Changes in Health State Utilities With Changes in Body Mass in the Diabetes Prevention Program

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Health utilities are measures of health-related quality of life (HRQL) used in cost-effectiveness research. We evaluated whether changes in body weight were associated with changes in health utilities in the Diabetes Prevention Program (DPP) and whether associations differed by treatment assignment (lifestyle intervention, metformin, placebo) or baseline obesity severity. We constructed physical (PCS-36) and mental component summary (MCS-36) subscales and short-form-6D (SF-6D) health utility index for all DPP participants completing a baseline 36-item short form (SF-36) HRQL assessment (N = 3,064). We used linear regression to test associations between changes in body weight and changes in HRQL indicators, while adjusting for other demographic and behavioral variables. Overall differences in HRQL between treatment groups were highly statistically significant but clinically small after 1 year. In multivariable models, weight change was independently associated with change in SF-6D score (increase of 0.007 for every 5 kg weight loss; $P < 0.001$), but treatment effects independent of weight loss were not. We found no significant interaction between baseline obesity severity and changes in SF-6D with changes in body weight. However, increases in physical function (PCS-36) with weight loss were greater in persons with higher baseline obesity severity. In summary, improvements in HRQL are associated with weight loss but not with other effects of obesity treatments that are unrelated to weight loss. Although improvements in the SF-6D did not exceed commonly reported thresholds for a minimally important difference (0.04), these changes, if causal, could still have a significant impact on clinical cost-effectiveness estimates if sustained over multiple years.

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INTRODUCTION

For persons who are contemplating different weight loss strategies, improvement in health-related quality of life (HRQL) is an important consideration. In this context, improvements in HRQL could be mediated by weight loss or, rather, could occur through other intervention effects. For example, weight loss could improve well-being and reduce bodily pain, depression, or anxiety (1–3). Conversely, components of lifestyle interventions that enhance social activation (4) and increase physical activity (5) could produce greater HRQL improvements than non-lifestyle interventions (e.g., pharmacotherapy), regardless of weight loss.

A recent systematic review of randomized trials found mixed evidence for any consistent or meaningful change in common HRQL measures with weight loss interventions (3). However, this review was unable to disentangle HRQL changes occurring as a result of weight loss vs. other intervention effects. In addition, very few prior studies have focused on the impact of weight changes on health state utilities (3,6). Health utilities are generic HRQL measures that capture individual preferences for different states of health and functioning using a continuum from 0 (representing death) to 1 (representing optimal health) (7). Health utilities are used to calculate quality-adjusted health outcomes in cost-effectiveness research and are instrumental for informing policy decisions (7) and perhaps personal treatment choices (8–10).

The Diabetes Prevention Program (DPP) was a large, multicenter, randomized trial that demonstrated the

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effect of an intensive lifestyle (ILS) intervention and of pharmacotherapy with metformin on the development of type 2 diabetes mellitus among overweight or obese adults with impaired glucose tolerance (11,12). The DPP collected annual data that can be used to calculate health utilities and other HRQL measures. Because participants in all three DPP treatment groups experienced varying degrees of weight loss, the extent to which changes in health utilities were a result of weight loss as opposed to some other effect of the different treatment approaches is not yet clear. We evaluated whether changes in body weight were associated with changes in health utility scores over 1 and 2 years of follow-up in the DPP. In addition, we explored whether relationships between changes in body weight and changes in health utilities differed by the type of weight loss approach (i.e., ILS intervention, medication (metformin), or standard lifestyle intervention (placebo)), or by baseline obesity severity.

METHODS AND PROCEDURES

Design and participants

DPP participants were ≥25 years of age, had a BMI of ≥24 kg/m^2 (≥22 kg/m^2 in Asian Americans), and had impaired glucose tolerance, defined by a plasma glucose level of 140–199 mg/dl 2 h following a 75 g oral glucose challenge (13).

DPP study interventions

The DPP ILS intervention was a goal-based diet and physical activity intervention designed to achieve and maintain modest weight reduction (14). Goals were to achieve and maintain at least 150 min per week of moderate physical activity (e.g., walking or swimming) and to reduce weight by 7% from baseline. Participants were counseled to reduce dietary intake to 1,200–2,000 kcal/day based on their baseline weight, and to reduce dietary fat to <25% of total calories. ILS participants were assigned a personal lifestyle coach who met with them 16 times over the first 24 weeks to complete a core curriculum and then met at least bimonthly for the remainder of the trial. Periodic group classes and campaigns were used to maintain weight and activity goals. Approximately three-fourths of DPP ILS participants achieved the intended treatment goal for physical activity and half achieved the 7% weight loss goal at 6 months; this translated to a 58% reduction in the risk for developing diabetes over 2.8 years of follow-up (12).

Participants in both placebo and metformin arms received standard lifestyle recommendations in the form of written information and an annual 20–30-min individual session that emphasized the importance of a low-fat diet and regular physical activity to achieve modest weight reduction. Treatment with metformin was increased over 1 month to a full dose of 850 mg taken twice daily. The placebo group also received a matching placebo tablet taken twice daily.

Measures

Generic quality of life assessments were collected annually using both the Medical Outcomes Study 36-item short form (SF-36) (15–17) and the self-administered version of the Quality of Well-being Scale (QWB-SA) (18,19). Although the QWB-SA has been used previously to model quality-adjusted health outcomes in the DPP (20,21), study sites did not begin administering this instrument until midway through recruitment. Thus, only 807 DPP participants completed the QWB-SA at baseline, making it less useful for exploring changes in health utilities with changes in weight over time and across participant subgroups. By contrast, the SF-36 was administered from the start of the DPP and is available for 3,206 participants. The short-form-6D (SF-6D) is a preference-based health state classification developed from the SF-36 (22,23). The six dimensions captured by the SF-6D are physical functioning, role limitations, social functioning, pain, mental health, and vitality. Each dimension has between two and six levels. An SF-6D "health state" is defined by selecting one level from each dimension. A total of 18,000 health states are possible. In a previous study, preference weights for a sample of these health states were obtained from a community-based population using a standard gamble technique, and estimates for all remaining health states were modeled using multivariable regression (22). All responders to the SF-36 questionnaire can be assigned an SF-6D score if the 11 items used to calculate the SF-6D were completed. The SF-6D is a continuous measure, scored on a 0.29–1.00 scale, with 1.00 indicating optimal health (22,24). The SF-6D is valid, reproducible, and sensitive to change across a variety of disease states (22,24). In past studies involving adults with a wide spectrum of chronic health conditions, meaningful differences in other measures of global health status were associated with average differences in the SF-6D (i.e., a "minimally important difference") of ~0.041, with a relatively wide range of estimates for minimally important difference (0.011–0.097) across studies (24).

We explored changes in weight associated with changes in mental and physical health constructs by using the physical component summary (PCS-36) and mental component summary (MCS-36) of the SF-36. Both scales have been used extensively in past research and are valid and reproducible in adults with a variety of chronic illnesses (25).

Weight was measured to the nearest 0.1 kg with participants wearing usual clothes. Dietary information was collected by personal interview using a modified Block semi-quantitative food frequency questionnaire (26). Physical activity was measured by the Modifiable Activity Questionnaire (27,28). Leisure activity levels (MET-hours per week averaged over the past year) were derived from the product of the duration and frequency of each activity (hours/week), weighted by an estimate of the metabolic cost of that activity (MET) and summed across all activities performed.

Analysis

Our primary dependent variable was change in SF-6D, calculated as the difference between scores at baseline and follow-up. Our primary independent variable was change in body weight, also calculated as the difference between baseline and follow-up. We assessed the significance of associations between changes in SF-6D and changes in weight using multivariable linear regression, with separate models to assess changes at 1 and 2 years of follow-up. We believed *a priori* that several factors might confound observed relationships between changes in body weight and SF-6D scores. In bivariate analyses, we found no association in the DPP study sample between changes in SF-6D score and either age or selected comorbid diseases (hypertension or dyslipidemia). To avoid potential confounding by other factors, we included the following covariates in each of our models: sex, a five-category race/ethnicity indicator (Hispanic, non-Hispanic white, non-Hispanic black, Native American, Asian/Pacific Islander), baseline marital status (married or living together vs. not married), baseline employment (full time/part-time vs. retired vs. other), baseline education (high school or less vs. beyond high school), baseline Beck Anxiety Inventory (range: 0–63) (29), baseline Beck Depression Inventory (BDI; range: 0–63) (30), baseline percent calories from fat, baseline MET-hours per week of modifiable physical activity, and baseline weight. Because our main effect was the *change* in SF-6D, models already accounted for differences in baseline HRQL. However, we conducted sensitivity analyses that re-ran regression models including the baseline value of the dependent variable (e.g., baseline SF-6D) as a covariate. These sensitivity analyses showed no statistically significant or clinically meaningful differences in effect estimates when compared to models without covariate adjustment for the dependent HRQL variables. Because the SF-6D score was highly correlated with PCS-36 and MCS-36 subscales, we did not include these indicators as covariates in models assessing changes in SF-6D. However, we did explore the influence of change in weight on change in PCS-36 and MCS-36 in separate models.

Table 1 Baseline and 1-year behavioral, metabolic, and quality of life variables by DPP treatment group*

	Baseline (overall) *N* = 3,206	1 Year					
		Lifestyle		Metformin		Placebo	
Variable	Mean (s.d.)	*N*	Mean (s.d.)	*N*	Mean (s.d.)	*N*	Mean (s.d.)
Age (years)	50.6 (10.7)	—	—	—	—	—	—
Female	68%	—	—	—	—	—	—
Non-Hispanic white	55%	—	—	—	—	—	—
African American	20%	—	—	—	—	—	—
Hispanic	16%	—	—	—	—	—	—
American Indian	5%	—	—	—	—	—	—
Asian American	4%	—	—	—	—	—	—
Weight (kg)	94.2 (20.3)	1,023	87.2 (20.2)	1,015	91.5 (20.0)	1,026	93.89 (20.6)
Weight change (kg)	—	1,023	–6.75 (6.98)†	1,015	–2.72 (4.73)†	1,026	–0.43 (4.73)**
%kcal from fat	34.1 (7.1)	987	27.6 (6.7)	993	33.3 (6.6)	988	33.3 (7.1)
Total kcal/day	2,126 (1,037)	987	1,660 (718)	993	1,849 (787)	988	1,852 (808)
Physical activity (MET-hours per week)	16.3 (25.8)	1,013	22.5 (22.8)	1,008	18.3 (26.7)	1,015	18.1 (24.2)
SF-6D	0.800 (0.103)	1,024	0.802 (0.106)	1,016	0.797 (0.105)	1,019	0.788 (0.111)
Change in SF-6D	—	1,015	0.000 (0.103)	1,009	–0.002 (0.108)	1,012	–0.013 (0.106)†
QWB-SA (*N* = 807)	0.683 (0.107)	679	0.710 (0.115)	707	0.693 (0.114)	702	0.700 (0.115)
Change in QWB-SA	—	268	0.022 (0.113)***	262	0.017 (0.105)**	252	0.013 (0.124)
PCS-36	50.3 (7.1)	1,072	50.6 (6.9)	1,067	50.1 (7.3)	1,079	50.4 (7.2)
Change in PCS-36	—	1,017	1.33 (7.00)†	1,011	0.22 (7.49)	1,018	–0.04 (7.12)
MCS-36	54.0 (7.5)	1,072	53.7 (7.6)	1,067	54.1 (7.7)	1,079	54.0 (7.4)
Change in MCS-36	—	1,017	–0.70 (8.67)***	1,011	–0.58 (8.30)**	1,018	–1.16 (8.33)†
Beck Depression Inventory	4.56 (4.56)	1,011	3.53 (4.58)	1,001	3.84 (4.40)	1,012	4.05 (5.00)
Change in Beck Depression	—	998	–1.02 (4.12)†	992	–0.71 (4.03)†	993	–0.58 (4.52)†
Beck Anxiety Inventory	4.01 (4.98)	1,011	3.19 (4.48)	1,001	3.75 (4.69)	1,012	3.78 (4.89)
Change in Beck Anxiety	—	998	–0.89 (4.78)†	992	–0.15 (4.44)	993	–0.25 (4.80)

For SF-6D, PCS-36, MCS-36, and QWB-SA, higher scores represent higher quality of life/function; for Beck Depression Inventory and Beck Anxiety Inventory, higher scores represent greater depressive/anxiety symptoms.
kcal, kilocalories; MET-hours per week, hours of metabolic equivalents of task per week (1 MET = metabolic rate consuming 1 kilocalorie per kilogram of body weight per hour); MCS-36, mental component summary derived from 36-item Medical Outcomes Study short-form; PCS-36, physical component summary derived from 36-item Medical Outcomes Study short-form; QWB-SA, Self-administered Quality of Well-Being index; SF-6D, short-form-6D health utility index.
*All *P* values for differences in changes between treatment groups <0.001 except change in SF-6D where *P* = 0.002. **$P < 0.05$; ***$P < 0.01$; †$P < 0.001$—all *P* values for test of change from baseline, within treatment groups (unadjusted).

We included variables for treatment group (ILS, metformin, placebo) in all models to evaluate the independent significance of DPP treatment group effects on changes in HRQL that were unrelated to changes in weight. To test whether associations between changes in weight and HRQL measures differed across treatment groups, we included a weight change-by-treatment group interaction term in models. Similarly, to explore whether associations between changes in weight and HRQL differed across baseline BMI subgroups (<30, 30–34.9, ≥35 kg/m^2), we included (in separate models) a weight change-by-baseline BMI group interaction term. Finally, to evaluate three-way interactions between weight change, treatment group, and baseline BMI group, we constructed separate models, stratified by baseline BMI subgroup, and including the weight change-by-treatment group interaction term. We used the SAS analysis system for all analyses (version 8.2; SAS Institute, Cary, NC).

RESULTS

DPP participants were enrolled from June 1996 to May 1999 and followed through July 2001 for an average follow-up of 3.2 years. A total of 3,234 participants were randomized: 1,079 to ILS, 1,073 to metformin, and 1,082 to placebo. SF-36 data were available to calculate SF-6D health utility scores for 99.5, 94.2, and 92.8% of participants at baseline, 1 year, and 2 years, respectively. Basic characteristics of DPP participants are shown in Table 1. Mean BMI was 34 kg/m^2, and the mean baseline SF-6D utility score was 0.801. This health utility level is consistent with a prior study reporting an average SF-6D score of 0.804 in a general population of adults aged 45–54 (31).

Table 1 also summarizes major behavioral, metabolic, and HRQL outcomes by DPP treatment group at 1 year. Mean weight change was greatest for ILS participants (−6.74 kg vs. −2.71 kg for metformin participants and −0.42 kg for placebo; overall $P < 0.001$). At 1 year, persons randomized to ILS reported participating in more physical activity and eating fewer total calories and calories from fat, compared to metformin or placebo participants (all $P < 0.001$).

Overall changes between treatment groups in HRQL, Beck Depression, and Beck Anxiety measures from baseline to year 1 were highly statistically significant (Table 1). However, the magnitudes of change within treatment groups were clinically

Table 2 Changes in SF-6D, PCS-36, and MCS-36 indicators with every 5 kg decrease in body weight

	Treatment group						Weight change-by-treatment group interaction
	Lifestyle		Metformin		Placebo		
Variable	Mean change (s.e.)	*P* value[a]	Mean change (s.e.)	*P* value[a]	Mean change (s.e.)	*P* value[a]	*P* value
Change in SF-6D							
Baseline to year 1	0.010 (0.002)	<0.001	0.009 (0.004)	0.01	0.005 (0.004)	0.14	0.56
Baseline to year 2	0.010 (0.002)	<0.001	0.006 (0.002)	0.04	0.006 (0.003)	0.08	0.31
Change in PCS-36							
Baseline to year 1	0.48 (0.16)	0.003	0.87 (0.26)	<0.001	0.79 (0.24)	0.001	0.44
Baseline to year 2	0.71 (0.26)	<0.001	1.06 (0.22)	<0.001	0.96 (0.22)	<0.001	0.21
Change in MCS-36							
Baseline to year 1	0.71 (0.20)	<0.001	−0.002 (0.27)	0.99	0.10 (0.28)	0.71	0.13
Baseline to year 2	0.34 (0.20)	0.080	−0.23 (0.24)	0.34	−0.15 (0.24)	0.54	0.14

MCS-36, mental component summary derived from 36-item Medical Outcomes Study short-form (0–100); PCS-36, physical component summary derived from 36-item Medical Outcomes Study short-form (0–100); SF-6D, short-form-6D health utility index (0.26–1.00).
[a]Mean changes >0 indicate an improvement in health-related quality of life with weight loss; *P* values from two-sided test using stratified multivariable linear regression models adjusting for sex, race/ethnicity, marital status, employment, educational attainment, baseline Beck Anxiety Inventory, baseline Beck Depression Inventory, baseline percent calories from fat, baseline MET-hours per week of modifiable physical activity, and baseline body weight (see text for details).

small. At 1 year, ILS participants had small but statistically significant improvements in the QWB-SA (+0.022; $P = 0.002$), PCS-36 (+1.33; $P < 0.001$), BDI (−1.02; $P < 0.001$), and Beck Anxiety Inventory (−0.89; $P < 0.001$), a small worsening of the MCS-36 (−0.70; $P = 0.008$), and no change in the SF-6D (+0.0004; $P = 0.90$). Metformin participants had comparable improvements in the QWB-SA (+0.017; $P = 0.014$) and the BDI (0.71; $P < 0.001$), a similar worsening of the MCS-36 (−0.58; $P = 0.03$), and no significant changes in other indicators. Placebo participants had a small improvement in the BDI (0.58; $P < 0.001$), but modest worsening of SF-6D (−0.013; $P < 0.001$) and MCS-36 (−1.16; $P < 0.001$), and no change in other indicators.

Analyses of changes in HRQL with changes in weight

In a fully adjusted model including both treatment group assignment and change in weight, assignment to ILS ($P = 0.388$) or to metformin ($P = 0.089$) were not significantly associated with changes in SF-6D at 1 year when compared to placebo. However, even after adjusting for treatment assignment, change in weight was associated with change in SF-6D at 1 year (increase of 0.007 for every 5 kg (11 lb) weight loss; $P < 0.001$). Similarly, change in weight at 1 year was also associated with change in PCS-36 (increase of 0.64 in PCS-36 with every 5 kg weight loss; $P < 0.001$) and change in MCS-36 (increase of 0.28 in MCS-36 with every 5 kg weight loss; $P = 0.04$). Similar associations were observed for SF-6D and PCS-36 at 2 years of follow-up. These differences are estimates of mean changes in HRQL mediated by weight loss, regardless of the intervention modality.

Analyses stratified by treatment group

Table 2 summarizes results of the analysis of changes in SF-6D with changes in weight using fully adjusted models, stratified by treatment group. Within the ILS treatment group, every 5 kg of weight loss was associated with an increase in SF-6D score of 0.010 ($P < 0.001$) at 1 year and 0.010 ($P < 0.001$) at 2 years. Increases in SF-6D scores with weight loss were of similar magnitude at 1 year for the metformin group but were not statistically significant within the placebo group. Changes in weight were associated with modest but statistically significant changes in PCS-36 within all three treatment groups at both 1 and 2 years. Statistically significant improvements in MCS-36 score were also associated with changes in weight, but only within the ILS treatment group, and only after 1 year of follow-up. Although these stratified analyses suggested small between-treatment group differences in the associations between changes in weight and changes in SF-6D, PCS-36, and MCS-36, none of these differences were statistically significant when we included a treatment group-by-weight change interaction term in a fully adjusted model with all three treatment groups.

Analyses of the effects of baseline BMI subgroup

Results of analyses stratified by both treatment group and baseline BMI subgroup are shown in Figure 1. We observed statistically significant changes in SF-6D in association with changes in weight only for participants with a baseline BMI ≥35 kg/m^2, although the interaction term between weight loss and baseline BMI category in models predicting SF-6D was not significant for any treatment group. We also found no statistically significant three-way interactions between baseline BMI, treatment group, and the changes in SF-6D in association with weight loss. Regardless of treatment group, participants with a baseline BMI ≥35 kg/m^2 also had modest but statistically significant increases in PCS-36 scores. Among participants with baseline BMI ≥35 kg/m^2, ILS, metformin, and placebo groups increased 0.54 ($P = 0.018$), 0.97 ($P = 0.009$), and 1.4 ($P < 0.001$) points, respectively for each 5 kg of weight loss. There were no statistically significant differences in PCS-36 changes with changes in weight within any of the three treatment arms for less obese participants. However, an interaction term

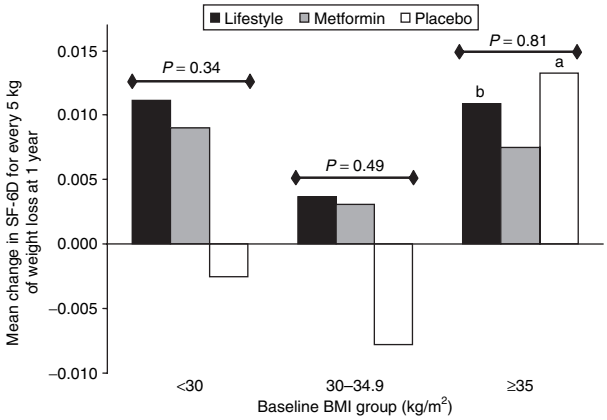

Figure 1 Mean changes in SF-6D scores at year 1 by DPP treatment group and baseline BMI category. Mean changes >0 indicate an improvement in health-related quality of life with weight loss; *P* values shown are for weight change-by-treatment group interaction term, from separate multivariable linear regression models, stratified by BMI subgroup and adjusting for sex, race/ethnicity, marital status, employment, educational attainment, baseline Beck Anxiety Inventory, baseline Beck Depression Inventory, baseline percent calories from fat, baseline MET-hours per week of modifiable physical activity, and baseline body weight (see text for details). [a]$P < 0.05$ and [b]$P < 0.01$ for tests of change in SF-6D within individual BMI × treatment group substrata. DPP, Diabetes Prevention Program; SF-6D, short-form-6D.

between weight loss and baseline BMI category in models predicting PCS-36 was not significant for any treatment group. No consistent changes in MCS-36 scores were observed with treatment group × baseline BMI substratum.

DISCUSSION

The DPP demonstrated considerable differences in lifestyle behavior change and weight reduction occurring 1 and 2 years after participants initiated an ILS intervention. Despite these impressive changes, we found no statistically significant change in the SF-6D HRQL measure for lifestyle intervention group participants at 1 year. However, we did find that changes in body weight were independently associated with changes in health utilities, even when adjusting for potential confounders and for other possible treatment effects that were unrelated to weight loss. Thus, these estimates reflect the mean changes in HRQL mediated by weight loss, regardless of the intervention modality. Our findings demonstrate that improvements in HRQL occurring across different diabetes prevention interventions in the DPP were mediated primarily by weight loss, and no significant improvement in global HRQL occurred through intervention pathways independent of weight loss.

We also found that changes in body weight were more associated with measures of physical function (PCS-36) than with mental health function (MCS-36). In subgroup analyses, changes in SF-6D in association with weight change also appeared most consistent for persons who began the study with a BMI ≥35 kg/m^2. However, formal testing did not confirm an interaction between baseline BMI and the degree of SF-6D change associated with a given change in body weight. Similarly, we found that improvements in the PCS-36 (i.e., physical function) associated with weight loss within each treatment arm were statistically significant only for those with the highest baseline BMI. These findings suggest that changes in weight among overweight or obese adults with impaired glucose tolerance are likely to result in modest direct benefits on health utilities, but the degree of expected benefit depends on the amount of weight loss achieved and may be mediated by improvements in physical function that occur more consistently for persons with a higher level of baseline obesity severity.

Our findings provide estimates of changes in health utilities for use in future economic modeling studies to predict the cost-effectiveness of interventions to achieve weight reduction. In addition, these estimates have implications for policies regarding weight management services for adults at risk for developing type 2 diabetes. Our analyses suggest that weight losses of at least 5–10 kg are needed to produce clinically meaningful differences in global health status (24). However, it is important to understand that prior estimates of minimally important differences in SF-6D scores were based on comparisons to other global health indicators and not to changes in cost-effectiveness estimates for therapies that impact health utilities (24). Because cost-effectiveness estimates rely on the sum of incremental quality-adjusted life-years associated with a particular therapy, even small changes in health utilities could have large impacts on cost-effectiveness if sustained over several years. For these reasons, the policy relevance of therapies that achieve even modest weight loss should be determined by future cost-effectiveness studies that consider the full health and economic effects of a particular therapy over a meaningful time horizon. In light of our findings, future studies should also explore whether an ILS intervention might be more cost-effective among more obese persons who appear to experience similar or greater improvements in HRQL with proportionately smaller reductions in body weight.

Our study has some notable limitations. Although we used data from a large randomized trial, we compared differences in HRQL for groups defined by the level of weight loss achieved. Because study participants were not randomized to different levels of weight reduction, we used statistical models to adjust for baseline variables that might confound associations between changes in weight and HRQL. In this context, it is possible that unmeasured confounders could have impacted our results. It is also possible that our results would have differed if we had used a health utility instrument other than the SF-6D. The relative emphasis (i.e., weighting) of different major HRQL domains (e.g., physical functioning, mental health functioning, bodily pain) differs across health utility instruments. In our analysis, changes in body weight were associated more strongly with changes in PCS-36 scores than with changes in MCS-36 scores. Thus, a health utility instrument that is constructed with less emphasis upon physical function might be less responsive to changes in body weight. The preference weights for the SF-6D used in our analysis were also based on community surveys conducted in the United Kingdom. It is possible that Americans may report different health state preferences, and any such

differences could affect our findings. Lastly, although the DPP was a large clinical trial, it is possible that subgroup analyses that explored three-way interactions among treatment group, baseline obesity severity, and changes in weight may have had low statistical power to detect associations with minimally important changes in HRQL.

Our study is consistent with limited past research exploring changes in HRQL with interventions designed to reduce body weight. A recent systematic review found mixed effects of weight loss interventions on various generic and obesity-specific measures of HRQL (3). Unlike our study, this review was not designed to disentangle changes in HRQL mediated by weight loss from those resulting from other intervention effects unrelated to weight changes. Our study demonstrates that weight loss has an independent but modest association with changes in HRQL. Future work is needed to replicate our findings in other study populations, over a longer period of follow-up, and using different measures of HRQL. This work will be extremely helpful for providing more robust information to inform policy decisions regarding the most optimal target populations and intervention strategies for confronting the growing epidemic of obesity.

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DISCLOSURE

The authors declared no conflict of interest.

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