Obesity

The Population Cost-Effectiveness of Weight Watchers with General Practitioner Referral Compared with Standard Care

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Objective: This study aimed to assess population-level cost-effectiveness of the Weight Watchers (WW) program with doctor referral compared with standard care (SC) for Australian adults with overweight and obesity.

Methods: The target population was Australian adults ≥ 20 years old with BMI ≥ 27 kg/m^2, whose obesity status was subsequently modeled for 2015 to 2025. A microsimulation model (noncommunicable disease model [NCDMod]) was used to assess the incremental cost-effectiveness of WW compared with SC. A health system perspective was taken, and outcomes were measured by obesity cases averted in 2025, BMI units averted for 2015 to 2025, and quality-adjusted life years for 2015 to 2025. Univariate sensitivity testing was used to measure variations in the model parameters.

Results: The WW intervention resulted in 60,445 averted cases of obesity in 2025 (2,311 more cases than for SC), extra intervention costs of A$219 million, and cost savings within the health system of A$17,248 million (A$82 million more than for SC) for 2015 to 2025 compared with doing nothing. The modeled WW had an incremental cost-effectiveness ratio of A$35,195 in savings per case of obesity averted in 2025. WW remained dominant over SC for the different scenarios in the sensitivity analysis.

Conclusions: The WW intervention represents good value for money. The WW intervention needs serious consideration in a national package of obesity health services.

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Introduction

The obesity epidemic in Australia persists, with 63.4% of Australians aged 18 years and older having overweight or obesity in 2015 (1). Furthermore, the proportion of the adult population in the heaviest BMI categories over the past 10 years has increased from 5% with BMI > 35 kg/m^2 in 1995 to 9.5% in 2015 (1). Overweight and obesity were estimated to contribute around 9% of the total disease burden (measured as disability-adjusted life years) in Australia in 2010 (2).

Treatment for obesity requires extensive health care resources. The excess cost of direct health care for Australians aged 18 years and older who have obesity was reported to be A$3.8 billion in 2015 (3), equivalent to 2.5% of the total Australian health care cost (4). Higher obesity-related health care expenditure occurs across all types of care (5). A modest degree of weight loss (i.e., 5%-10% of body weight) sustained over time has been found to reduce costs from obesity-related conditions (6). Consequently, there is a need for population-level cost-effective interventions to address the obesity epidemic in Australia.

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Author contributions: DS and SC conceived the study. SL led the study. SL, DS, SC, and CL made substantial contributions to study conception and design. SL, DS, SC, CL, NF, and IC made substantial contributions to acquisition of data. SL analyzed data, and SL, DS, SC, and MC made substantial contributions to interpretation of results. MC advised on health economics. SL and MC wrote the first draft of the article, and SL, MC, DS, SC, IC, CL, and NF were responsible for drafting the article or revising it critically for important intellectual content. SL, DS, and SC developed NCDMod. All authors gave final approval of the version of the article to be published.

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One practical intervention has been the partnering of primary care providers and commercial weight-loss organizations, such as Weight Watchers (WW), to provide early lifestyle interventions for weight management. Jebb et al. (7) found that a 1-year WW program with general practitioner (GP) referral achieved, on average, a weight loss of 5.1 ± 0.3 kg over the randomized controlled trial (RCT) period compared with a loss of 2.3 ± 0.2 kg ($P < 0.0001$) for those receiving "standard care" (SC) (i.e., GP advice and follow-up over a 12-month period). WW was found to be within-trial cost-effective compared with this SC (8). A lifetime study based on the trial results for Australia found that WW was the dominant treatment, that is, more effective and less costly than SC (the 95% CI ranged from being dominant to costing A$6,225 per quality-adjusted life year [QALY]) (9).

There is minimal evidence that universal interventions can reduce obesity (10) and even less on the cost-effectiveness of such interventions (11,12). There is an urgent need to assess whether WW and other interventions, when implemented at the population level, are likely to produce the levels of weight loss needed to meet the World Health Organization's recommendations for population obesity levels in 2025 (13). This study uses WW for modeling as it is a widely available program in Australia and has a sound evidence base as an effective treatment (7,14).

This study is the first economic evaluation of the WW program (with GP referral) scaled up to the Australian adult population using the world's first obesity microsimulation model, noncommunicable disease model (NCDMod). Microsimulation focuses on individual characteristics, behaviors, and decisions, allowing for the combination of data from multiple sources, modeling population subgroups, and representation of heterogeneity. Cost-effectiveness analysis (CEA) then compares interventions in terms of their costs and consequences using an incremental cost-effectiveness ratio (ICER), that is, the ratio of the difference in health gains divided by the difference in costs (15). CEAs commonly use QALYs, a generic health measure that includes both the quality and the quantity of life lived (16), to quantify outcomes. Population-level health outcomes, costs, and cost offsets are projected over a 10-year period (2015-2025). This study aims to address the question of whether the WW intervention is a good use of health care resources in Australia.

Methods

This study compares population-level health outcomes, costs, and cost offsets (savings) of adults with overweight or obesity accessing 1 year of WW through GP referral compared with SC provided by GPs as experienced in the RCT (7), which formed this simulation's data source. In the SC intervention, the number of GP visits was determined by the GP and patient (average 10.7 visits per person in 1 year). SC has been defined for ethical reasons within the RCT. However, there is no specific program for GP obesity care in Australia. A third simulation of the current system was run going forward to 2025 based on historic outcomes; that is, all probability transition equations within the microsimulation model were held constant across the projection period. Therefore, for BMI levels, the transition equation projecting individual BMI at the end of the next 5-year period (t) is based on modeling BMI change with predictor variables of age (t-5), gender, systolic blood pressure (SBP) (t-5), cholesterol (t-5), smoking status (t-5), and education as defined. This is labeled the status quo, or "do-nothing," scenario.

The microsimulation model

NCDMod was used to project the health outcomes, costs, and cost offsets of the interventions from 2015 to 2025. The modeling implemented the interventions in 2014 for the eligible population. The intervention is treated as a one-off shock to the system applied across the cohorts in 2014 and follows the impact across the projection period. NCDMod is Australia's first microsimulation model of the interrelationships of obesity with other chronic diseases in the Australian adult population. It provides midterm projections of outcomes from health interventions and/or policies to address obesity.

NCDMod has the following four main components: (1) the base population (the microdata the model is built on), (2) incidence models for chronic disease and risk factors, (3) health expenditure modeling, and (4) population projections from the Australian Bureau of Statistics (ABS). The basefile represents Australian population characteristics, including demographics (e.g., age, gender, socioeconomic status), risk factors (e.g., BMI, cholesterol, SBP), and chronic illness profile (e.g., diabetes cardiovascular disease [CVD]). The model moves forward in 5-year cycles. Transition equations determine probabilities of BMI change, cholesterol level, SBP level, smoking status, diabetes, heart disease events, stroke events, and CVD deaths (details of transition equations in Supporting Information Table S1). Monte Carlo simulation determines event occurrence for the individual record. Figure 1 provides a graphical representation of the microsimulation model (NCDMod) used in this study. Model assumptions include the following: statistical models generating probabilities include all key predictors and are not biased; relationships in the statistical models, based on historical data, hold into the future; and RCT results informing intervention parameters are generalizable to the broader population. The specific details about NCDMod are detailed in Lymer et al. (17).

Base population

NCDMod's basefile uses the 2005 ABS National Health Survey (18,19), a nationally representative survey including personal and socioeconomic variables, chronic disease indicators, and risk factors.

Reweighting

The 2005 National Health Survey data were reweighted using the generalized regression estimator weight (GREGWT) (20), an algorithm for reweighting survey data. It takes into account projected changes in the age-sex distribution of the Australian adult population across time.

Population projections

To account for population growth, ABS population projections (series B assumptions; moderate population growth) (19) were used in aligning the population projections to 2025.

Incidence models for chronic disease and risk factors

The transition models were sourced from the literature, such as the Framingham risk equations for acute myocardial infarction, stroke, and CVD deaths (21), and some were based on in-house modeling, such as change in BMI value and diabetes incidence (17).

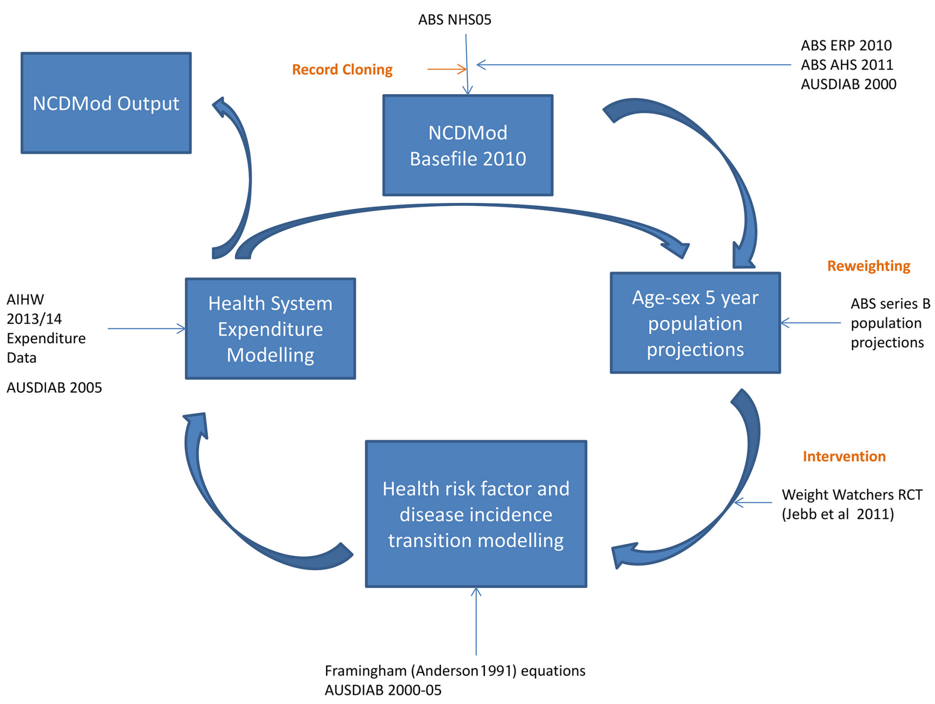

Figure 1 NCDMod: microsimulation modeling of chronic diseases and health interventions. AIHW, Australian Institute of Health and Welfare; NHS05, National Health Survey 2005; AHS, Australian Health Survey; AUSDIAB, Australian Diabetes, Obesity and Lifestyle Study. [Color figure can be viewed at wileyonlinelibrary.com]

Simulation

Both WW and SC were applied in the 1-year period prior to 2015. Changes in health outcomes and costs because of the interventions were simulated across time using statistical transition equations (17) and Monte Carlo simulation (22).

Data output

The output data files of NCDMod provided information on Australians aged 20 years and older at key time points (2015, 2020, and 2025). Postsimulation analysis compared health outcomes, health care costs, and cost offsets between status quo, WW, and SC simulations.

Health outcomes

The economic evaluation measured the following health outcomes: (1) averted cases of people with obesity in 2025, (2) averted BMI units from 2015 to 2025, and (3) QALYs gained based on BMI changes from 2015 to 2025.

CEA

Both health outcomes and costs, which were offset by associated savings to the health system, between WW, SC, and the do-nothing scenario were calculated. CEAs used health outcomes in natural units (i.e., averted cases of obesity in 2025 and averted BMI units for 2015-2025). A cost–utility analysis using QALYs was also undertaken. The ICERs were calculated to allow a comparison of the differences in health outcomes given the differences in costs (15).

The study's economic perspective was the health system. Costs and cost offsets were measured in real Australian dollars and expressed in 2010 values over the projection time frame (i.e., 2015-2025), removing inflation impacts (15). A 5% annual discount rate was applied to all cost measures (23,24).

To determine the "worth" of WW, a threshold of A$50,000 per QALY "value for money" was assumed. ICERs below this threshold offer "good" value for money. Australia has no official threshold; however, this one has been used in Australian studies with policy maker acceptance (25).

Specification and effectiveness of interventions assessed

Both WW and SC interventions were sourced from published studies (7-9,14). They consisted of GP referral and vouchers to attend a weekly community meeting of the commercial provider (WW) for 1 year and, for SC, weight-loss advice delivered by a GP or primary care professional at the participant's local medical practice for 1 year.

The WW inclusion criteria were age 20 to 64 years old with overweight or obesity ($BMI \geq 27$ kg/m^2). To operationalize the simulation, parameters were set based on best available evidence. The WW simulation used an 8.8% uptake among the eligible population with overweight and 17.5% among those with obesity (26). Of those, 61% completed the WW intervention (7). SC simulation uptake was set at the same rate as the WW simulation but with 54% of people completing the 1-year intervention (7).

TABLE 1 Basefile and simulated intervention group characteristics for Australian adults (20 years and older), 2010

	Population	Eligible for intervention	SC completers[a]	WW completers[a]
Gender (%)				
Male	48.57	55.94	56.10	56.09
Age group (%)				
20-34 years	28.56	26.81	26.88	26.82
35-49 years	27.96	37.19	37.20	37.23
50-64 years	24.07	35.99	35.99	35.96
65 + years	19.41	0	0	0
Income (%)				
Top quintile personal weekly income	18.65	25.99	25.49	25.69
Education (%)				
University or other postschool education	51.22	55.18	54.99	55.33
Labor force status (%)				
Employed	62.49	74.42	74.77	74.67
Unemployed	2.67	2.67	2.80	2.68
Not in labor force	34.83	22.90	22.65	22.43
Weight distribution (%)				
BMI less than 25 kg/m^2	39.72	0	0	0
BMI 25-29.99 kg/m^2	30.27	41.83	41.65	41.60
BMI 30 kg/m^2+	30.01	58.17	58.35	58.40

Source: NCDMod simulation.
[a]Numbers are as per the main simulation.
SC, standard care; WW, Weight Watchers.

Impacts on the individual's weight and SBP were modeled directly. Weight loss (in kilograms) in the simulation controlled for the individual's starting weight as well as the intervention. Similarly, change in SBP controlled for SBP at baseline. The transition equations used to estimate these health outcomes were based on in-house statistical analysis of the raw trial data using complete case data (final equations presented in Supporting Information Table S2).

Our study explicitly models weight regain based on the 2-year follow-up of the trial (14). WW assumed a 3% increase in weight each year from the individual's lowest weight until they reached their preintervention weight, and SC assumed a 1% increase in weight each year from the individual's lowest weight until they returned to their preintervention weight.

Modeling to health utilities

To quantify the effectiveness of WW, QALYs gained within the projection period of 2015 to 2025 were simulated. The utility based on BMI category was modeled based on Sach et al. (27), who reported EQ-5D (EuroQol Research Foundation, Rotterdam, The Netherlands) results for UK patients aged 45 years and older across the following BMI groups: underweight (0.760), normal (0.803), overweight (0.780), obesity class I (0.704), obesity class II (0.682), and obesity class III (0.621).

Costs of interventions and cost offsets

The resources used were based on the cost information described in Fuller et al. (8,9). The WW cost used the market price of attending the program. For SC, the costs were for 10.7 GP consultations (8) over the year, with a GP consultation lasting 20 minutes or less as per the Australian Medicare Benefits Schedule (item 23, www.mbsonline.gov.au). See Supporting Information Table S3 for a description of the intervention resources and unit costs.

Intervention completers had the full cost applied (i.e., A$754.30), whereas noncompleters were charged for the GP visit for referral to WW or the first GP visit in SC. The WW noncompleters also had 50% of the 1-year WW membership cost applied (i.e., A$395.70).

Cost offsets are the savings associated with the treatment of obesity and associated chronic disease because of fewer people with overweight and obesity. Total health system costs were estimated from health expenditure equations within NCDMod (17). Cost offsets can be partitioned into costs directly related to obesity and those related to chronic disease. These costs are the average yearly health costs per person in Australia.

The costs were sourced from the Australian Institute of Health and Welfare 2013-2014 health expenditure data and The Australian Diabetes, Obesity and Lifestyle Study (2005), as detailed in Lymer et al. (17). Total health expenditure included government expenditure on hospitals, primary health care, and pharmaceuticals. Total direct health expenditure modeling used a linear regression model with independent variables of type 2 diabetes status, CVD event, BMI status (three levels), and age.

Sensitivity analysis

We conducted a sensitivity analysis of the main assumptions underlying the model. Using univariate analysis, we examined the

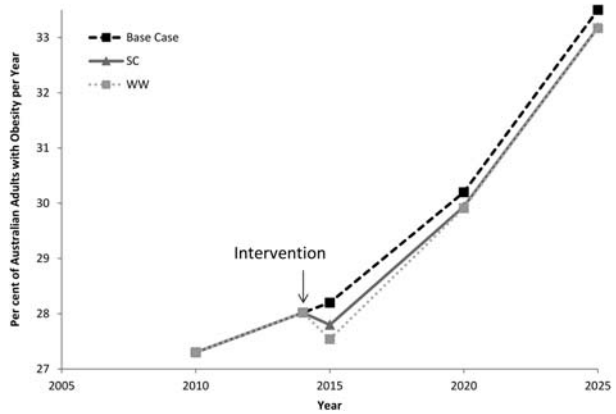

Figure 2 Comparison of the trajectory of the annual percentage of Australian adults with obesity between 2010 and 2025 for Weight Watchers (WW) with general practitioner referral and standard care (SC) compared with the base case of doing nothing.

following scenarios: (1) a conservative option in which WW noncompleters were assigned the full 1-year program cost under the assumption that a complete package is bought at the start compared with the "pay as you go" option in the main analysis, (2) uptake levels ranging from complete uptake among the eligible population (100%) to a 50% decrease in uptake compared with the main scenario parameters (see Supporting Information Table S4 for uptake modeled in the sensitivity analysis), and (3) variations in the discount rate (0% and 3.5%).

The sensitivity analysis focused on cost and eligibility issues, so the parameters selected were closely aligned to that aspect of a scaled-up version of WW.

Results

Table 1 describes the baseline characteristics of Australians aged 20 years and older. Of the 16.9 million adults in Australia in 2010, there were 7.8 million (46%) simulated eligible for weight-loss intervention. In each simulation, 550,000 commenced the intervention (6.4% of those eligible). The numbers simulated to complete the weight-loss intervention were 300,000 (54% of those commencing) and 338,000 (61% of those starting) for SC and WW, respectively. Males made up 56% of the eligible population, slightly higher than the percentage of males in the overall population (49%). Of the eligible population, 37% were aged 35 to 49 years, and 36% were aged 50 to 64 years, 10 percentage points higher than in the total population. People with BMI in the obesity category (30 or greater) made up 58% of the eligible population.

In 2015, there was a 1-percentage-point decrease in the percentage of Australian adults with obesity after the implementation of WW and half a percentage point decrease for SC compared with the status quo simulation. The percentage point decrease was maintained (although narrowing) for the 10 years to 2025 (Figure 2). In 2015, there were 105,700 fewer Australian adults with obesity for WW (2.3%) and 62,500 fewer adults with obesity for SC (1.4%) compared with the "do-nothing" simulation. By following the simulated weight-loss trajectories, there were approximately 60,400 (0.9%) fewer adults with obesity by 2025 for WW and approximately 58,100 (0.8%) fewer for SC compared with the do-nothing simulation. By 2025, there were similar results across the two interventions in class III obesity, with 13,500 (1.7%) fewer persons for WW and 10,500 (1.3%) fewer for SC compared with the do-nothing simulation.

Table 2 presents the health outcomes of WW and SC from 2015 to 2025 compared with the status quo simulation. Table 3 presents the costs of the two interventions from 2015 to 2025 and the economic evaluation results comparing WW with SC. WW performed better on every health outcome and cost calculation than SC compared with the status quo simulation across time. For instance, there were 2,311 more cases of obesity averted in 2025 under WW (60,445 cases) than under SC (58,134 cases) compared with the status quo simulation (Table 2). The QALYs gained between 2015 and 2025 based on changes in BMI were greater for WW (22,076 million) than SC (17,263 million) compared with the status quo simulation, a difference of 4,813 million QALYs gained (Table 2). In the main simulation, WW was more costly to implement (A$340 million) than SC (A$121 million) in the start-up year (2015) (Table 3). However, the cost offsets for the health system were estimated to be A$17,248 million with WW instead of the status quo simulation, offering A$82 million more in savings than SC (A$17,166 million). The estimated cost offsets related to obesity were A$17,248 million for WW and A$17,166 million for SC over the period from 2015 to 2025 compared with the status quo simulation. Therefore, the costs for which health care resources have been appropriated but will not

TABLE 2 Projected health outcomes of SC and WW scenarios compared with a do-nothing baseline, 2015-2025

	Intervention		
Disease outcomes	SC[a]	WW[a]	Difference
Averted cases of persons with obesity in 2025	58,134	60,445	2,311
Averted BMI units, 2015-2025 (in thousands)	4,117	4,858	741
QALYs gained, 2015-2025 (based on BMI changes)	17,263	22,076	4,813

Source: NCDMod simulation.
[a]Main simulation.
QALY, quality-adjusted life year; SC, standard care; WW, Weight Watchers.

TABLE 3 Projected cost consequences of SC and WW scenarios compared with a do-nothing baseline, 2015-2025, and ICERs of WW

	Intervention		
	SC[a]	WW[a]	Difference
Health costs (A$ in millions)			
Cost of the intervention in 2015	121	340	219
Cost offsets, 2015-2025[b]	17,166	17,248	82
Cost offsets directly related to obesity, 2015-2025[c]	1,209	1,558	349
ICER (with cost offsets)[d]			
ICER (cost offsets in A$ per case of obesity averted in 2025)			35,195
ICER (cost offsets in A$ per BMI unit averted, 2015-2025)			110
ICER (cost offsets in A$ per QALY gained, 2015-2025)			16,899

Source: NCDMod simulation.
[a]Results from main simulation.
[b,c]Cost offsets refer to net savings associated with the treatment of obesity and associated chronic diseases because of fewer people with overweight and obesity. The Total health system costs estimated from health expenditure equations developed within NCDMod. Cost offsets have been partitioned into those costs directly related to obesity and those related to chronic disease. These costs refer to average yearly health costs per person in Australia. All costs and cost offsets discounted at 5% per annum.
[d]ICER reflects treatment that offered improved health outcomes and greater levels of $A freed in the health system (savings).
A$, 2010 real Australian dollars; ICER, incremental cost-effectiveness ratio; QALY, quality-adjusted life year; SC, standard care; WW, Weight Watchers.

be used as a result of one of the weight-loss interventions were greater under WW than SC.

The ICERs (with cost offsets) for WW compared with SC were A$35,195 per averted case of obesity in 2015, A$110 per BMI unit averted from 2015 to 2025, and A$16,899 per QALY gained from 2015 to 2025 (Table 3). Therefore, WW was cost-effective (and it is dominant, achieving better outcomes at a lower cost) at the population level, with the ICERs falling below the threshold of A$50,000 per QALY as a guide.

In the sensitivity analysis, when the uptake rate of the weight-loss treatments was increased by 50%, the ICER (with cost offsets) decreased to A$28,708 in savings per case of obesity averted in 2025 and increased to A$17,142 in savings for QALYs gained from 2015 to 2025 (Table 4). The ICERs also decreased compared with those in main analysis when the uptake rate was increased by 100% (Table 4). Lower uptake rates also resulted in decreases in the ICERs compared with those in the main analysis, and these were smaller than those for higher uptake rates.

A 10% reduction in completion rates resulted in the ICER (with cost offsets) for cases of obesity averted dropping by half of the main analysis (A$7,764 vs. A$35,195) but a marginal change in the ICER (with cost offsets) for QALYs gained (A$14,594 vs. A$16,899) (Table 4). However, the reverse was true when there was a further drop in completion rates. When completion rates dropped by 20%, both ICERs became smaller, but the reduction was greater for QALYs gained than cases of obesity averted. The impact on the ICERs of increased completion rates was as expected, with both ICERs becoming larger but remaining under the threshold.

Changing the payment process from regular payments to up-front payments for the 1-year-long weight-loss intervention resulted in relatively small increases in costs but large reductions in health effects (cases of people with obesity averted, BMIs averted, and QALYs), which, in turn, resulted in significant reductions in the ICERs.

Lastly, variations in the discount rate made little difference to results (Table 5).

In summary, the results remained such that WW offered more cost offsets (savings) than SC under the various uptake, completion, payment method, and discounting assumptions, though results were quite sensitive to uptake changes.

Discussion

This study modeled potential population-level impacts of the policy option of a publicly funded WW program via GP referral for the eligible population. Microsimulation modeling was used to show health outcomes and cost offsets (savings) to the health system over a 10-year period (2015-2025). New insight is provided on whether the WW program with GP referral over SC is a good use of health care resources at the population level.

Both WW and SC resulted in decreased numbers of adults with obesity. However, the potential reduction in the number of adults with obesity to 2025 compared with current disease trends is not at a level that would ensure that population obesity levels meet the World Health Organization's (13) recommendations for 2025, which set targets of no increase in obesity (or diabetes) beyond the levels of 2010. Therefore, greater access, including higher uptake levels of interventions in conjunction with a suite of additional effective options for weight loss, will be needed for Australia to make a concerted effort to meet those recommendations.

TABLE 4 Sensitivity analysis (intervention uptake and completion) of SC and WW scenarios compared with do-nothing baseline, 2015-2025[a,b]

Sensitivity analysis	SC	WW	Difference
Sensitivity to population uptake of intervention			
100% increase in uptake			
Number of adults with obesity averted in 2025	114,521	121,232	6,711
BMI units averted, 2015-2025	8,265,272	9,763,829	1,498,557
QALYs gained, 2015-2025	34,516	44,514	9,998
Cost offsets, 2015-2025 (A$ in millions)[a]	17,942	18,114	172
ICER (cost offsets in A$ per case of obesity averted in 2025)			25,624
ICER (cost offsets in A$ per QALY gained, 2015-2025)			17,200
50% increase in uptake			
Number of adults with obesity averted in 2025	86,342	90,754	4,412
BMI units averted, 2015-2025	6,200,045	7,324,934	1,124,890
QALYs gained, 2015-2025	25,898	33,287	7,389
Cost offsets, 2015-2025 (A$ in millions)[a]	17,554	17,681	127
ICER (cost offsets in A$ per case of obesity averted)			28,708
ICER (cost offsets in A$ per QALY gained, 2015-2025)			17,142
50% decrease in uptake			
Number of adults with obesity averted in 2025	28,616	29,829	1,213
BMI units averted, 2015-2025	2,055,247	2,386,982	331,735
QALYS gained, 2015-2025	8,493	10,965	2,472
Cost offsets, 2015-2025 (A$ in millions)[a]	16,761	16,798	37
ICER (cost offsets in A$ per case of obesity averted)			30,375
ICER (cost offsets in A$ per QALY gained, 2015-2025)			14,9076
Sensitivity to completion of intervention			
10% increase in completion (i.e., 67.1% for WW and 59.4% for SC)			
Number of adults with obesity averted in 2025	63,032	65,919	2,887
BMI units averted, 2015-2025	4,512,801	5,052,555	539,755
QALYs gained, 2015-2025	18,822	24,276	5,454
Cost offsets, 2015-2025 (A$ in millions)[a]	17,237	17,356	119
ICER (cost offsets in A$ per case of obesity saved, 2025)			40,978
ICER (cost offsets in A$ per QALY gained, 2015-2025)			21,693
10% decrease in completion (i.e., 54.9% for WW and 48.6% for SC)			
Number of adults with obesity averted in 2025	52,746	55,340	2,594
BMI units averted, 2015-2025	3,705,208	4,142,904	437,696
QALYs gained, 2015-2025	15,526	20,004	4,478
Cost offsets, 2015-2025 (A$ in millions)[a]	17,194	17,477	65
ICER (cost offsets in A$ per case of obesity averted 2025)			7,764
ICER (cost offsets in A$ per QALY gained, 2015-2025)			14,594
20% decrease in completion (i.e., 48.8% for WW and 43.2% for SC)			
Number of adults with obesity averted in 2025	47,657	49,809	2152
BMI units averted, 2015-2025	3,300,692	3,682,163	381,471
QALYs gained, 2015-2025	13,923	17,796	3872
Cost offsets, 2015-2025 (A$ in millions)	17,012	17,037	25
ICER (cost offsets in A$ per case of obesity averted, 2025)			11,791
ICER (cost offsets in A$ per QALY gained, 2015-2025)			6,553

Source: NCDMod simulation.
[a]Cost offsets refer to net savings associated with treatment of obesity and associated chronic diseases because of fewer people with overweight and obesity. Total health system costs estimated from health expenditure equations developed within NCDMod. Cost offsets presented are those related to obesity and other chronic diseases. All costs and cost offsets discounted at 5% per annum.
[b]ICER reflects treatment that offered improved health outcomes and greater levels of A$ (health care resources) freed in the health system (savings).
A$, 2010 real Australian dollars; ICER, incremental cost-effectiveness ratio; QALY, quality-adjusted life year; SC, standard care, WW, Weight Watchers.

TABLE 5 Sensitivity analysis (prepayment of intervention and discount rate) of SC and WW scenarios compared with do-nothing baseline, 2015-2025

Sensitivity analysis	SC	WW	Difference
Prepayment of WW			
Cost of the intervention in 2015 (A$ in millions)	121	418	297
Cost offsets, 2015-2025 (A$ in millions)[a]	17,437	17,767	3
ICER (cost offsets in A$ per person with obesity averted)			1298
ICER (cost offsets in A$ per unit of BMI averted, 2015-2025)			4
ICER (cost offsets in A$ per QALY gained, 2015-2025)			623
3.5% discounting			
Cost offsets, 2015-2025 (A$ in millions)[a]	17,231	17,328	97
ICER (cost offsets in A$ per person with obesity averted)			41,973
ICER (cost offsets in A$ per unit of BMI averted, 2015-2025)			131
ICER (cost offsets in A$ per QALY gained, 2015-2025)			20,153
No discounting			
Cost offsets, 2015-2025 (A$ in millions)[a]	17,415	17,551	136
ICER (cost offsets in A$ per person with obesity averted)			58,842
ICER (cost offsets in A$ per unit of BMI averted, 2015-2025)			184
ICER (cost offsets in A$ per QALY gained, 2015-2025)			28,256

Source: NCDMod simulation.
[a]Cost offsets refer to net savings associated with treatment of obesity and associated chronic diseases because of fewer people with overweight and obesity. Total health system costs estimated from health expenditure equations developed within NCDMod. Cost offsets presented are those related to obesity and other chronic diseases. All costs and cost offsets discounted at 5% per annum.
QALY, quality-adjusted life year; ICER, incremental cost-effectiveness ratio; SC, standard care; WW, Weight Watchers.

The only other simulation study for Australia had contrary findings that “intensive behavioral counseling interventions are not very cost-effective strategies for reducing obesity, and the potential benefits for population health are small” (11). However, there are important differences between the underlying trial data and modeling undertaken in Cobiac et al. (11) and this study. The Cobiac et al. model (11) incorporated data from a smaller RCT for the WW program (28), in which only 119 participants (aged 18-65 years and with BMI 27-40) undertook a shorter (6-month) program in a single country (the United Kingdom). Furthermore, Cobiac et al. (11) used a multistate, multiple-cohort life table approach (29), whereas our study used microsimulation and dynamic transition modeling. Lastly, they modeled lower levels of uptake (0.1% of the population at risk) but higher levels of intervention completion. Our choice of uptake was based on a recent study of the types of interventions attempted by people with overweight or obesity (26). Our sensitivity analysis confirmed that a reduction in uptake rate results in smaller population-level health changes.

Overseas lifestyle interventions modeled using individual-level models yielded results similar to those of our study. For example, the Counterweight intervention, a weight-management intervention delivered in general practice, was cost-effective with extra health benefits as well as reduced use of health care resources offsetting total program provision costs (30).

Cases of disease averted and cost offsets (savings) are sensitive to the uptake rates. The uptake rates in the main scenario were based on previous studies assessing the effectiveness of self-reported methods of attempting weight loss in the last 12 months. This illustrates the intervention’s potential with a relatively conservative uptake but hints at the potential population-level impacts that could be made if greater uptake of WW could be achieved. It also illustrates the level of uptake required (6% of the eligible population) for the program to be cost-effective. The uptake rate sensitivity analysis indicates that the study outcomes are impacted by differential uptake rates between the interventions such that the intervention with higher uptake will have better outcomes.

The study has some limitations. The simulation based on the RCT implies that the trial results, while providing high-quality evidence (31,32), may not be representative because of the trial’s eligibility criteria. Douketis et al. (33) described limitations of weight-loss studies that affect generalizability, including follow-up duration, dropout, and noninclusion of high-risk subgroups. A simulation model based on RCT results is likely to have these limitations but is the best available evidence.

Sources of uncertainty around the microsimulation model outcomes include stochastic, parameter, and structural uncertainty. Because of the model’s large size, in both number of individuals simulated and parameters included, a full probability sensitivity analysis was not within scope. The large number of individuals simulated provides stability around the outcomes regarding stochastic uncertainty, and the sensitivity analysis provides information about the parameter uncertainty.

SC is modeled on an RCT in which GPs provided best-evidence advice and follow-up, which may not represent usual care in general practice. In 2012, only 24% of Australian patients seen for obesity received care in line with the national guidelines (34), suggesting that the modeled SC overestimates outcomes compared with current GP care in Australia, meaning that WW benefits may be greater than simulated.

The analysis assumes that WW would have the capacity to expand its services to meet the generated need of implementing the described intervention. This assumption may not initially hold, but because WW is a commercial group-based intervention, it would expand over time to accommodate increased demand.

In the current environment, primary care professionals, especially GPs, are working at capacity as well as facing an increasing number of patients with obesity in need of treatment (35). GPs have little more than the standard 20-minute consultation within which to try to improve the management of patients with obesity, a complex, multifactorial chronic condition (8). The capacity for GPs to refer to an established commercial weight-loss program (such as WW) offering cost savings provides an additional feasible treatment. Under current funding arrangements, attending such programs results in out-of-pocket costs that, for those most in need (because of the established links between obesity and socioeconomic disadvantage) (36,37), are likely to be unaffordable (38). Government funding or subsidies through Medicare for commercial weight-loss programs found to be both efficacious and cost-effective would therefore provide GPs with additional weight-management options that make good "economic sense" but also help to address some of the inequalities in access to obesity care (i.e., health care access based on need). As shown in our sensitivity analysis, careful consideration is required in the development of policy around payment, as pre-purchase of a 1-year intervention is more costly than a pay-as-you-go option because of the relatively high level of dropout in weight-management interventions. However, the addition of effective commercial weight-loss programs (namely WW) as Medicare items and coverage by private health insurance companies could remove barriers to better treatments and support individuals with overweight or obesity in their efforts to make lifestyle changes (39). O

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