HHS Public Access
Author manuscript
Appl Nurs Res. Author manuscript; available in PMC 2018 August 01.

Published in final edited form as:
Appl Nurs Res. 2017 August ; 36: 100–105. doi:10.1016/j.apnr.2017.06.002.

Percent Weight Reduction Required to Achieve Minimal Clinically Important Improvements in Health-related Quality of Life among African Americans: A Secondary Analysis of the Fit Body and Soul Study

Jane T. Garvin, PhD, APRN, FNP-BC,
Augusta University, College of Nursing, 987 St. Sebastian Way, EC-4346, Augusta, GA 30912

Lovoria B. Williams, PhD, APRN, FNP-C, FAANP,
Augusta University, College of Nursing

Thomas V. Joshua, MS,
Augusta University, College of Nursing

Stephen W. Looney, PhD, and
Augusta University, Medical College of Georgia, Department of Biostatistics and Epidemiology, 1120 15th Street, AE-1014, Augusta, GA 30912

Lucy N. Marion, PhD, RN, FAAN, FAANP
Augusta University, College of Nursing

Abstract

Objective—To calculate the percent weight reduction required to achieve minimal clinically important improvement (MCII) in health-related quality of life (HRQOL)

Design—Secondary data analysis from the longitudinal cohort of a single-blinded, cluster-randomized community trial to test the efficacy of the faith-based adaptation of the Diabetes Prevention Program

Setting—African-American churches

Participants—This study included 472 congregants with a body mass index of ≥ 25 and fasting plasma glucose<126 mg/dl.

Main Outcome Measure—Percent weight reduction required to achieve the MCII in HRQOL measured by two instruments, SF-12 and EQ-5D, one year following baseline

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COORESPONDING AUTHOR INFO: Jane T. Garvin, PhD, APRN, FNP-BC, Augusta University, College of Nursing, 987 St. Sebastian Way, EC-4346, Augusta, GA 30912, USA, bgarvin@augusta.edu, Work telephone: 706-721-2470.

Analysis—The percent weight reduction required to achieve established MCII in SF-12 Physical Component Summary (PCS), SF-12 Mental Component Summary (MCS), and EQ-5D Health Status (HS) at one-year follow-up were calculated using fitted linear regression models. In addition to models for the total sample, we generated models, stratified by baseline BMI, PCS, and HS, to calculate the percent weight reduction required to achieve MCII in HRQOL for those most in need of weight reduction and those in need of improved HRQOL.

Results—The percent weight reduction was a significant predictor of improvement in the SF-12PCS and the EQ-5DHS but not SF-12MCS. To achieve a MCII in SF-12PCS and EQ-5DHS, 18% and 30% weight reductions were required, respectively. A smaller percent weight reduction was required when the baseline BMI was ≥ 40.

Conclusions and Implications—Improvements in HRQOL among African-American congregants seeking weight reduction required more than the 3–5% weight reduction associated with improvements in physical health.

Keywords

African American; body composition; body mass index; EQ-5D; health-related quality of life; minimal clinically important difference; quality of life; obesity; SF-12; waist circumference; waist-to-height ratio

Introduction

Obesity remains a prevalent health problem. Among African Americans in the United States, over 76% of Non-Hispanic Black adults have a body mass index (BMI) above the recommended range (Flegal et al., 2012). Obesity has long been associated with poor health-related quality of life (HRQOL) (Anandacoomarasamy et al., 2009, Doll et al., 2000, Fontaine and Barofsky, 2001, Forhan and Gill, 2013, Jia and Lubetkin, 2010, Kolotkin et al., 2001). While the burden of obesity has increased over time with African-Americans bearing the largest burden (Jia and Lubetkin, 2010), reports of HRQOL among African Americans have been mixed. African-American women report better HRQOL than their White counterparts (Kolotkin et al., 2002, White et al., 2004). Overweight African Americans report better HRQOL than underweight and obese African Americans (Bentley et al., 2011). A number of factors have been proposed to explain the mixed findings related to HRQOL among African Americans. Cultural differences and perception of body weight may be contributing factors (Kumanyika et al., 1993, McDonough et al., 2013). In addition, many variables including age, gender, education, employment or income, marriage, history of smoking, and chronic disease have been associated with HRQOL (Huisingh-Scheetz et al., 2013). Although other factors may affect HRQOL, evidence suggests that obesity has a major influence on HRQOL (Anandacoomarasamy et al., 2009, Doll et al., 2000, Fontaine and Barofsky, 2001, Forhan and Gill, 2013, Jia and Lubetkin, 2010, Kolotkin et al., 2001).

While improved physical function is associated with a 3% to 5% weight reduction, it is not clear what percentage of weight reduction is required to achieve a meaningful benefit or minimal clinically important improvement (MCII) in HRQOL among African Americans (Jensen et al., 2014, Magkos et al., 2016). In a recent meta-analysis, HRQOL rarely improved without weight reduction (Warkentin et al., 2014). The meta-analysis did not address race/ethnicity (Warkentin et al., 2014). The Obesity Society recognized the need and called for additional research related to race and improvements in quality of life with weight reduction (Jensen et al., 2014). About the same time, Canadian researchers reported that a 23% weight reduction was required to achieve a MCII in HRQOL among a primarily White (92%) sample seeking surgical intervention for weight reduction (Warkentin et al., 2014). Therefore, the purpose of this study was to calculate the percent weight reduction required to achieve a MCII in HRQOL among African-American congregants seeking weight reduction in the Fit Body & Soul study using two measures of HRQOL: 1) SF-12 and 2) EQ-5D.

Methods

Using secondary data, we calculated the percent weight reduction required to achieve established MCII in HRQOL at one-year follow-up among a cohort of African American congregants seeking diabetes prevention via weight reduction in the Fit Body & Soul study. We examined baseline data from Fit Body & Soul, the parent study, including demographic, anthropometric, and metabolic data as well as data from self-administered questionnaires, including HRQOL. Anthropometric, metabolic, and HRQOL data were collected again at 12 weeks and 1 year. Methods of the FBAS study are reported elsewhere in detail. Briefly, the Fit Body & Soul study was a single-blinded, cluster randomized, community trial designed to test the efficacy of the faith-based adaptation of Group Lifestyle Balance, which was modified from the Diabetes Prevention Program, as compared to a health education program, among non-diabetic African Americans; the primary outcome was weight reduction (Sattin et al., 2016, Williams et al., 2013). Participants were recruited from 20 urban and rural churches in the Augusta, GA area. Baseline data were collected from October 2009 to March 2012; the final follow-up data collections were completed in March 2013. All participants gave informed consent. The Augusta University Institutional Review Board approved the study.

Inclusion and Exclusion Criteria

Briefly, participants from the Fit Body & Soul study included those who: 1) were between the ages of 21 and 64 years; 2) self-identified as African-American; 3) had a BMI ≥ 25; and 4) were planning to remain in the community for at least one year. We excluded participants with a fasting plasma glucose (FPG) ≥ 126 mg/dl or glycosylated hemoglobin (A1C) ≥ 7% and those who had medical contraindications to physical activity, physical conditions or medications that might impact glucose metabolism, behaviors that may interfere with participation, and diseases that would limit life span. For this analysis, we included only those with complete data for anthropometric, metabolic, and HRQOL measures; thus, our sample included 472 of the original 604 Fit Body & Soul study participants (78%). Participants with complete data were older (47 ± 10.5 vs 44 ± 12.1 years of age) and had higher baseline scores on the EQ-5D HS (79 ± 14.8 vs 75 ± 17.2) when compared to those with incomplete data ($p < .05$).

Data Collection and Measures

At the baseline Fit Body & Soul visit, data collectors obtained background data, anthropometric data, and data from self-administered questionnaires. Background data included age, gender, education, marital status, employment status, history of smoking 100 or more cigarettes, alcohol consumption in the last 30 days, and knowledge of a parent having type 2 diabetes. In addition, laboratory specialists collected blood samples to determine diabetic status (FPG ≥ 126 mg/dl or A1C ≥ 7%). The basic protocol is presented elsewhere in detail (Sattin et al., 2016, Williams et al., 2013). However, procedures for data collection related to obesity and HRQOL are highlighted here.

Health-related quality of life—Health-related quality of life was measured with the SF-12 and Euro-Quality of Life (EQ-5D). Version 2 of the SF-12 (SF-12v2®), a self-administered 12-item instrument, was used in this study and has been validated in a wide variety of populations (Ware Jr, 2002). The instrument covers eight domains: physical functioning, role physical, bodily pain, general health, vitality, social functioning, role emotional and, mental health. We followed the Norm-Based Scoring protocol for the SF-12v2® to compute the eight scale scores and the two summary measure scores (Physical Component Summary and the Mental Component Summary). For this analysis, the Physical Component Summary (PCS) and the Mental Component Summary (MCS) scores were used. The SF-12 has the advantage of being shorter than the SF-36 and been shown to be highly correlated with SF-36 for all BMI groups (Wee et al., 2008). However, the PCS of SF-12 was better at explaining differences in HRQOL among persons with various BMIs than the PCS of SF-36 (Wee et al., 2008). We defined the minimal clinically important improvement (MCII) in both PCS and MCS to be a value of 5, consistent with Warkentin et al. (2014).

In addition to the SF-12, we used the EQ-5D (EuroQOL Group, 1990)—The EQ-5D is a brief, self-administered instrument that evaluates five single-item health dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Each item has response options of “no problems, some problems, extreme problems”. The EQ-5D also includes an overall health status (HS) question measured using a visual analog scale (VAS) which is a vertical, graduated (0–100 points) “thermometer,” with 100 representing “best imaginable health state” at the top and 0 representing “worst imaginable health state” at the bottom. For this analysis, only this final item on the EQ-5D, the VAS, was used. We defined the minimal clinically important improvement (MCII) in HS to be a value of 10, consistent with Warkentin et al. (2014).

Anthropometric data—We used three measures of obesity, body mass index (BMI), waist circumference (WC) and waist-to-height ratio (WHt Ratio). Data collectors measured weight (in kilograms) and height (in centimeters) using the Seca 703 high-capacity digital scale fitted with the Seca 220 height rod. BMI was calculated as weight in kilograms divided by height in meters squared. Data collectors measured waist circumference (WC) using the Gulick II tape measure touching the skin mid-point between the lowest palpable rib and the iliac crest. WC was recorded to the nearest tenth of a centimeter. WHt Ratio was calculated as waist circumference in centimeters divided by height in centimeters.

Statistical Analysis

Initially, we characterized the sample using descriptive statistics. Linear regression was used to model improvement in HRQOL measures as a function of the percent weight reduction from baseline to one-year follow-up. We then adjusted for age, gender, baseline BMI, baseline A1C, and group assignment (Fit Body & Soul treatment or health education comparison) using multiple regression. Final models included only statistically significant explanatory variables ($p < .05$). Then, to be consistent with Warkentin et al.(2014) adjustments were made for age, gender, and baseline BMI. The percent weight reduction coefficients from each of the linear regression models were used to calculate the percent weight reduction required to achieve established minimal clinically important improvement in SF-12 Physical Component Summary, SF-12 Mental Component Summary, and EQ-5D Health Status. In addition to models for the total sample, we generated models, stratified by baseline BMI, PCS, and HS, to calculate the percent weight reduction required to achieve MCII in HRQOL for participants most in need of weight reduction and those in need of improved HRQOL. We defined those most in need of weight reduction as participants with class III obesity, baseline BMI ≥ 40, and those in need of improved HRQOL as participants with baseline scores below the norms, PCS < 50 and HS < 80.

Results

The majority of the sample were females (83%), college graduates (52%), employed (80%), and married (54%). Forty percent reported a family history of a parent diagnosed with diabetes. A similar percent (39%) reported personal consumption of alcohol in the last 30 days. Yet, only 20% reported a personal history of smoking 100 or more cigarettes. Anthropometric measures reflected a wide range of body sizes covering all classes of overweight and obesity. See Table 1 for more details on the sample characteristics.

Table 2 summarizes HRQOL at baseline and one-year follow-up. Mean scores were about 50 for SF-12 Physical Component Summary (SF-12 PCS) and SF-12 Mental Component Summary (SF-12 MCS), and about 80 for EQ-5D Health Status (EQ-5D HS). Generally, the mean values were similar at baseline and one year for SF-12 PCS and SF-12 MCS. However, the EQ-5D HS increased by 3.5 on average from baseline to one year.

Tables 3 and 4 present the final regression models with significant explanatory variables. Table 3 presents the models for improvement in SF-12 Physical Component Summary; Table 4 presents the models for improvement in EQ-5D Health Status. All linear regression analyses found that percent weight reduction was a significant predictor of improvement in SF-12 PCS. All linear regression analyses also found that percent weight reduction was a significant predictor of improvement in EQ-5D HS scores except for participants with a baseline HS < 80. For SF-12 Mental Component Summary, linear regression did not yield meaningful results. Multiple regression analysis showed that not all explanatory variables made statistically significant contributions to the models. For the full sample, gender, group assignment, and baseline A1C made no significant contribution to any model ($p > .05$). For the stratified analyses, group assignment also made no significant contribution to any model ($p > .05$).

See Table 5 for both the unadjusted and adjusted percent weight reduction required to achieve the established MCII in SF-12 PCS and EQ-5D HS. (Adjustment was made for all explanatory variables included in the final regression models.) To be consistent with Warkentin et al. (2014), the percent weight reduction required to achieve the established MCII in SF-12 PCS and EQ-5D HS after adjusting for age, gender, and baseline BMI is also presented. To achieve a minimal clinically important improvement in SF-12 PCS and EQ-5D HS, 18% and 33% weight reductions were required based on unadjusted models, respectively. The percent weight reduction coefficients from each of the linear regression models were used to calculate the percent weight reduction required to achieve established MCII in SF-12 Physical Component Summary and EQ-5D Health Status (MCII for the specific HRQOL instrument / regression model coefficient for percent weight reduction = percent weight reduction required to achieve the MCII in HRQOL using the specific instrument). For example, the MCII in SF-12 Physical Component Summary, 5, was divided by the coefficient for percent weight reduction, 0.283, for the full sample in the unadjusted model; the result, 17.67, was rounded to 18%. Similarly, the MCII in EQ-5D HS, 10, was divided by the coefficient for percent weigh reduction, 0.302, for the full sample in the unadjusted model; the result, 33.11, was rounded to 33%. In the adjusted models congruent with Warkentin et al. (2014), the MCII in SF-12 PCS and EQ-5D HS required 18% and 30% weight reductions, respectively. Participants with a baseline SF-12 PCS below the norm of 50 required more weight reduction (21%) to achieve the MCII in SF-12 PCS than the full sample (18%) after adjusting for age, gender, and baseline BMI. Conversely, participants with a baseline SF-12 PCS below the norm of 50 required less weight reduction (25%) to achieve the MCII in EQ-5D HS than the full sample (30%) after adjusting for age, gender, and baseline BMI. A smaller percent weight reduction was required to achieve a MCII in SF-12 PCS and EQ-5D HS when participants were in the highest class of obesity at baseline, BMI ≥ 40, compared with the full sample. All calculations for percent weight reduction required for MCII in HRQOL exceeded the 3–5% weight reduction associated with physical benefits.

Discussion

The results of this study show that the MCII in HRQOL among African-American congregants seeking weight reduction required more than the 3 – 5% weight reduction associated with improvements in physical health. In fact, our calculations show that a MCII in HRQOL measured by the SF-12 PCS required a weight reduction of 18%, while a MCII in HRQOL measured by EQ-5D HS required a 33% weight reduction; the latter amount was reduced to a 30% weight reduction after adjusting for age, and after adjusting for age, gender, and BMI. Our findings differ from those of Warkentin et al. (2014), a study of Canadians, a primarily Caucasian sample in a country with socialized healthcare, who met the clinical criteria for surgical weight-reduction intervention and had lower baseline HRQOL scores than our sample. In that study, 23% weight reduction was needed to achieve a MCII in both the SF-12 PCS and EQ-5D HS (Warkentin et al., 2014). Our participants required 5% less weight reduction to achieve a MCII in SF-12 PCS and 7% more weight reduction for a MCII in EQ-5D HS. Our sample was taken from the southeastern United States, was non-diabetic, and had BMIs ranging from 25 to 61 with about 45% having a

BMI of 35 or more. We found that age and baseline BMI played a significant role in improvements in HRQOL, depending on the instrument used to measure HRQOL. On the other hand, percent weight reduction consistently played a significant role in improvements in HRQOL using both measures of HRQOL, SF-12 PCS and EQ-5D HS, for the total sample and for most stratified samples. When comparing our findings based on the stratified sample most similar to the Canadian sample in terms of baseline BMI and HRQOL (BMI ≥ 40 and SF-12 PCS < 50 and EQ-5D HS < 80), the percent weight reduction required to achieve a MCII in HRQOL dropped to 10–14%, much less than the 23% Warkentin et al. (2014) reported, although no percent could be calculated using EQ-5D HS when the baseline HS score was < 80.

Similar to other reports where SF-12 MCS was not associated with weight reduction (Warkentin et al., 2014), SF-12 MCS did not yield a meaningful regression model with any significant predictors for a MCII in HRQOL. On average, the baseline and one-year follow-up scores on measures of HRQOL did not demonstrate large differences. This may be related to the stabilizing cultural environment of the churches. We are not aware of any other studies reporting the percent weight reduction required to generate a MCII in HRQOL among African Americans; however, our findings that MCII in HRQOL required more than the 5% weight reduction associated with improvements in physical health are consistent with the findings of Warkentin et al. (2014).

Our findings are important for both healthcare providers and patients because the findings suggest that African Americans require more than the currently recommended 3 to 5% weight reduction for improvements in physical wellbeing to achieve a MCII in HRQOL. Healthcare providers may be focused on the physical benefits of weight reduction, informing patients that they need just a 5% weight reduction to see these benefits. On the other hand, patients may find physical benefits to be less meaningful and less tangible, and they often cannot see or feel the physical benefits of weight reduction such as improved blood pressure or improvement in biomarkers that require laboratory blood tests. Instead, quality of life may be more meaningful to patients than clinical test results. As such, healthcare providers should set realistic expectations related to the benefits of weight reduction that are meaningful to patients and patients should enter weight reduction programs fully aware that improved quality of life will likely require more than a 5% weight reduction. In addition, it may be necessary to assist individuals seeking weight reduction to translate realistic percentages to meaningful units of measure such as pounds or kilograms.

Our study had both strengths and limitations. In terms of strengths, using the percent weight reduction instead of pounds as an outcome variable makes our findings applicable and meaningful to individuals across a wide range of body sizes. In addition, our sample was distributed fairly evenly across a wide range for BMIs (25–61), with roughly one quarter of the sample in each obesity class, making our findings applicable to individuals of all classes of obesity. Our stratified analyses provide information about African-American congregants seeking weight reduction, as well as those who might be qualified for surgical intervention with BMI ≥ 40, i.e., class III obesity. Using defined MCII in HRQOL as the threshold makes our findings clinically meaningful. In terms of limitations, we did not examine all variables thought to influence HRQOL. While we used the SF-12 and EQ-5D to measure quality of life, other obesity-specific quality of life instruments exist though few have been developed for persons with a BMI of 40 or more (Duval et al., 2006). Nevertheless, quality of life instruments designed specifically for persons who are overweight or obese may provide additional meaningful information. Even though the Fit Body & Soul participants on whom this study was based were significantly older and had higher baseline scores on the EQ-5D HS than those participants with incomplete data who were not included in this secondary analysis, these differences were unlikely to result in any substantial selection bias that would affect the conclusions of the study regarding percent weight reduction required to achieve a MCII in HRQOL. Our findings may not be generalizable to populations other than congregants who are employed, female, and African-American. In addition, over half of our sample was married and college educated. Furthermore, participants were already socially engaged at baseline as members of a church community that embraces multiple aspects of wellbeing, both spiritual and physical. These characteristics may have confounded our findings on the percent weight reduction required to achieve a MCII in HRQOL. Future studies should include individuals who are not engaged in church activities and individuals involved in weight reduction programs in settings other than churches. In addition, the percent weight reduction required to achieve a MCII in HRQOL should be reported for a variety of weight-reduction programs and for individuals of various ethnic/racial groups, levels of education, and degrees of employment, including the unemployed and the under employed.

We conclude that more weight reduction is required to achieve a MCII in HRQOL among African-American congregants than the 3 – 5% required for improvements in physical wellbeing. Both age and BMI influenced improvement in HRQOL, depending on the instrument used to measure it; however, the percent weight reduction consistently influenced improvement in HRQOL for the total sample. We found that weight reductions of 18% and 30% for the total sample, 12% and 15 – 17% for those with class III obesity, and 10 – 12% and 14% for those with class III obesity and low HRQOL were required to achieve a MCII in HRQOL for SF-12 PCS and ED-5D HS. This information is important for healthcare providers and individuals to be able to set realistic expectations related to the benefits of weight reduction.

Acknowledgments

The parent research project, Fit Body & Soul, was supported by National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, grant # R18DK082401.

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Table 1

Baseline background characteristics (N = 472 Participants)

Measure	Mean (SD)	# (%)
Age	47.1 (10.5) (Range 21 – 64)	
Female		392 (83)
College Graduate		244 (52)
Employed		379 (80)
Married		254 (54)
Cigarette Use		92 (20)
Alcohol Use		182 (39)
Diabetic Parent		188 (40)
FPG	90 (9) (Range 62 – 122)	
A1C	5.8 (0.5) (Range 4.4 – 6.9)	
Weight (kg)	98.5 (21.2) (Range 61.5 – 195.1)	
BMI	35.6 (7.4) (Range 25.0 – 61.3)	
WC (cm)	107.5 (15.4) (Range 75.2 – 167.5)	
W-Ht Ratio	0.65 (0.09) (Range 0.46 – 1.0)	
Obesity Classification by BMI Categories		
Overweight (BMI 25 – 29.99)		129 (27)
Class I Obesity (BMI 30 – 34.99)		129 (27)
Class II Obesity (BMI 35 – 39.99)		105 (22)
Class III Obesity (BMI 40 or more)		109 (23)

Note

BMI: Body mass index

FPG: Fasting plasma glucose

WC: Waist circumference

W-Ht: Waist-to - height

Table 2

HRQOL at baseline and 1 year follow-up (N =472)

Measure	Baseline Mean (SD)	1 Year Follow-up Mean (SD)
SF-12		
PCS	48.8 (8.5)	49.6 (8.7)
MCS	52.4 (8.8)	52.4 (8.6)
EQ-5D		
HS	79.4 (14.8)	82.9 (13.5)

Note

EQ-5D HS: Health status on the EuroQol-5 D

HRQOL: Health-related quality of life

SF-12 MCS: Mental component summary of the Short Form-12 Health Survey

SF-12 PCS: Physical component summary of the Short Form-12 Health Survey

Table 3

Final regression models for improvement in SF-12 Physical Component Summary

Variable	*b*	*t*	*p*	*95% CI*
Full sample (N =472)				
Baseline BMI	0.122	2.247	.025*	(0.015, 0.228)
Percent weight reduction, baseline to one year	0.278	3.988	.001*	(0.141, 0.416)
Participants with baseline SF-12 PCS < 50 (N = 205)				
Percent weight reduction, baseline to one year	0.247	2.109	.036*	(0.016, 0.477)
Participants with baseline EQ-5D HS < 80 (N = 172)				
Baseline BMI	0.215	2.583	.011*	(0.051, 0.379)
Percent weight reduction, baseline to one year	0.393	3.589	<.001*	(0.177, 0.610)
Participants with baseline BMI ≥ 40 (N = 111)				
Female	−7.663	−2.164	.033*	(−14.681, −0.645)
Percent weight reduction, baseline to one year	0.429	2.780	.006*	(0.123, 0.735)
Participants with baseline BMI ≥ 40 and baseline SF-12 PCS < 50 (N = 72)				
A1C	7.056	2.561	.013*	(1.560, 12.552)
Percent weight reduction, baseline to one year	0.442	2.226	.029*	(0.046, 0.838)
Participants with baseline BMI ≥ 40 and baseline EQ-5D HS < 80 (N = 52)				
Percent weight reduction, baseline to one year	0.477	2.522	.015*	(0.097, 0.857)

Note

A1C: Hemoglobin A1C, glycosylated hemoglobin

BMI: Body mass index

EQ-5D HS: Health status on the EuroQol-5D

SF-12 PCS: Physical component summary on the SF-12

*p < .05

Table 4

Final regression model for improvement in EQ-5D Health Status

Variable	*b*	*t*	*p*	*95% CI*
Full sample (N = 472)				
Age	−0.122	−2.231	.026 *	(−0.283, −0.018)
Percent weight reduction, baseline to one year	0.337	2.727	.007 *	(0.094, 0.580)
Participants with baseline SF-12 PCS < 50 (N = 205)				
Age	−0.271	−2.357	.019 *	(−0.497, −0.044)
Percent weight reduction, baseline to one year	0.388	2.018	.045 *	(0.009, 0.768)
Participants with baseline EQ-5D HS < 80 (N = 172)				
Baseline A1C	−6.252	−2.226	.027 *	(−11.796, −0.708)
Participants with baseline BMI ≥ 40 (N = 111)				
Percent weight reduction, baseline to one year	0.591	2.177	.032 *	(0.053, 1.129)
Participants with baseline BMI ≥ 40 and baseline SF-12 PCS < 50 (N = 72)				
Percent weight reduction, baseline to one year	0.708	2.113	.038 *	(0.040, 1.376)

Note

A1C: Hemoglobin A1C, glycosylated hemoglobin

BMI: Body mass index

EQ-5D HS: Health status on the EuroQol-5D

SF-12 PCS: Physical component summary on the Short Form-12 Health Survey No significant model for participants with baseline BMI ≥ 40 and baseline EQ-5D HS < 80.

* $p < .05$

Table 5

Percent weight reduction required for minimal clinically important improvement in HRQOL

HRQOL	N	Unadjusted %	Adjusted[a] %	Adjusted[b] %
Full sample				
SF-12 PCS	472	18	18	18
EQ-5D Health Status	472	33	30	30
Participants with baseline SF-12 PCS < 50				
SF-12 PCS	205	20	20	21
EQ-5D Health Status	205	25	26	25
Participants with baseline EQ-5D HS < 80				
SF-12 PCS	172	12	13	13
EQ-5D Health Status	172	NC	NC	NC
Participants with baseline BMI ≥ 40				
SF-12 PCS	111	12	12	12
EQ-5D Health Status	111	17	17	15
Participants with baseline BMI ≥ 40 and baseline SF-12 PCS < 50				
SF-12 PCS	72	12	11	11
EQ-5D Health Status	72	14	14	14
Participants with baseline BMI ≥ 40 and baseline EQ-5D HS < 80				
SF-12 PCS	52	10	10	11
EQ-5D Health Status	52	NC	NC	NC

Note

[a]Adjustments based on the final models presented in Tables 3 and 4

[b]Adjusted for age, gender, and baseline body mass index A1C: Hemoglobin A1C, glycosylated hemoglobin

BMI: Body mass index

EQ-5D HS: Health status on the EuroQol-5D

HRQOL: Health-related Quality of Life

NC: Not calculated as percent weight reduction was not a significant variable

SF-12 PCS: Physical component summary on the Short Form-12 Health Survey