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Validity of self-reported weight, height and body mass index among African American breast cancer survivors

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Abstract

Purpose—Self-reported weight, height and body mass index (BMI) are commonly used in cancer epidemiology studies, but information on the validity of self-reports among cancer survivors is lacking. This study aimed to evaluate the validity of these self-reported measures among African American (AA) breast cancer survivors, known to have a high obesity prevalence.

Methods—We compared the self-reported and measured values among 243 participants from the Women's Circle of Health Follow-Up Study (WCHFS), a population-based longitudinal study of AA breast cancer survivors. Multivariable-adjusted linear regressions were used to identify factors associated with reporting errors. We also examined the associations of self-reported and measured BMI with obesity-related health outcomes using multivariable logistic regressions, with hypertension as an example, to evaluate the impact of misreporting.

Results—We found that self-reported and measured values were highly correlated among all and when stratified by participants' characteristics (intraclass correlation coefficients ≥0.99, 0.84 and 0.96 for weight, height and BMI, respectively). The agreement between BMI categories (normal, overweight and obese) based on self-reported and measured data was excellent (kappa=0.81). Women who were older, never smoked, had higher grade tumors or greater BMI tended to have over-estimated BMI calculated from self-reported weight and height. The BMI-hypertension association was similar using self-reported (OR per 5 kg/m^2 increase: 1.63; 95% CI: 1.27–2.10) and measured BMI (1.58; 95% CI: 1.23–2.03).

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Conclusions—Self-reported weight, height and BMI were reasonably accurate in the WCHFS.

Implications—Our study supports the use of these self-reported values among cancer survivors when direct measurements are not possible.

Keywords

self-report; body mass index; cancer survivors; African American

INTRODUCTION

Body mass index (BMI), an index of weight adjusted for height, is used in clinical settings and epidemiological studies to indicate body fatness and obesity. Higher BMI and obesity are associated with multiple health problems in the general population. They are also risk factors for adverse cancer outcomes, such as a higher risk of all-cause and breast cancer-specific mortality among breast cancer patients [1].

Self-reports, rather than measured values, are often used to collect data on height and weight and to calculate BMI, because self-reports are easy to acquire and time- and cost-efficient, especially in large population-based studies. In addition, there are situations when collecting self-reports are more feasible; for example, cancer patients may sometimes be unwilling and/or unable to participate in in-person interviews (i.e., face-to-face). Therefore, many cancer epidemiology studies have relied on self-reports to evaluate the role of obesity in cancer outcomes [2–7].

Previous studies, mostly based on general adult populations, suggest trends of under-reporting for weight, particularly in women, and over-reporting for height, particularly among older adults [8, 9]. Therefore, BMI calculated based on self-reported weight and height (referred to as "self-reported BMI") tends to be systematically underestimated, and the inaccurate BMI categorization may result in substantial errors in estimating mortality hazard associated with obesity [10–12]. However, it remains unknown if cancer survivors report their anthropometric values accurately. Breast cancer survivors, for example, may experience treatment-induced weight gain or weight loss [13, 14], but they may watch their weight status more closely than the general population. Furthermore, limited and inconsistent evidence has been available with respect to whether African Americans, who, on average, have higher BMI than their white counterparts [15], are more prone to underestimate their BMI [16–19].

The Women's Circle of Health Follow-Up Study (WCHFS) has both self-reported and measured weight and height among African American breast cancer survivors, thus offering us a unique opportunity to compare the two different methods of obtaining anthropometric measurements. The primary objective of this study was to evaluate the accuracy of self-reported weight, height and BMI among African American breast cancer survivors. The secondary aim was to identify factors associated with reporting errors.

METHODS

Study Population

The WCHFS is an ongoing longitudinal study of lifestyle, obesity, obesity-related comorbidities, and breast cancer outcomes among African American breast cancer survivors. Participants were identified by rapid case ascertainment in 10 counties in New Jersey through the New Jersey State Cancer Registry. The study sample for this analysis included women who were enrolled in the WCHFS from July 2012 to June 2015. Eligible participants included English-speaking women of self-identified Black/African American aged 20–75 years, who had recently been diagnosed with histologically confirmed ductal carcinoma *in situ* (DCIS) or invasive breast cancer, and who had no history of cancer except non-melanoma skin cancer.

Data were collected during an in-person home visit occurring approximately 9–12 months after diagnosis of breast cancer, and during a follow-up home visit approximately 2 years after diagnosis. Both visits included structured questions on socio-demographic, lifestyle, and reproductive factors, current comorbidities and medications, family history of cancer, and quality of life. Anthropometric measures and blood pressure were also taken, as described below. The present analyses were limited to the African American breast cancer survivors who completed a follow-up visit. The study was approved by the institutional review boards at the Rutgers Cancer Institute of New Jersey and Roswell Park Cancer Institute. Informed consent was obtained from all individual participants included in the study.

Starting in January 2015, WCHFS began to include self-reported weight during the follow-up visit, resulting in a sample of 294 women with this information by March 2017. We excluded 38 women who did not respond to the self-reported questions for weight or height, and an additional 13 participants who did not complete interviewer-administered anthropometric assessments, leaving 243 women in this study. None of them were pregnant. Women excluded for not having anthropometric data were similar to those included except for marital status; excluded women were more likely to be single (data not shown).

Assessment of Anthropometric Data

Participants were asked to report their current weight (in pounds) in the follow-up interview and were asked to report their height (in feet and inches) during the baseline interview. Current height was not ascertained in the follow-up visit, which was an average of 1.8 years after the baseline visit. The self-reported values were converted to metric units for analyses. Self-reported BMI was calculated as weight (kg) divided by squared height (m^2).

Anthropometric measurements were conducted shortly after the collection of self-reported weight during the follow-up visit. Trained interviewers measured weight and height on participants in light clothing, and without shoes or any heavy jewelry, following a standardized protocol [20]. Weight was measured to the nearest 0.1 kg using digital scales (TBF-300A; TANITA Corp.). Height was measured with a vertical ruler to the nearest 0.1 cm. BMI based on interviewer-measured weight and height was also calculated, and is referred to as measured BMI in this paper.

Assessment of Other Variables

We selected and evaluated factors potentially associated with BMI misreporting based on *a priori* hypotheses. Age, smoking (current, former, never), time since diagnosis (<20 months, ≥20 months), diabetes (self-report) and hypertension (measured mean SBP/DBP ≥140/90 mmHg or self-report of antihypertension medications [21]) were collected at the follow-up interview. Education (≤high school graduate, ≥some college), marital status (married/living as married, single/other), and breast cancer treatments including mastectomy, chemotherapy and hormonal therapy (yes, no, unknown) were ascertained at baseline interview. Post-diagnosis weight change was calculated as measured weight at follow-up minus measured weight at baseline. Tumor clinicopathologic data including histologic type (DCIS, invasive, unknown), stage (in situ/localized, regional/distant), grade (I, II, III, unknown) and estrogen receptor (ER) status (ER+, ER−, unknown) were obtained from the New Jersey State Cancer Registry files and patients' medical and pathology records.

Hypertension, as defined above, was selected as an example of an obesity-related health outcome to evaluate the potential impact of BMI misreporting. During the follow-up interview, blood pressure was measured using a standard automated blood pressure monitor (Omron HEM-907XL; Omron Healthcare) after a 5-minute seated rest at three 1-minute intervals and was repeated after half of the interview. A total of six readings were averaged to derive the mean blood pressure.

Statistical Analysis

The validity of self-reported weight, height and BMI was assessed in five ways. First, we calculated the mean differences between self-reported and measured values (self-report minus measured values) and the standard deviation (SD) to understand the direction and degree of systematic bias. Second, we calculated Pearson's correlation coefficients and intraclass correlation coefficients (ICCs) using a two-way random-effects model. The former does not take into account all the systematic errors but was provided to compare with previous studies. The latter was provided as a summary measure of the validity of self-reports. Third, to visualize and evaluate whether the difference between self-reported and measured BMI was related to the magnitude of measurements, we plotted the difference against the measured BMI. Finally, since BMI is often categorized when studied as a risk factor, we classified it according to World Health Organization definitions (<25, 25–29.9, 30–34.9, 35–39.9 and ≥40 kg/m^2) [22]. The first two BMI categories were combined because only one participant was underweight. We assessed the agreement between self-reported and measured BMI categories using cross-tabulation and Cohen's kappa [23]. To allow a direct comparison with prior studies, we also calculated Cohen's kappa based on three BMI categories (<25, 25–29.9, ≥30 kg/m^2).

We used multivariable-adjusted linear regression models to identify factors associated with reporting errors. The differences between self-reported and measured weight, height and BMI, were used as the outcomes. All factors as listed in Table 1 were considered using backward elimination, but only variables with $P < 0.10$ were retained in the final models.

We also examined the associations of self-reported and measured BMI with hypertension as an example of an obesity-related outcome, to evaluate the impact of potential misreporting. The first logistic regression model adjusted for age, and the second model further adjusted for education, smoking status, and recreational physical activity levels [24]. All statistical analyses were performed using Stata (version 14.2; StataCorp).

RESULTS

Concordance Between Self-Reported and Measured Weight, Height and BMI

Table 1 shows the selected characteristics of African American breast cancer survivors in the WCHFS, including the mean differences between self-reported and measured anthropometric values. Participants accurately reported their weight but tended to over-report their height, leading to a lower self-reported BMI by a mean (SD) of 0.41 (1.49) kg/m^2.

Table 2 shows Pearson's correlation coefficients and ICCs comparing self-reported and measured weight, height and BMI overall and by participants' characteristics. Self-reported and measured anthropometric values were approximately normally distributed in each subgroup of selected characteristics. Pearson's correlations and ICCs for weight among all participants and in each subgroup were 0.99 or 1.00. There were greater variations in the correlations between self-reported and measured height, with ICC of 0.90 among all and with the lowest ICC of 0.84 among participants who were diagnosed at regional/distant stages. As expected, the Pearson's correlation coefficient for height was slightly higher than the ICC, suggesting there were some systematic errors associated with self-reported height. Self-reported and measured BMI were highly correlated among all participants and across subgroups, with both Pearson's correlation coefficients and ICCs ranging narrowly from 0.96 to 0.98.

The figure presented in Online Resource 1 supports that the difference between self-reported and measured BMI was small. It additionally shows that the negative difference became stronger with increased BMI, suggesting that BMI based on self-reported height and weight was more likely to be underestimated with increased adiposity.

Cross-tabulation and Cohen's kappa were used to evaluate the impact of misreporting on BMI categories. Because of the high prevalence of severe obesity in our study sample, we were able to examine 5 categories of BMI, i.e., normal weight, overweight, and obesity I, II and III. Online Resource 2 shows that, overall, 80.7% of self-reported BMI were allocated to the correct BMI categories. Except for two participants, the rest were allocated to adjacent BMI categories. The agreement between self-reported and measured BMI categories was good (kappa = 0.75). The kappa coefficient based on three categories, i.e., normal weight, overweight and obesity, suggests excellent agreement (kappa = 0.81).

Predictors of Self-Reported Errors

Table 3 shows factors that, after backward elimination, were associated with differences between self-reported and measured BMI, weight, and height respectively. Women who were 65 years or older or had grade II tumors were borderline significantly associated with underestimation of BMI compared with women who were less than 55 years or had grade I tumors, respectively ($P = 0.08$ or 0.07). Women who had greater BMI were more likely to underestimate their BMI (e.g., $P = 0.001$ comparing ≥ 40 *vs.* < 25 kg/m^2). Current smokers were less likely to underestimate their BMI than never smokers ($P = 0.03$). Women with BMI < 25 kg/m^2 and women who had lost more than 2% of body weight since baseline tended to under-report their weight. Over-reporting of height significantly increased among women after age 65 ($P = 0.005$ *vs.* < 55 years), who were former smokers ($P = 0.03$ *vs.* never smoked), or who were diagnosed with grade II tumors ($P = 0.04$ *vs.* grade I), and borderline significantly increased with BMI of 35–39.9 kg/m^2 and ≥ 40 kg/m^2 ($P = 0.07$ and 0.09, respectively *vs.* < 25 kg/m^2). Other factors (i.e., education, marital status, having diabetes or hypertension, time since diagnosis, histologic type, tumor stage, ER status and breast cancer treatments including hormonal therapy) were not associated with the self-reported errors of weight, height or calculated BMI.

Associations of Self-Reported and Measured BMI with Hypertension

As shown in Table 4, we observed positive associations of higher BMI and obesity with hypertension, as expected. In the multivariable-adjusted model, the associations between higher BMI categories and hypertension tended to be slightly attenuated when using self-reported values, while the association using continuous self-reported BMI (OR per 5 kg/m^2 increase: 1.63; 95% CI: 1.27–2.10) was similar to that using measured values (OR per 5 kg/m^2 increase: 1.58; 95% CI: 1.23–2.03).

DISCUSSION

In this study of African American breast cancer survivors, we found a low level of mean difference and a high degree of correlation between self-reported and measured weight, height and BMI. Several factors including older age, never smoking, higher tumor grade and greater BMI were associated with BMI misreporting, but they did not substantially influence the accuracy of self-reported BMI and the classification of weight status. To our knowledge, this is the first study to evaluate the validity of self-reported anthropometric data among African American cancer survivors, despite that many studies relied on self-reports in assessing the current weight status of participants who had cancer [25–27].

The size of the mean errors in height (1.2 cm or 0.5 in) in our study is in broad agreement with previous studies [8]. Among adult women in the EPIC-Norfolk study (Norfolk arm of the European Investigation into Cancer and Nutrition study), self-reported height was on average 1.4 cm taller than the measured value [28]. In the National Health and Nutrition Examination Survey (NHANES) III, the mean height of African American women was 163 cm (5 ft 4 in), and the mean difference between self-reported and measured height was 0 cm among adult women below 60 years of age, and 2.5 cm among women aged 60 years and over [9]. To allow a direct comparison, in our study, women's mean height was 162 cm and the mean differences among these two age groups were 0.80 cm and 1.7 cm, respectively. Consistent with findings in the general population [9, 28], we found that women with older age and higher BMI were more likely to over-report their height, which may be caused by height loss in the elderly and cultural pressure. We also found that former or current smokers and women who had grade II or grade III tumors overestimated their height by more than 1 cm, which may reflect the relation between poorer health status and greater reporting errors.

Self-reported weight was sufficiently accurate in our study. This finding may seem surprising as greater BMI is generally associated with more errors in self-reported weight [8], and 60% of African American breast cancer survivors in our study had obesity (BMI ≥ 30 kg/m^2) and 14% had severely obesity (BMI ≥ 40 kg/m^2). Calculated from interviewer-measured weight at baseline and follow-up visits, 31% of women had more than 2% weight gain and 22% experienced more than 2% weight loss. However, only the weight loss group slightly overestimated their weight by 0.6 kg (1.4 lb), and both those with stable weight (within 2% of weight fluctuations) and the weight gain groups were able to accurately report their current weight. Our finding in self-reported weight differed from the results based on general populations [8], such as NHANES, where self-reported weight was on average 1.9 kg below the measured value among African American women [9]. In the Sister Study, a cohort of US women with a sister with breast cancer, their self-reported weight was underestimated by a mean of 0.7 kg [29], which was more accurate than that from the general population. It is possible that breast cancer survivors are more aware of their weight through their more frequent contact with medical professionals than women in the general population. Therefore, they are able to report their weight to a greater level of accuracy.

Compared with a mean difference of −0.8 kg/m^2 between self-reported and measured BMI among African American women in NHANES [9], we found an improved accuracy of self-reported BMI in our study with a mean difference of −0.4 kg/m^2. This small underestimation was mainly caused by the overestimated denominator, i.e., self-reported height, for BMI calculation. Our observation that the effect of underestimation was more marked with increased adiposity is consistent with the previous literature [8]. The same set of factors associated with the inaccuracy of self-reported height, i.e., age, smoking status, tumor grade, and BMI, also predicted errors in self-reported BMI.

Previous studies recommended using self-reported BMI as a continuous independent variable to avoid the potentially more biased risk estimates when using categorical self-reported BMI [10, 12, 11]. Our findings generally support this recommendation. Although we observed good to excellent agreement between self-reported and measured BMI categories, we found the multivariable-adjusted odds ratios of having hypertension were attenuated with categorical self-reported BMI, meanwhile the estimates were very similar when we used continuous BMI. We used hypertension as one example to evaluate the impact of potential misreporting, but the findings may be relevant to the study of BMI and other comorbidities of breast cancer survivors.

We recognize the limitation that self-reported height was collected at baseline while measured height and other anthropometric values used in the current study were collected at a subsequent follow-up visit. The rate of stature decline, which is 1 to 2 cm per decade [30], may have contributed to the underreported height and the slightly overestimated BMI. We might have observed even more accurate self-reports if we had asked participants to report their height at the follow-up visit. However, an average 1.8-year lapse between baseline and follow-up visits is unlikely to have substantially changed the results. Second, the level of inaccuracy of self-reports could have been underestimated if participants with undesirable weight tended to decline the requests for reporting or measuring their weight. This is unlikely to have affected our results, given that, except for marital status, we found no difference in baseline measured BMI and other participants' characteristics between women with complete self-reported and measured values versus those without. In addition, like NHANES [31], the self-reported data in our study were collected through in-person interviews, where participants may be less likely to intentionally misreport their weight and height compared to the telephone interviews or mail surveys.

A major strength of this study is that there was a greater prevalence of obesity and severe obesity than any of the previous studies on this topic, so that we were able to compare the accuracy of self-reported BMI among participants with extreme obesity. Although objective measures offer the most accurate anthropometric values, the time and efforts associated with the in-person interviews and the intrusive nature of such measures may potentially decrease response rates and contribute to attribution bias in follow-up studies of cancer survivors. Our study supports the use of self-reported BMI among cancer survivors when direct measurements are not possible.

CONCLUSIONS

Our findings suggest that self-reported weight, height and BMI were reasonably accurate among African American breast cancer survivors, but may lead to some degree of systematic misreporting in certain subgroups, such as women with older age, higher grade tumors, or higher BMI. When evaluating associations with BMI, self-reported BMI as a continuous variable may provide more accurate risk estimates and may be preferable to categorical self-reported BMI.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Selected characteristics and differences between self-reported and measured anthropometric values among African American breast cancer survivors in the WCHFS (*n* = 243)

	n	(%)[a]
Age		
<55	94	(38.7)
55–<66	89	(36.6)
≥65	60	(25.7)
Education		
≤High school graduate	112	(46.1)
≥Some college	131	(53.9)
Smoking status		
Never	129	(53.1)
Former	75	(30.9)
Current	39	(16.0)
Marital status		
Married/living as married	86	(35.4)
Single/other	157	(64.6)
Time since diagnosis		
<20 month	114	(46.9)
≥20 month	129	(53.1)
Histologic type		
Ductal Carcinoma In Situ	45	(18.5)
Invasive Ductal Carcinoma	175	(72.0)
Unknown	23	(9.5)
Stage		
In situ/Localized	141	(58.0)
Regional/Distant	75	(30.9)
Unknown	27	(11.1)
Grade		
I	26	(10.7)
II	73	(30.0)
III	97	(39.9)
Unknown	47	(19.3)
ER status		
ER+	178	(73.3)
ER−	51	(21.0)
Unknown	14	(5.8)
Mastectomy		
No	161	(66.3)
Yes	81	(33.3)
Unknown	1	(0.4)

	n	(%)[a]
Chemotherapy		
No	112	(46.1)
Yes	130	(53.5)
Unknown	1	(0.4)
Hormonal therapy		
No	122	(50.2)
Yes	120	(49.4)
Unknown	1	(0.4)
Diabetes		
No	176	(72.4)
Yes	67	(27.6)
Hypertension		
No	92	(37.9)
Yes	151	(62.1)
Post-diagnosis weight change		
>2% loss	54	(22.2)
±2% maintain	114	(46.9)
>2% gain	75	(30.9)
Measured BMI categories		
Normal (<25 kg/m^2)[b]	24	(9.9)
Overweight (25–29.9 kg/m^2)	73	(30.0)
Obese I (30–34.9 kg/m^2)	63	(25.9)
Obese II (35–39.9 kg/m^2)	49	(20.2)
Obese III (≥40 kg/m^2)	34	(14.0)
Self-reported anthropometry		
Weight (kg, mean±SD)	86.1	±18.5
Height (cm, mean±SD)	163.1	±7.2
BMI (kg/m^2, mean±SD)	32.4	±6.7
Measured anthropometry		
Weight (kg, mean±SD)	85.9	±18.6
Height (cm, mean±SD)	161.9	±6.6
BMI (kg/m^2, mean±SD)	32.8	±6.9
Difference between self-reported and measured values[c]		
Weight (kg, mean±SD)	0.16	±2.35
Height (cm, mean±SD)	1.16	±2.88
BMI (kg/m^2, mean±SD)	−0.41	±1.49

[a] Values are *n* (%) unless otherwise noted.

[b] One women was underweight (measured BMI = 17.1 kg/m^2) and was included.

[c] Difference was calculated as self-reported minus measured value.

Table 2

Pearson correlations and intraclass correlations between self-reported and measured anthropometric values among African American breast cancer survivors in the WCHFS ($n = 243$)

	Pearson Correlation			Intraclass Correlation		
	Weight	Height	BMI	Weight	Height	BMI
Total	0.99	0.92	0.97	0.99	0.90	0.97
Age categories						
<55	0.99	0.91	0.97	0.99	0.90	0.97
55–<65	0.99	0.94	0.98	0.99	0.93	0.98
≥65	0.99	0.92	0.98	0.99	0.86	0.97
Education						
≤High school graduate	0.99	0.91	0.98	0.99	0.89	0.98
≥Some college	0.99	0.93	0.97	0.99	0.91	0.97
Smoking status						
Never	0.99	0.92	0.97	0.99	0.90	0.97
Former	0.99	0.92	0.98	0.99	0.89	0.98
Current	0.99	0.92	0.98	0.99	0.92	0.98
Marital status						
Married/living as married	0.99	0.92	0.97	0.99	0.91	0.97
Single/other	0.99	0.91	0.98	0.99	0.90	0.98
Time since diagnosis, month						
<20 mo	0.99	0.93	0.98	0.99	0.92	0.98
≥20 mo	0.99	0.90	0.97	0.99	0.88	0.97
Histologic type						
Ductal Carcinoma In Situ	0.99	0.94	0.98	0.99	0.91	0.98
Invasive Ductal Carcinoma	0.99	0.91	0.97	0.99	0.89	0.97
Unknown	0.99	0.96	0.98	0.99	0.95	0.98
Stage						
In situ/Localized	0.99	0.94	0.98	0.99	0.92	0.98
Regional/Distant	0.99	0.85	0.96	0.99	0.84	0.96
Unknown	0.99	0.94	0.98	1.00	0.93	0.98

	Pearson Correlation			Intraclass Correlation		
	Weight	**Height**	**BMI**	**Weight**	**Height**	**BMI**
Grade						
I	0.99	0.95	0.98	0.99	0.93	0.98
II	1.00	0.93	0.99	1.00	0.90	0.98
III	0.99	0.90	0.97	0.99	0.89	0.96
Unknown	0.99	0.94	0.98	0.99	0.93	0.98
ER status						
ER+	0.99	0.94	0.98	0.99	0.92	0.98
ER−	0.99	0.86	0.97	0.99	0.85	0.96
Unknown	0.99	0.92	0.98	0.99	0.90	0.98
Mastectomy						
No	0.99	0.92	0.98	0.99	0.90	0.98
Yes	0.99	0.91	0.97	0.99	0.90	0.97
Chemotherapy						
No	0.99	0.93	0.99	0.99	0.91	0.98
Yes	0.99	0.91	0.97	0.99	0.90	0.97
Hormonal therapy						
No	0.99	0.90	0.97	0.99	0.89	0.97
Yes	0.99	0.94	0.98	0.99	0.92	0.98
Diabetes						
No	0.99	0.91	0.97	0.99	0.90	0.97
Yes	0.99	0.93	0.98	0.99	0.89	0.98
Hypertension						
No	0.99	0.92	0.97	0.99	0.92	0.97
Yes	0.99	0.92	0.98	0.99	0.89	0.97
Post-diagnosis weight change						
≥2% loss	0.99	0.92	0.97	0.99	0.90	0.97
±2% stable	0.99	0.89	0.98	0.99	0.88	0.98
>2% gain	0.99	0.92	0.98	0.99	0.91	0.98

Table 3

Multivariable-adjusted mean differences (95% CI) between self-reported and measured BMI, weight and height, the WCHFS (n = 243)

	Multivariable-adjusted mean differences (95% CIs) between self-reported and measured values of[b]					
Factors[a]	**BMI, kg/m²**	***P***	**Weight, kg**	***P***	**Height, cm**	***P***
Age categories						
<55	−0.30 (−0.59, 0.00)	Ref	--		0.77 (0.20, 1.35)	Ref
55–<65	−0.30 (−0.60, −0.00)	0.97	--		0.92 (0.34, 1.50)	0.72
≥65	−0.73 (−1.10, −0.36)	0.08	--		2.13 (1.41, 2.85)	0.005
Smoking status						
Never	−0.47 (−0.72, −0.22)	Ref	--		0.11 (−0.77, 1.00)	Ref
Former	−0.56 (−0.89, −0.23)	0.69	--		1.55 (0.90, 2.19)	0.49
Current	0.10 (−0.36, 0.55)	0.03	--		1.26 (0.77, 1.74)	0.03
Tumor grade						
I	−0.05 (−0.60, 0.51)	Ref	--		0.39 (−0.68, 1.47)	Ref
II	−0.64 (−0.98, −0.31)	0.07	--		1.74 (1.09, 2.39)	0.04
III	−0.44 (−0.73, −0.15)	0.22	--		1.09 (0.53, 1.65)	0.26
Unknown	−0.16 (−0.58, 0.25)	0.74	--		0.85 (0.05, 1.65)	0.51
Measured BMI categories						
<25 kg/m²	0.36 (−0.23, 0.95)	Ref	1.33 (0.39, 2.26)	Ref	0.29 (−0.85, 1.42)	Ref
25–29.9 kg/m²	−0.35 (−0.68, −0.02)	0.04	0.20 (−0.34, 0.74)	0.04	1.33 (0.69, 1.97)	0.12
30–34.9 kg/m²	−0.20 (−0.55, 0.16)	0.11	0.16 (−0.41, 0.74)	0.04	0.75 (0.06, 1.44)	0.49
35–39.9 kg/m²	−0.80 (−1.21, −0.40)	0.002	−0.32 (−0.97, 0.33)	0.005	1.59 (0.80, 2.37)	0.07
≥40 kg/m²	−0.90 (−1.39, −0.41)	0.001	−0.03 (−0.82, 0.75)	0.03	1.57 (0.63, 2.52)	0.09
Post-diagnosis weight change						
≥2% loss	--		0.64 (0.01, 1.26)	0.04	--	
±2% stable	--		0.31 (−0.12, 0.74)	Ref	--	
>2% gain	--		−0.39 (−0.92, 0.13)	0.40	--	

[a] Only factors with $P < 0.10$ were retained in the final models and were presented.

[b] Difference was calculated as self-reported minus measured value.

Table 4

Comparing the associations of hypertension with self-reported BMI *vs.* measured BMI in the WCHFS ($n = 243$)[a]

	OR1 (95% CI)[b]		OR2 (95% CI)[c]	
BMI categories	**Measured**	**Self-reported**	**Measured**	**Self-reported**
<25 kg/m^2	Ref	Ref	Ref	Ref
25–29.9 kg/m^2	1.57 (0.55, 4.49)	1.44 (0.53, 3.91)	1.87 (0.62, 5.58)	1.64 (0.59, 4.55)
30–34.9 kg/m^2	4.90 (1.61, 14.88)	3.34 (1.15, 9.69)	5.81 (1.83, 18.44)	3.83 (1.28, 11.44)
≥35.0 kg/m^2	5.69 (1.94, 16.64)	5.80 (2.05, 16.44)	6.80 (2.21, 20.93)	6.55 (2.24, 19.17)
Per 5 kg/m^2	1.59 (1.24, 2.03)	1.56 (1.22, 1.99)	1.63 (1.27, 2.10)	1.58 (1.23, 2.03)

[a]Hypertension is defined as SBP/DBP≥140/90 mmHg or on hypertensive medications.

[b]OR1 adjusted for age (y).

[c]OR2 adjusted for age (y), education (≤high school graduate, ≥some college), smoking status (current, former, never), and recreational physical activity since diagnosis (0, <150 min per week, ≥150 min per week since diagnosis).