


ORIGINAL ARTICLE

Adult weight management across the community: population-level impact of the LOSE IT to WIN IT challenge

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Summary

Objective

Excess body weight negatively impacts health, but there are few evaluations of low-intensity weight management challenge programs in defined populations. This study examined weight change in adults who participated in the LOSE IT to WIN IT (LIWI) health challenge in a US community. The community-level impact on body mass index was also explored.

Methods

Body weight was analysed over 1 year in the cohort of LIWI enrollees, stratified by participants who were healthy weight or overweight/obese at baseline. Secondly, a multiple cross-sectional analysis compared the 2.5-year trends in body mass index between community adults who did vs. did not participate in LIWI.

Results

LOSE IT to WIN IT participants who were overweight/obese lost a mean (95% confidence interval) 1.6 (1.2, 2.0) kg (~2%) over 1 year ($p < 0.001$), whereas healthy weight participants lost 0.7 (0.3, 1.1) kg. Across the community, LIWI participants and non-participants both gained 0.4 kg m⁻² over the 2.5-year study period ($p = 0.884$).

Conclusions

LOSE IT to WIN IT was modestly effective among enrollees, resulting in a small weight loss of 2% over 1 year among those who were overweight/obese. However, LIWI did not impact weight gain in the community. To slow such community-level weight gain trends, weight management challenges must reach larger fractions of the populations that they target.

Keywords: Adults, Community health, Weight management.

Introduction

Excess body weight is a top public health concern in the USA and many other countries. Overweight and obesity are major contributing causes of the most prevalent chronic diseases, including cardiovascular disease (CVD) and type 2 diabetes (1). The number of individuals who are overweight or obese in the USA has continually risen over decades, with 38% of adults now considered obese (2). Environmental and clinical interventions are needed to reverse this trend, particularly in groups with

lower socioeconomic status, racial minorities and rural areas, where the burden of overweight and obesity is disproportionately high (2–4).

There is accumulating clinical trial evidence on various weight loss therapies, but few published examples targeting whole communities. Community-level weight management interventions tend to be of lower intensity, which is often necessary (due to resource constraints) when delivering such programs on a large scale. Regional health departments and other health interest groups often recognize the priority of addressing overweight/obesity in

their constituent areas, and community weight management challenges are a recommended population health strategy (5). Evaluations of their performance, however, are quite limited. Most published community programs are community-based, meaning they are conducted in non-clinical settings or are otherwise designed for specialized groups within the community (6–13). Programs targeting entire defined communities are rarer. An early example of a community weight management challenge found that about 10% of adult residents from the rural Australian community of Wellington participated over 12 weeks (14). Mean weight loss was 3 kg over that time, but this estimate was statistically unreliable as only 59% of the 371 enrollees were available for follow-up, and study timepoints were analysed as independent samples. Carter-Edwards and colleagues (15) promoted a weight management challenge in the Durham, NC, community using the local newspaper (and associated website). Of the 705 participants, only 154 with self-reported body weights during weeks 1 and 15 were analysed, again making the estimated 2.7-kg weight loss inference difficult to interpret. Similar findings have been reported by at least three other community-level weight management challenges (16–18).

Scientists have called for more rigorous research to confirm the purported benefits of community weight management challenges (19), as few prior evaluations adequately quantify the target population, systematically collect weight change data (beyond self-report) or use all available data to generate appropriate statistical estimates of weight outcomes. The purpose of this study was to, using an observational design, examine weight change over 1 year in adults who participated in LOSE IT to WIN IT (LIWI), a weight management challenge that targeted both overweight/obese and healthy weight adult residents of a defined rural community in Minnesota (USA). We also examined the population-level impact of LIWI on body mass index (BMI) trends among residents of the target community who did vs. did not participate.

Methods

Setting

LOSE IT to WIN IT was implemented as part of the broader Hearts Beat Back: The Heart of New Ulm Project (HONU). Initiated in 2009, HONU is a 10-year cardiovascular health improvement project (20,21) based in the postal district (ZIP code) of 56073, a predominantly rural area of south-central Minnesota that includes the city of New Ulm. The suite of HONU initiatives are described in more detail elsewhere (22–24), but interventions were designed to reduce the most prevalent modifiable CVD risk

factors, such as overweight and obesity, dyslipidemia and hypertension (among others), as previously identified via a baseline risk assessment (21). Some CVD risk factors in HONU have already improved (22,23), but little progress has been observed regarding body weight (22). Health care in New Ulm is delivered by a single system, Allina Health (headquarters Minneapolis, MN, USA), that operates the New Ulm Medical Center (NUMC). Thus, the use of a single electronic health records (EHRs) repository provides near-complete capture of medical data for research and surveillance purposes (25).

LOSE IT to WIN IT

As part of HONU activities, LIWI was implemented as a free community-wide health challenge offered to all adults who live or work in New Ulm. LIWI ran from June 2013 to December 2014. LIWI was open to area adults of any weight, as it was designed to help those with a BMI ≥ 25 kg m⁻² lose weight (a weight loss goal of 10 lb [4.5 kg] was encouraged) or those with a BMI < 25 kg m⁻² avoid weight gain. It was a low-intensity, lifestyle approach that aimed to reach all adult community members, whether overweight or not, and reward them for making healthier lifestyle choices towards a general goal of improved weight control. This community health challenge was tailored and adapted using the incentaHEALTH™ (www.incentahealth.com; Denver, CO, USA) platform that is designed to deliver incentives to individuals for weight loss. As described further in the succeeding text, HONU adapted the general incentaHEALTH framework for New Ulm with supplemental strategies, educational materials, community resources and input from the HONU Steering Committee (community advisory board).

Components

Enrolment data and outcomes ascertainment was enabled through the use of four primary LIWI kiosks placed at common locations throughout New Ulm, including NUMC, the city recreation centre, a local grocery store and one that was initially located at a major local employer, but was subsequently relocated to a second local grocery store in order to broaden community access. A fifth mobile kiosk was also temporarily available to conduct weigh-ins at different locations throughout the community upon request, such as at worksites or other community health events. Each kiosk was connected to the LIWI website and a private self-weighing station. In order to enrol in LIWI, participants had to complete a two-step registration process before the end of November 2013 that included (1) creation of an online account plus baseline survey and (2) registration at a LIWI kiosk, which

included a baseline weigh-in with photographic identity verification. As part of the LIWI instructions at enrolment, participants were encouraged to weigh-in at a LIWI kiosk at least quarterly through the end of December 2014 and were offered additional weight management support/education via daily motivational tips sent to their email or texted to their mobile phone, access to an online health guide and tracking logs for weight, physical activity and nutrition. Other online LIWI features included workout podcasts available for download and a personal success journal to record milestones or challenges. LIWI participants could also self-refer to a personal trainer for weight management questions or advice via phone or email.

Incentives

Incentives were offered as a motivational component of LIWI. As outlined in Table 1, the overall incentive model had several components, including community-level and some individual-level incentives for LIWI engagement, supported by local donors. The HONU Steering Committee advised against the sole use of a traditional individual-level weight loss incentive model (whereby participants only earn rewards for the weight that they lose at regular intervals) and instead recommended community-based incentives for participation, weight loss and/or weight maintenance milestones. LIWI participants could collectively earn up to \$100,000 for the New Ulm city government to purchase outdoor fitness equipment for area

parks and bicycling improvements (e.g. storage racks, designated lanes and route signage) at the end of the challenge.

Phone coaching

LOSE IT to WIN IT enrollees who lived in the HONU target ZIP code and had a BMI ≥ 30 kg m⁻² also had the option of personalized telephonic coaching for weight loss. As part of the online registration, individuals were asked whether they would be interested in phone coaching. A designated LIWI coach then proactively reached out to eligible and interested participants (up to three phone attempts) to invite them to participate in coaching activities. Coaching sessions focused on personalized goals for improving nutrition, increasing physical activity, managing stress and preventing relapse. Calls typically lasted 20 min and were conducted monthly for up to 1 year, but participants could choose to talk with their health coach more or less often depending on preferences. Following a similar model established in a prior telephonic CVD prevention program in HONU (24), coaches documented participants' weight and behaviour change progress in the local EHR.

Recruitment

The LIWI enrolment period lasted 6 months (June to November 2013) in order to provide all participants with

Table 1 Incentive structure of the LOSE IT to WIN IT (LIWI) community health challenge

LIWI activities	Community incentives – awarded to the City of New Ulm for completion of each activity	Individual incentives – awarded to the LIWI participant for completion of each activity
Participation	<ul style="list-style-type: none"> • \$10 earned for completing LIWI registration online, up to \$25,000 total 	
Engagement	<ul style="list-style-type: none"> • \$36.93 earned for meeting LIWI completion criteria (i.e. kiosk weigh-in for at least two quarterly follow-up periods plus completed the 6- or 12-month follow-up survey), up to \$25,000 total 	<ul style="list-style-type: none"> • Free t-shirt for meeting LIWI completion criteria • Entry into \$50 drawing for meeting LIWI completion criteria • Entry into monthly prize drawings (~\$50 value, donated by local businesses) for earning 400 points by tracking health behaviours on the LIWI website • \$0.10/gallon gasoline discount (from a local grocery store) earned for each month a kiosk weigh-in occurred • \$0.25/gallon gasoline discount (from a local grocery store) earned for each quarter a kiosk weigh-in occurred
Weight change	<ul style="list-style-type: none"> • Range from \$15 earned for no weight gain (if baseline BMI was <25 kg m⁻²) up to \$150 earned for $\geq 30\%$ weight loss (if baseline BMI was ≥ 25 kg m⁻²), up to \$50,000 total 	

BMI, body mass index.

at least 1 year of exposure to the challenge. Promotional strategies included mass media announcements (e.g. newspaper articles/inserts, billboards, radio ads, signage and local television access video), targeted outreaches (e.g. postcards, HONU newsletter and emails/calls to large community worksites), social media postings, HONU website links and HONU staff presentations at local service group meetings. In-person registration sessions were also held at various community and worksite events. For individuals who began the LIWI enrolment process but did not complete it (e.g. only created an online account but failed to visit a kiosk), letters were mailed prompting them to complete all enrolment activities.

Behaviour change and retention strategies

To help maintain engagement in weight management activities, a LIWI promotional campaign was launched that included mass media efforts (e.g. newspaper ads, billboards, newsletter articles, e-blasts, local cable television video, radio ads and sandwich-board postings), targeted mailings to inactive enrollees and weekly social media postings encouraging continued behaviour change and weight management progress. Regular utilization of behavioural self-monitoring tools was promoted in this campaign that included a tracking logbook (online and printed [and wallet] versions available) for daily food/beverage intake and body weight and a daily success journal for other key weight management behaviours such as adequate sleep, daily breakfast, regular physical activity, high consumption of fruits and vegetables and managing stress. Educational handouts were available online and by request in print format for physical activity, managing stress for weight loss, sleeping well to manage weight, creating a calorie deficit, seasonal handouts with specific seasonal activity and nutrition suggestions and a supplemental mailing to prompt participants to complete a 12-month evaluation survey and final weigh-in. Three team challenges were also implemented whereby LIWI participants could assemble four to eight person teams and compete against other teams for weight loss amounts or other tracked healthy behaviours. Prizes to winning teams included free cooking classes, jackets and complementary entries to a community 5K race/walk event.

Research design

Two separate evaluation studies were conducted. To examine the within-challenge weight management benefits of LIWI, body weight was longitudinally analysed over 1 year among the cohort of enrollees, stratified by participants' weight status at enrolment ($\text{BMI} \geq 25 \text{ kg m}^{-2}$ or $\text{BMI} < 25 \text{ kg m}^{-2}$). A secondary analysis was also performed

using a multiple cross-sectional design and included all adult residents of the target ZIP code with an active EHR. BMI was compared over 2.5 years between those who did vs. did not participate in LIWI, per EHR data from NUMC. The timeframe for this analysis corresponded to the 1-year period before LIWI launch, plus the 1.5-year active phase of LIWI. The use of programmatic and EHR data for this study was approved by the Quorum Institutional Review Board on behalf of Allina Health, with a waiver of informed consent for this retrospective program evaluation.

Sample and data sources

The primary analysis included all LIWI enrollees, and data for this analysis were extracted from LIWI records. For the secondary analysis of the New Ulm community, inclusion criteria were (during the 2.5-year study timeframe): (1) resident of the 56073 ZIP code, (2) age ≥ 18 years and (3) at least one ambulatory BMI measure in the EHR. Data for this analysis included LIWI information to identify participants and linkage to NUMC's EHR data. To link LIWI challenge data with local EHR data, an automated record matching algorithm was used that considered individuals' full name, date of birth, gender, residential address and race/ethnicity. Partial or questionable matches were manually reviewed for final determinations.

Measures

In the primary analysis of LIWI participants, the outcome was body weight. Body weight was collected from LIWI kiosk weigh-ins. At a given kiosk station, this involved a participant entering the private weigh-in area, removing their shoes and any heavy clothing, stepping onto the calibrated digital scale and having their picture taken for verification purposes before logging out. Body weight was collected in this manner at enrolment, and participants were recommended to weigh-in at baseline and at least once per quarter over 1 year. The LIWI kiosk scales were calibrated and validated upon set-up, but no further calibration was performed during the active intervention phase. For analytical purposes, enrolment weight plus the most recently known weight value within each of the four ensuing quarterly follow-up periods was used. Covariates for this analysis included baseline age, gender and BMI, which were collected from LIWI records.

In the secondary analysis of the New Ulm community, the outcome was BMI. BMI was extracted from the EHR, and it was calculated by dividing weight in kilograms by height in meters squared, as measured by NUMC staff during usual medical care visits. For analytical purposes, the most recently known BMI value within

each quarterly follow-up interval was used. Covariates for this analysis included age and gender, per the EHR. LIWI enrolment status was established based on the patient matching procedures outlined previously.

Analyses

Analytical procedures were conducted using two-sided tests with SPSS version 18 (IBM, Armonk, NY, USA). In the primary longitudinal panel analysis of LIWI participants, all individuals enrolled in LIWI were included, and no imputations were made for missing body weights. Using generalized estimating equations (GEEs), body weight was predicted at each of the four quarterly follow-ups over 1 year since enrolment. Pairwise *t*-tests were used to compare within-group weight changes between each quarterly follow-up. Models were adjusted for participant age, gender and baseline BMI. Given their differing goals, separate analyses were carried out for LIWI participants who were overweight/obese (BMI ≥ 25 kg m⁻²) or not overweight/obese (BMI < 25 kg m⁻²) at enrolment. A sensitivity analysis was also conducted in the subset of participants who were obese (BMI ≥ 30 kg m⁻²) at enrolment and did vs. did not participate in the phone coaching option.

In the secondary multiple cross-sectional analysis of the New Ulm community, GEE was again used to predict BMI in each of the 10 quarters over the 2.5-year timeframe covering July 2012–December 2014. Models were adjusted for age and gender and included a group-by-time (i.e. LIWI participation by quarter) interaction term. No stratification was made by overweight/obese or healthy weight status, as the intent of this analysis was examined if LIWI (in whole) impacted community BMI trends. To gauge the degree to which BMI trends

may have differed between LIWI participants and non-participants before and after LIWI launched, a spline knot was also included in this analysis after the first four quarters.

Generalized estimating equation was used in both analyses because it accounts for the correlation of repeated measurements over time and uses an estimator for variances of fixed effects that is asymptotically robust to misspecification of the correlation structure. This approach is also well suited for natively dealing with missing data under the assumption of missing at random (26). The working correlation matrix was specified as unstructured because it does not impose a priori constraints on observed correlations over time. Robust standard errors are computed for an unbiased estimate of the variability in predicted weight and BMI values.

Results

There were 1,970 adults that completed LIWI registration, with 74% being overweight or obese at enrolment (Figure 1). Mean (standard deviation) age was 48 (13) years, and 76% were female. About two-thirds of participants completed at least one post-enrolment weigh-in, with 13% completing a weigh-in at all four follow-up quarters. Fifty per cent of participants enrolled during the first month of the registration window. When asked how they heard about LIWI, common sources were the HONU newsletter (9% email version and 8% print version), community flyers (9%) and newspaper ads (9%). The most popular source was at work, with 37% reporting having heard about LIWI from their employer and another 12% from a co-worker. A total of 72 worksites had employees enrolled in LIWI. The total community incentive amount earned was \$59,175 (of \$100,000 possible) for new

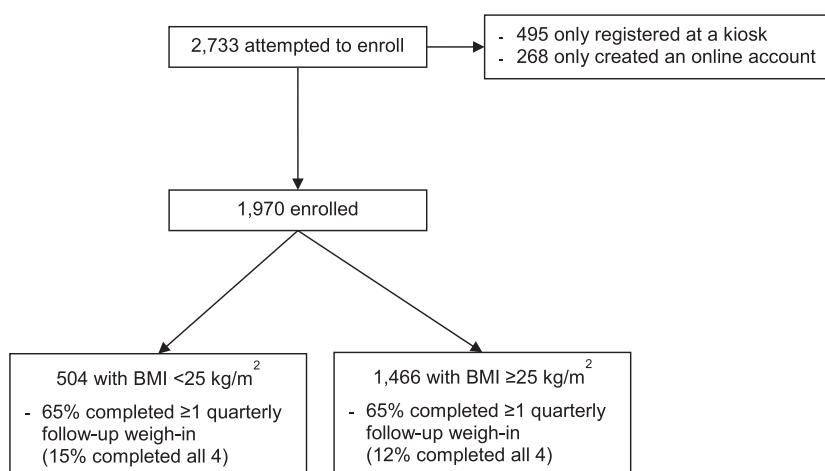


Figure 1 Participant flow in the LOSE IT to WIN IT community health challenge. BMI, body mass index.

outdoor fitness equipment in New Ulm. This included \$22,380 earned for enrolments based on \$10 earned for each of the 2,238 individuals who enrolled in LIWI online, \$19,905 for the 539 individuals who met the LIWI completion criteria and \$16,890 for weight loss and weight maintenance milestones.

Weight change within LOSE IT to WIN IT

Among LIWI participants who were overweight/obese at enrolment, there was a significant overall association for time ($p < 0.001$) in the adjusted model. As outlined in Figure 2, mean (standard error) baseline weight was 94.5 (0.2) kg, and mean weight at the fourth quarter follow-up was 92.9 (0.3) kg, for an estimated weight loss of 1.6 (0.2) kg over 1 year. Body weight measured at all

quarterly follow-ups was significantly less than baseline ($p < 0.001$ for all baseline to follow-up comparisons), but pair-wise comparisons revealed no significant differences in body weights between any follow-up quarters, suggesting that weight loss was most pronounced during the first quarter after enrolment. Among the 830 LIWI participants who were obese at enrolment, 126 (15%) utilized phone coaching. Weight loss was more pronounced in this subset of LIWI participants, averaging 3.0 (0.8) kg lost over 1 year. In contrast, LIWI participants who were obese and did not utilize phone coaching ($n = 704$) lost less weight (1.4 [0.5] kg lost) over 1 year.

Among LIWI participants who were not overweight/obese at enrolment, there was also a significant overall association for time ($p = 0.002$) in the adjusted model. On average, participants weighed 68.2

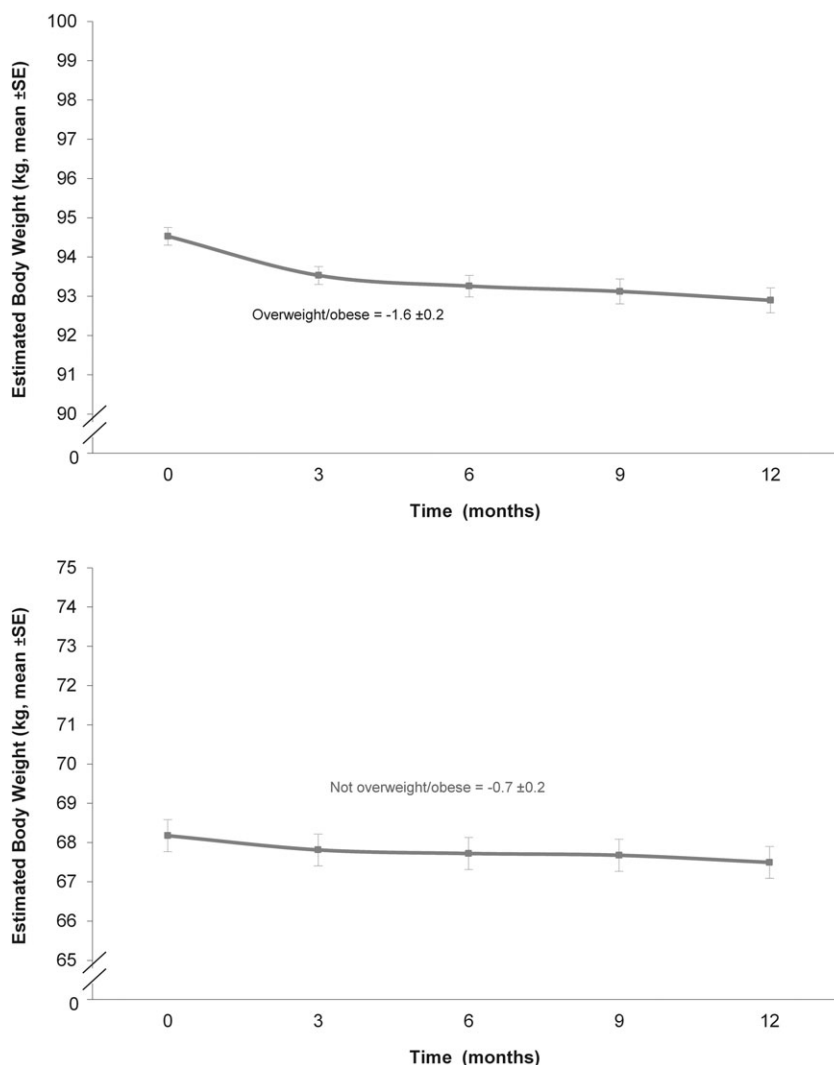


Figure 2 Model-estimated body weight change over 1 year among adults who participated in the LOSE IT to WIN IT community health challenge, panelled by those who were overweight/obese or not overweight/obese at enrolment. SE, standard error.

(0.4) kg at baseline and lost 0.7 (0.2) kg by the fourth quarter follow-up (Figure 2). Though of more modest magnitude, the general weight change pattern in this group was similar to the participants who were overweight/obese in that there was a small but significant weight loss in all follow-up quarters relative to baseline ($p < 0.05$ for all baseline to follow-up comparisons) but no significant differences between follow-up quarters thereafter.

Body mass index change across New Ulm

To assess BMI change across New Ulm, data on LIWI enrolment status were linked to local EHR data and analyses restricted to those who resided in the target 56073 ZIP code. Of the 1,970 LIWI enrollees, 1,362 resided in the HONU target ZIP code and also had a BMI measure available in the EHR. Per US Census estimates, there were an estimated 13,288 adult residents in the target population at the time of LIWI launch; thus, the estimated participation rate was 10%. In addition to the 1,367 LIWI participants from the target ZIP code, there were 10,555 adult residents of the target ZIP code who had at least one BMI measure available in the EHR during the 2.5-year study timeframe (i.e. comparison group of non-LIWI participants). A high proportion (>80%) of New Ulm adults are typically 'captured' in the NUMC EHR within a ~2-year timeframe (22), and the EHR-based adult community population has a similar age and gender structure as compared with community Census data (25). In the

analytical dataset, the proportion of individuals contributing a BMI measure in any given quarter during this timeframe was stable, with a mean of 44% per quarter contributing a BMI measure among LIWI participants and 42% per quarter contributing a BMI measure among non-participants. As outlined in Figure 3, the average New Ulm adult had a BMI that was near to the obesity threshold, and LIWI participants were somewhat larger than those who did not participate. BMI change was similar in both groups over time, as LIWI participants and non-participants each gained about 0.4 kg m^{-2} , on average, over the 2.5-year study period. The group-by-time interaction term after the fourth quarter spline knot (corresponding to LIWI launch) was not significant ($p = 0.884$), indicating similar weight change 'slopes' in both groups. Age and gender were also significant covariates in the full model (not shown).

Discussion

The LIWI challenge was associated with a small but statistically significant average weight loss of about 2% over 1 year among participants who were overweight or obese at enrolment. This was nearly identical to observations from a large community weight management challenge recently completed in Colorado (27) and generally encouraging given the similarly low-intensity components in both studies (e.g. online access to weight management education and behavioural self-monitoring tools and weigh-in kiosks). The subset of LIWI participants who

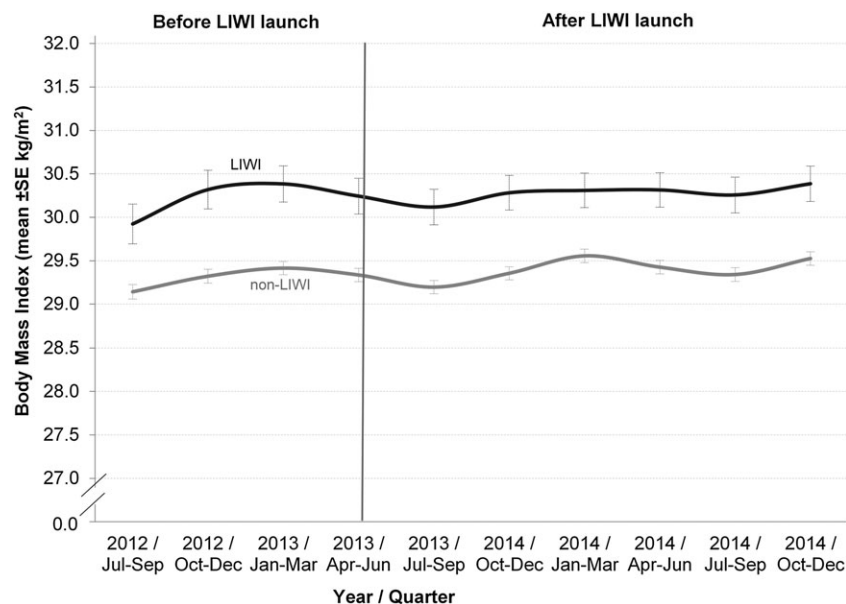


Figure 3 Model-estimated body mass index by quarter between July 2012 and December 2014 among adult residents of New Ulm, Minnesota, stratified by those who did and did not participate in the LOSE IT to WIN IT (LIWI) community health challenge. SE, standard error.

took advantage of the phone coaching option had the greatest weight loss at about 3% over 1 year, although in the absence of a parallel control condition, it is difficult to attribute this finding solely to phone coaching.

Interestingly, LIWI participants who were not overweight or obese lost about 1% of their body weight over 1 year. And the proportion of LIWI enrollees who were overweight/obese at baseline mirrored rates previously observed in New Ulm (21). The reach of LIWI into the healthy weight population, many of whom would presumably consider a weight management challenge program unnecessary, was somewhat surprising. Given the expected weight gain of about 1 kg year⁻¹ in US adults (28,29), LIWI was arguably more impactful with the subgroup of participants who were (presumably) seeking weight gain prevention, which has proven elusive in many large trials (30,31). Why this may have been the case in LIWI is unclear but could be related to the programmatic emphasis on regular self-weighing, which has been shown to be an effective strategy for weight gain prevention (32). This may suggest that community-level weight management efforts should put more focus on, or at least not forgo, groups where weight gain prevention is most appropriate because the within-program impact may be greater than focusing only on participants who desire weight loss.

Given the single healthcare system in New Ulm and existing HONU population health surveillance activities (21,22), this study offered an uncommon opportunity to gauge the impact of a weight management challenge across the entire community that it targeted. But the population-level analysis of BMI change in New Ulm underscored some of the limits of low-intensity community-level weight management challenge programs like LIWI. The 6-month recruitment efforts yielded a participation rate of about 10% among New Ulm adult residents. This was greater than the ~1% program penetration observed in the prior Colorado project (27) and the reach of LIWI seemed particularly successful in worksites. As is typical of many weight management programs (33), however, enrollees were skewed towards middle-age females. Regardless of LIWI participation status, typical circannual patterns of weight change (e.g. seasonal weight gain during the winter months (34)) were similar in both groups over 2.5 years (1 year before and 1.5 years after LIWI launch). In addition, few participants continuously weighed in at LIWI kiosks. The combined community-individual incentive model linked to weight change and self-monitoring behaviours, while novel, was perhaps insufficiently large (or motivating enough) when viewed from the population-level. LIWI may not have attracted a meaningfully large enough fraction of the target community, nor sustained enrollees'

interest/engagement in key activities like kiosk weigh-ins long enough, to at least slow the broader community-level weight gain trends in New Ulm.

Strengths of this study were the widespread availability of EHR data within the target community, as well as the estimates of weight change in both analyses that did not rely on self-reports. There were also several limitations. This study was a retrospective evaluation of a lifestyle weight management challenge that, while lower in intensity relative to other major trials and medical weight loss therapies (35), still required considerable resources for recruitment promotions, individual and community engagement and programmatic infrastructure that few other communities have or may want to invest. The within-program analysis did not have a parallel control arm, and direct measurements of behavioural factors (e.g. caloric consumption and physical activity minutes) were not systematically captured for all participants. Also, there were missing body weight observations in both analyses. The GEE procedure takes advantage of inverse probability weighting to account for missing values, but this is obviously less desirable than having complete data to directly base weight change estimates on. The secondary analysis of BMI trends across New Ulm was not a panel analysis whereby all individuals contributed complete data in all follow-up periods. It instead consisted of a series of cross-sectional extractions of BMI to provide a reasonable representation of bodily growth trends in New Ulm adults. Future analyses may benefit from assembling a prospective cohort of community residents to examine lifestyle factors alongside weight management effectiveness, as well as how community-level weight changes may or may not impact cardiometabolic disease risk over time.

Conclusions

Excess body weight continues to be a decrement to the American public's health. Low-intensity weight management challenges like LIWI can result in statistically significant weight loss for overweight/obese participants over time, but of rather limited clinical significance. They may be more helpful in terms of weight gain prevention, but more research is still needed on the optimal use/mix of resources to address weight management at the community level, as few published weight loss interventions include population-level impact estimates. Alongside continued improvements in public policy and the built environment, low-intensity weight management challenges have the potential to help slow overweight/obesity trends if they can be constructed in ways that sustain engagement by large fractions of the communities that they target.

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Disclosures

The authors declared no conflicts of interest.

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