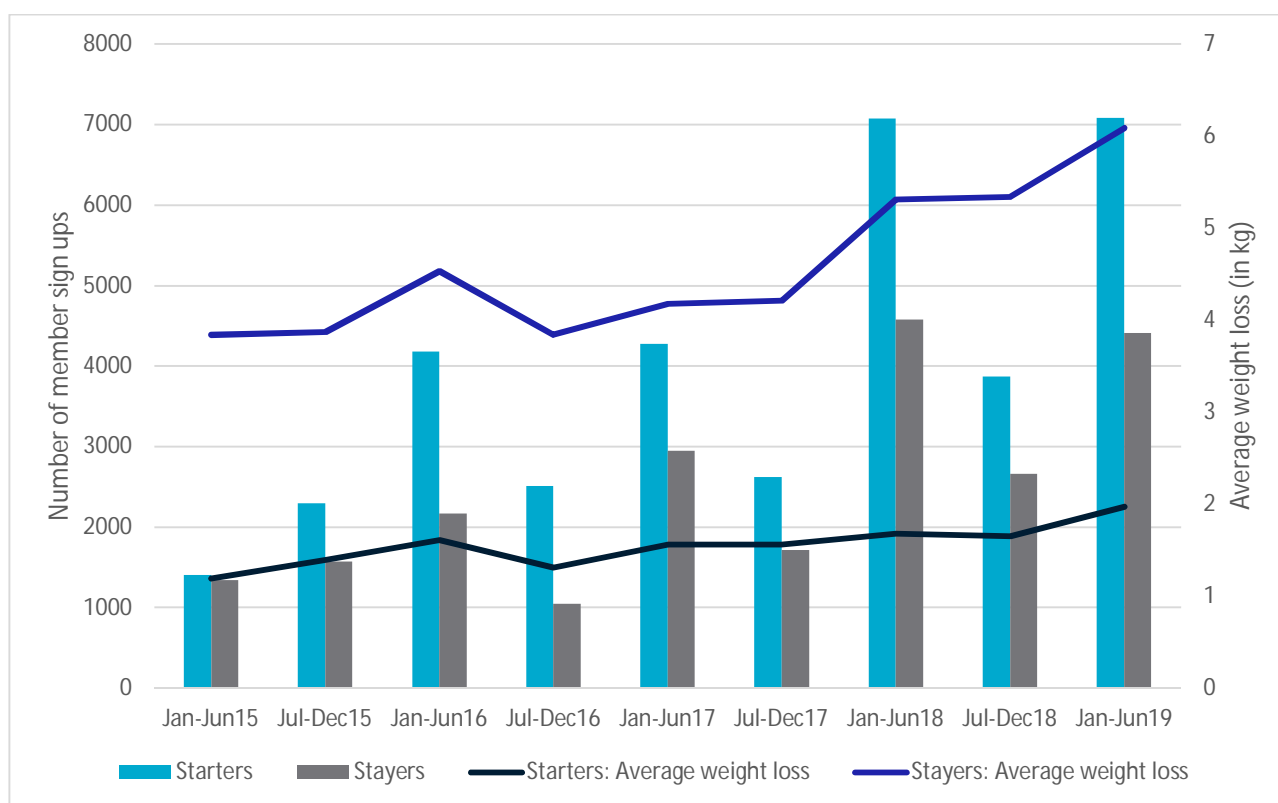


Figure 15. Membership numbers and average weight loss achieved by members signing up in 6-month period since the launch of the program, for starters and stayers

3.10 Member weight loss over time on the program

Figure 16 shows the incremental weight loss week by week for the first 24 weeks on the program. The rate of weight loss is greatest in the first few weeks on the program. For starters, weight loss then plateaus; whereas the weight loss for stayers continued to increase slowly through to the end of 24 weeks.

While weight loss continues for stayers throughout 24 weeks, the rate of weight loss slows somewhat at week 12 and again at about week 22.

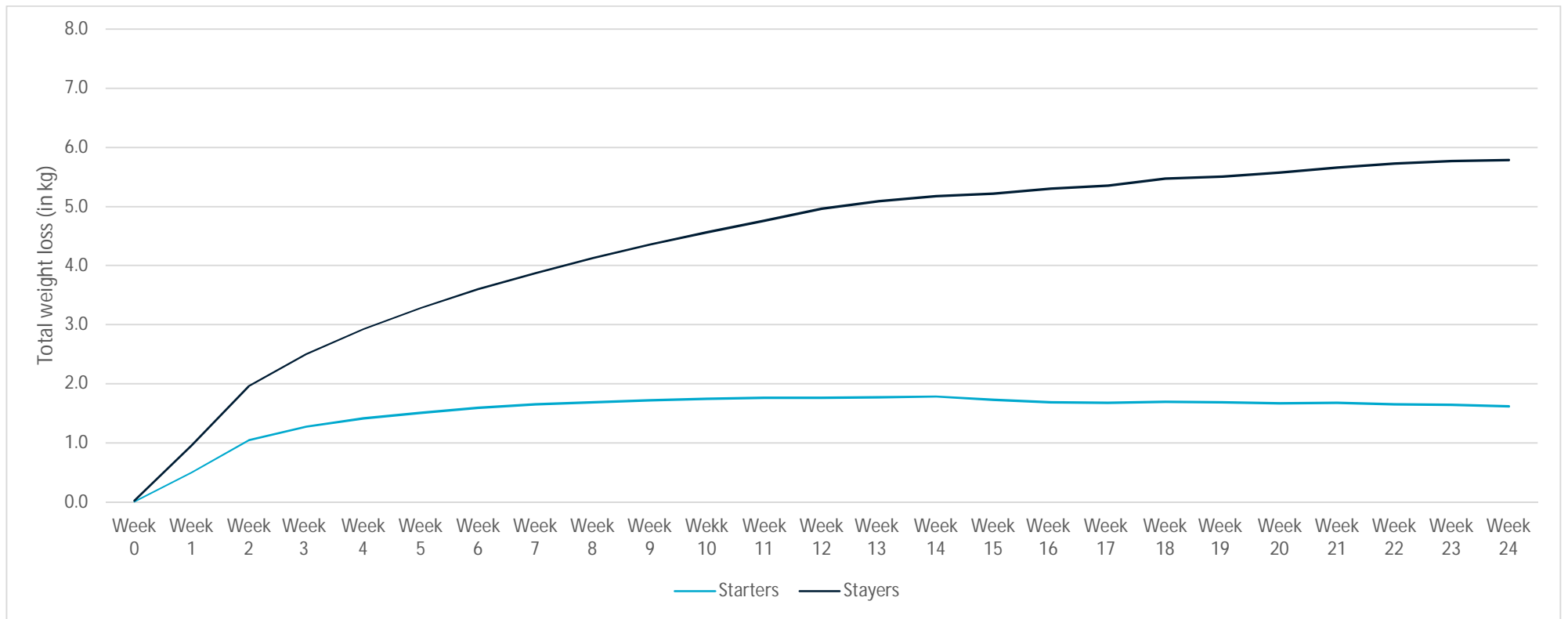


Figure 16. Average weekly weight loss achieved over 24 weeks of membership, for starters and stayers

4 Discussion

4.1 Key findings

This is the first comprehensive evaluation of the Total Wellbeing Diet (TWD) Online System which included data from almost 60,000 members. As part of this analysis we were interested to understand the characteristics of the TWD Online members, their weight loss results, who did particularly well on the program and what platform usage characteristics were associated with weight loss success. The key findings in relation to these questions are summarised below.

What are the characteristics of TWD Online members?

The majority of the TWD Online members were female and 57% were obese when they started the program. The majority of members (94.4%) were aged 30 years and older with an average age of 50 years. While the program had national reach, 55% of members were from New South Wales or Victoria. More than half (54.5%) of all members were from areas of higher than average socioeconomic status and 25.1% were from lower than average socioeconomic areas.

What were the weight loss results of members?

The average weight loss of all members on the TWD Online System was 2.8kg or 3.1% of their starting body weight. Members who stayed on the program until the end of 12 weeks, “Stayers”, lost an average of 4.9kg or 5.3% of their starting body weight, which was about three times more than those who started the program but didn’t continue.

Who did particularly well?

Almost half of the stayers lost 5% or more of their starting body weight, which is considered a clinically significant weight loss. About 15% of stayers lost ten percent or more of their starting body weight. Some groups of members did particularly well when they stayed on the program. For example, on average:

- Males lost 6.5% of their starting body weight, and 22% achieved a weight loss of ten percent or more of their starting body weight.
- Members from lower socioeconomic areas lost 5.8% of the starting body weight, and almost 18% lost ten percent or more of their starting body weight.
- Members who were classified as Class 3 or high-risk obese when they joined lost 6.0% of their starting body weight, and nearly 20% achieved a ten percent body weight lost.
- Members who earned the refund lost 6.9% of their starting body weight, and almost 23% lost ten percent or more of their starting body weight.

The weight loss achieved by some members who stayed on the program was enough to shift their weight status category down to a lower risk category. For example,

- 24.6% of stayers who were overweight at the start of the program were within the normal weight range at the end.
- Over 40% of members who were classified as Class 1 or 2 obese when they joined achieved a shift to a lower risk weight status category.
- 36.9% of members who were classified as Class 3 or high risk obese when they joined achieved a shift to a lower risk weight status category.

What system usage characteristics were associated with greater weight loss?

Overall it appeared that the more members used the platform, the more weight they lost on the program. Stayers with the highest levels of platform usage lost almost twice as much weight as those with the lowest usage patterns (6.7kg (7.3%BW) vs 3.6kg (3.8%BW)). One in four stayers with high usage lost more than ten percent of their starting body weight, compared to 1 in 10 of those with the lowest platform usage.

A group of the most successful 'super star' members was created based on a weight loss of 15% or more of starting body weight (N=939). The average weight loss among this group was 21% of starting body weight, or 21.7kg. The characteristics of members who were most successful on the program had usage platform patterns that were significantly different from other weight loss groups. On average, these members used the platform 5.3 times per day.

Online platforms are useful in supporting the practice of evidence-based strategies for weight control [11] in particular self-monitoring of weight, food and activity tracking through diary type features. Evidence is emerging supporting greater frequency of use of self-monitoring tools and associated greater compliance and weight loss [12, 13]. Digital programs can further support behaviour change by providing information, education and skills development, social support, feedback on progress, prompts or gamification [14]. The TWD Online System has a strong scientific foundation and the platform includes a range of these features to support behaviour change.

What did early success look like?

Stayers who lost most weight in the first three weeks went on to lose more weight than those with slower early weight loss. Those with greatest early weight loss had more platform activity in the first 21 days, driven largely by differences in the usage of the diary and menu plans, and to a lesser degree weigh ins.

- Members who had early weight loss success used the platform 11 days out of the first 21 days.
- Members who used the platform very actively in the first 21 days of the program lost twice as much weight as those were least active.

4.2 Comparisons to other weight loss studies

Dietary interventions conducted under clinically controlled conditions consistently report significant weight loss in those people who complete the trial. A systematic review of 80 published studies assessing the effects of different weight loss interventions found that those which included food and meal planning strategies using diet alone, diet and exercise, and meal replacements resulted in an average weight loss of 5.0-8.5kg (5.0-9.0% body weight) at six months, which stabilized to approximately 4.5-7.5 kg (4.8-8.0% body weight) at 12 months [15]. While clinical trials have demonstrated successful weight loss, they are usually resource intensive and often have limited reach, and their real-world application needs to be determined.

Community-based weight loss trials can have greater reach, often at the expense of intervention exposure or contact with researchers, and as a result report lower weight loss than clinically controlled trials. For example, the effectiveness of several community-based weight loss programs in England found that one-to-one general practice counselling or group-based programs led by a dietitian resulted in weight loss of 1.4-2.4 kg at three months [16]. There are also many commercial weight loss programs available. Published literature evaluating commercial weight loss programs has increased in the last few years but there are still only a few programs that have published longer term efficacy studies. One Australian example is an evaluation of Biggest Loser Club Australia, also a commercial online platform, that has reported average weight losses of 4.5kg (5.0% of starting body weight) after 8 weeks, or 2.6kg (2.9% of starting body weight) using last weight carried forward analysis [17].

4.3 Considerations and limitations

This study was an evaluation of an online commercial weight loss program currently available on the market, therefore data were only available for members who had joined the program and entered data into the system. These individuals are likely to be more motivated for weight loss, as they had paid to join a program, than overweight and obese individuals in the general population. There was no comparison group in this evaluation like what would be present in a more robust study design, such as a randomised controlled trial. Data was available from a very large sample of members, however given the nature of this study, these findings should be interpreted with caution. Further all data were self-reported and entered by individuals into the system. It is known that self-reported data has some limitations. For example, people tend to record data when they are doing well, possibly leading to an overestimation of weight loss.

References

1. Australian Institute of Health and Welfare (2017). A picture of overweight and obesity in Australia 2017. Cat. no.PHE 216. <https://www.aihw.gov.au/getmedia/172fba28-785e-4a08-ab37-2da3bbae40b8/aihw-phe-216.pdf.aspx?inline=true>.
2. Australian Bureau of Statistics, ABS National Health Surveys, ABS 4719.0 - Overweight and Obesity in Adults, Australia, Australian Bureau of Statistics (2018). National Health Survey: First Results, 2017-2018. <http://www.abs.gov.au/ausstats/abs@.nsf/mf/4364.0.55.001>.
3. World Health Organization. <https://www.who.in/topics/diet/en/>. Assessed: 28/10/2019.
4. Australian Bureau of Statistics. (2016) Australian Health Survey: Consumption of Food Groups from the Australian Dietary Guidelines. [http://www.ausstats.abs.gov.au/Ausstats/subscriber.nsf/0/12E8766EBAB492B0CA257FAF001A3CFD/\\$File/43640do002_20112012.pdf](http://www.ausstats.abs.gov.au/Ausstats/subscriber.nsf/0/12E8766EBAB492B0CA257FAF001A3CFD/$File/43640do002_20112012.pdf)
5. Stubbs, R.J., et al., Weight outcomes audit in 1.3 million adults during their first 3 months' attendance in a commercial weight management programme. *BMC Public Health*, 2015. 15(1): p. 882.
6. Clifton, P.M., et al., Body fat distribution as a determinant of the lipoprotein response to dietary fat and cholesterol. *Nutrition, Genetics, and Heart Disease*, 1996. 6: p. 143-160.
7. Noakes, M. and P.M. Clifton, Dietary fats in energy restricted diets: Effects on cardiovascular risk factors. *Circulation*, 1999. 100(18): p. 660-660.
8. Farnsworth, E., et al., Effect of a high-protein, energy-restricted diet on body composition, glycemic control, and lipid concentrations in overweight and obese hyperinsulinemic men and women. *American Journal of Clinical Nutrition*, 2003. 78(1): p. 31-39.
9. Luscombe, N.D., et al., Effect of a high-protein, energy-restricted diet on weight loss and energy expenditure after weight stabilization in hyperinsulinemic subjects. *International Journal of Obesity*, 2003. 27(5): p. 582-590.
10. Wyld, B., A. Harrison, and M. Noakes, The CSIRO Total Wellbeing Diet Book 1: sociodemographic differences and impact on weight loss and well-being in Australia. *Public Health Nutr*, 2010. 13(12): p. 2105-10.
11. Aguilar-Martínez, A., et al., Use of mobile phones as a tool for weight loss: a systematic review. *Journal of Telemedicine and Telecare*, 2014. 20(6): p. 339-349.
12. Harvey, J., et al., Log Often, Lose More: Electronic Dietary Self-Monitoring for Weight Loss. *Obesity (Silver Spring)*, 2019. 27(3): p. 380-384.
13. Burke, L.E., J. Wang, and M.A. Sevick, Self-monitoring in weight loss: a systematic review of the literature. *Journal of the American Dietetic Association*, 2011. 111(1): p. 92-102.
14. Rivera, J., et al., Mobile Apps for Weight Management: A Scoping Review. *JMIR Mhealth Uhealth*, 2016. 4(3): p. e87.
15. Franz, M.J., et al., Weight-loss outcomes: A systematic review and meta-analysis of weight-loss clinical trials with a minimum 1-year follow-up. *Journal of the American Dietetic Association*, 2007. 107(10): p. 1755-1767.
16. Jolly, K., et al., Comparison of range of commercial or primary care led weight reduction programmes with minimal intervention control for weight loss in obesity: Lighten Up randomised controlled trial. *BMJ*, 2011. 343: p. d6500.
17. Hutchesson, M.J., et al., An 8-week Web-based weight loss challenge with celebrity endorsement and enhanced social support: Observational study. *Journal of Medical Internet Research*, 2013. 15: p. 25-32.

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