Imperfect Information on Physical Activity and Caloric Intake

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Abstract

Using the National Health and Nutrition Examination Survey Data, I find that individuals who overestimate their activity level by one standard deviation consume 40-60 extra calories per day, or enough to gain five pounds per year. These extra calories are composed mainly of sugar and carbohydrate, and are concentrated among individuals in the 75th and 90th percentiles of caloric intake. The link between overeating and inaccurate estimation of physical activity is strongest among less educated individuals and individuals with high variance in their physical activity, suggesting that imperfect recall or information gaps explain at least part of the relationship of interest. These results imply the existence of a necessary condition for information treatments to be effective in changing health behaviors and obesity rates.

Keywords: Imperfect Recall, Health Behavior, Body Weight

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1 Introduction

The societal costs of obesity are well documented. Reuters reports that obesity costs $216 billion per year, a figure in excess of the costs attributable to smoking (Begley, 2012). Obesity leads to onset of chronic illness and increased medical care costs (Finkelstein et al., 2003; Flegal et al., 2010). Overweight and obesity may lead to lower earnings, lower productivity in the workplace (Cawley, 2004; Baum and Ruhm, 2009; Gregory and Ruhm, 2009) and less favorable outcomes in the marriage market (Oreffice and Quintana-Domeque, 2010; Chiappori et al., 2012). Economists and policy makers continue investigate the policy options to address obesity, focusing on information treatments and incentives.

Biologically, body weight is a function of net caloric consumption. If we assume that individuals have complete and accurate information about their caloric intake and expenditure, body weight is an economic function of the relative costs (time and money) of caloric intake and output. There is considerable debate about the causes of increased obesity rates, as they coincide with several other changes that have affected the relative costs of caloric intake and expenditure: an increase in the availability of convenient unhealthy food, changes in the economic environment and relative food prices, escalating portion sizes, decreased smoking, technological advances in sedentary entertainment, and shifts towards sedentary employment (Cutler et al., 2003; Powell, 2009; Chou et al., 2004; Courtemanche, 2009; Courtemanche et al., 2015; Lakdawalla and Philipson, 2009; Lakdawalla et al., 2005). Prior work has shown that education and personality traits impact health behaviors and obesity (Webbink et al., 2010; Cutler and Lleras-Muney, 2010; Conti and Hansman, 2013). More recent work has incorporated hyperbolic discounting, and a very present-focused "dual self" that makes choices inconsistent with expected present discounted value maximization (Courtemanche et al., 2015; Scharff, 2009; Ikeda et al., 2010). Ruhm (2012) also points out that food producers have become more effective at targeting present-valuing impulses. If individuals have full information, are making rational decisions and consequently becoming obese, incentives will be necessary to change health behaviors.

If individuals are operating under incomplete or inaccurate information about their net caloric intake, then a well-designed information treatment may affect individuals' health behaviors, increase the effectiveness of incentive programs, and improve welfare. Evidence on whether individuals respond to generalized health information on caloric content (or smoking) is mixed and somewhat idiosyncratic to setting (Downs et al., 2009; Elbel et al., 2009; Khwaja et al., 2009; Schwartz et al., 2012; Elbel et al., 2013). Emerging work has shown that information interventions must be highly personalized to affect changes in health behaviors (Darden, 2015).

Previous mixed responses to information treatments raises the question: do individuals have imperfect information about their caloric needs? Most prior work that has assessed individuals' awareness has found that individuals are aware of what constitutes a 'reasonable daily caloric intake', or are aware of their caloric needs within a 500 calorie range (Schwartz et al., 2012). While most of the previously cited field work has utilized general and somewhat coarse information , (e.g., labeling food as "healthy," caloric content posting, or invitations to eat smaller portions), small information imperfections in caloric needs or intake can lead to considerable changes in body weight over time if not corrected. For example, consuming 50 calories in excess of one's daily requirement can increase body weight by 5 pounds per year. [1]

This paper demonstrates that individuals perceive their physical activity levels with error, and this error is linked to caloric intake. Using nationally representative data, the 2003-2004 and 2005-2006 National Health and Nutrition Examination Survey (NHANES) data, I show that individuals who overestimate their level of physical activity eat more calories, most of which come from sugar and carbohydrates. Overestimating one's level of physical activity by one standard deviation leads to an increase of 40-60 calories per day, enough to cause or 4-6 pounds of weight gain per year. These results show the existence of a necessary condition for information to change behaviors: individuals misunderstand their activity level (and therefore their caloric needs) and this misunderstanding is linked to food consumption decisions.

The NHANES contains data on reported and recorded weight, reported and recorded physical activity, and reported nutritional intake; which is very useful in separating imperfect information from misreporting. This paper attributes the misreporting of physical activity to either intentional or unintentional misreporting, (acknowledging that some 'intentional' misreporting may happen subconsciously), claiming that that unintentional misreporting of physical activity is driven by imperfect information. Consistent with prior findings of favorable reporting bias in survey data,

[1] The nutrition field (e.g., Mayo Clinic) holds that a 3,500 calories roughly equates to 1 pound of fat, but acknowledges there is considerable heterogeneity among individuals.

there is evidence of a systematic relationship between misreported body weight and misreported exercise.[2] In our empirical analysis, we mitigate the confounding effects of intentional misreporting by increasingly restricting the estimation samples to individuals who accurately report their body weight.[3] While we cannot positively eliminate all bias from intentional misreporting of exercise, we empirically demonstrate that reducing the bias from intentional misreporting strengthens, rather than weakens, our main result.

I also conduct robustness and falsification tests to alleviate concerns about omitted variable bias from factors such as apathy or level of concern about health. The NHANES contains reported data on other arguably unhealthy behaviors, including consumption of cigarettes, alcohol, caffeine, and sodium. Results indicate that overestimated exercise is not strongly related to any of these behaviors, nor does including variables for these behaviors in our main regressions significantly affect the main results. Finally, I demonstrate that conditional on recorded exercise, there is no significant relationship between consumption of alcohol, cigarettes, caffeine or sodium and reported exercise. In all cases, these results hold under tighter sample restrictions on the basis of accuracy in reporting body weight, as a proxy for overall accurate reporting.

In short, this paper finds that misreported exercise is strongly related to intake of sugar, carbohydrates, and total calories; and that this result strengthens as the sample is strategically restricted to isolate the effects of unintentional misreporting. The effect of unintentional misreporting (which we interpret as stemming from imperfect information) is most pronounced among those who have high variance in their physical activity levels and those who have not been to college. Individuals with higher variance in their daily activity will likely estimate their "typical" physical activity behavior with greater error (Bordalo et al., 2013). Similarly, individuals with less education are more likely to exhibit information gaps.[4] Most of these marginal calories from overestimated physical activity are comprised of sugar and carbohydrate. A quantile regression specification finds these

[2]However, this paper shows that this type of misreporting will bias our results downward.

[3]This paper acknowledges the substantial literature on joint misreporting on health variables and differential misreporting on the basis of income and education, including D'uva et al. (2008); Butler et al. (1987); Suziedelyte and Johar (2013); Johnston et al. (2009) and Ljungvall et al. (2015). However, the empirical analysis and sample restrictions are motivated by two notions. First, if individuals are accurately reporting their body weight, they are less likely to lie about their physical activity. Second, conditional on intention to accurately report physical activity, what else but imperfect information or mis-perception would cause an individual to mis-report? The results in this paper support both notions.

[4]A working paper by Cawley and Choi (2015) also shows that there is heterogeneity in overall misreporting between individuals of varying education and other observable characteristics. We rely on our sample restriction by accuracy in reported body weight to mitigate deliberate misreporting.

results are largest in magnitude and significance among less active individuals and individuals in the 75th and 90th percentiles of caloric intake. I check that these results are robust to the inclusion of reported variables strongly correlated with attitudes about health. I check that overestimated exercise appears to affect only food intake, not any of the aforementioned unhealthy behaviors. Similarly, consumption of cigarettes, alcohol, caffeine and sodium do not significantly inform the misreporting of exercise. All of this evidence is consistent with the notion that individuals have imperfect information about their physical activity (and by extension, their caloric requirements) and these information imperfections are related to their food intake.

It should be re-emphasized that these estimates are to be interpreted descriptively, rather than causally. These estimates are intended to measure the importance of an existing information gap, but cannot be interpreted as a treatment effect of information. Rather, they point to the existence of a necessary (but not sufficient) condition for information treatments to be effective: individuals misperceive their activity levels, and that misperception is related to eating behavior, yielding mechanisms for weight gain.

2 Data

Data for this study are taken from the Centers for Disease Control's National Health and Nutrition Examination Survey. The NHANES is a repeated cross-section that contains information on physical health, mental health, body weight, and health behaviors. Nearly all waves contain data from respondent interviews and a subsequent physical examination. For only the 2003-2004 and 2005-2006 waves, respondents were fitted with a waist-mounted accelerometer, which recorded individuals' level of physical activity each minute of the day. As the activity monitor was not used in subsequent waves, we use only the 2003-2004 and 2005-2006 waves of the NHANES. The NHANES data contain measured and reported body weight, recorded and reported physical activity, and a recall of all things respondents ate or drank in the last 24 hours.

2.1 Timing of Data Collection Process and Implications For Reverse Causality and Simultaneity Bias

The timing of the data collection mitigates the effects of 'priming', e.g., respondents overestimating their physical activity because they are embarrassed about their recorded weight. Data were collected from the respondents in the following order:

1. Respondents were asked about body weight, various physical activity habits, and other health topics.

2. Respondents participated in a physical exam in which they were weighed, measured, and asked to recall everything they had to eat or drink during the last 24 hours.

3. Respondents were fitted with an activity monitor to track their movements over the next seven days. They were provided an envelope to return the monitor at the end of that period.

4. At some point in the first ten days after the physical exam, respondents were again asked to recall what they had to eat or drink during the last 24 hours.

The timing of the collection of these variables makes reverse causality (greater food intake causes overestimation of physical activity) virtually impossible. Respondents were asked about their physical activity habits in an earlier session than they were asked about their nutritional intake. If the timing was reversed, it would be plausible that reported caloric intake could cause overestimation of physical activity as respondents sought to ex post justify their eating behaviors. The timing of the collection implies that high reported caloric intake cannot cause overestimation of physical activity. It is therefore unlikely that reverse-causality drives our results.

The timing of the data collection also reduces the likelihood that these results are driven by simultaneity bias. A type of simultaneity bias is possible if actual physical activity as recorded by the accelerometer is "primed" by the interview and examination. However, this priming effect should lead individuals who report eating a lot to increase their activity, artificially reducing the difference between reported and recorded physical activity. This would cause our results to understate the true effect.

2.2 Variable Construction and Summary Statistics

Table 3 contains the combined summary statistics from the estimation sample taken from the 2003-2004 and 2005-2006 waves of the NHANES. Individuals were asked about their height and body weight and subsequently measured. I include controls for measured height and weight in our regressions as physically larger people usually eat more. Subscapular skinfold is a measure of the individual's body fat composition.

For reported nutrition, individuals were asked to recall everything they ate or drank in the last 24 hours. Individuals were shown containers and approximate measures for serving sizes. From these individually reported items, NHANES calculated composite nutritional intakes: total calories, grams of carbohydrate, protein, fat, etc., and various vitamins and minerals. Summary statistics for total calories and (milli)grams of specific nutrients used as dependent variables are in Table 3.

Two challenges must be addressed in measuring the difference between actual and reported physical activity: data for both actual and reported physical activity must each be compressed into a single measure; and comparisons must be made between the two different scales. Regarding the first challenge, I first form an index of reported physical activity by converting frequency responses into amounts of daily physical activity and general activity level. The third panel of Table 3 contains the physical activity variables used to calculate the index, with the summary statistics of the weighted index at the bottom. For the walking/biking and housework variables, individuals were asked if they did those things for at least 30 minutes in the past month. Respondents then answered questions about how many times and what frequency (day/week/month) they walked or biked (or performed housework). Respondents who reported more than 120 walking or biking sessions per month were topcoded at 120 sessions per month. Duration per session was topcoded at 180 minutes. Individuals were also asked similar questions about number and frequency of strength building activities and about their general level of activity on a 5 point scale. All values were converted to average daily hours of activity and were weighted by activity-specific metabolic weights provided by CDC. Obviously, some individuals undertake physical activities that are not included in the NHANES questionnaire. In this case, the difference between reported and actual physical activity will be understated. If this unreported physical activity leads individuals to consume additional food, our results will be understated.

Second, I compress the minute-by-minute activity data reported by the accelerometer (activity monitor) worn by the respondent to daily averages. Table 2 contains information on the distribution of intensity for each recorded minute of movement by day. As the week progresses, individuals spend more time being completely sedentary. The percentage of time that the accelerometer records no movement increases from 62.9% to 73.6%. Conditional on some movement, the mean and median recorded intensity also decline slightly over the course of the recorded week. The daily averages are reported in the last panel of Table 3. The average daily amount of recorded movement declines over the course of the recorded week. There is more than one plausible explanation. First, one might expect an individual who knows his/her activity is being monitored to exhibit a 'priming' effect, initially respond with increased activity levels, gradually returning to normal levels over the course of the monitoring period. Second, as the week progresses, individuals may be less diligent about wearing the monitor at all times .[5] The drop in recorded movement over the measurement period varies somewhat by the day of initial recording. Table 1 contains a cross-tabulation of average daily average by day of initial recording and day of monitor wear. Daily averages are then averaged to form a weekly average amount of intensity-weighted movement. To alleviate concerns that the measure of actual physical activity is biased by priming effects endogenous to reported variables, I calculate the average index of actual physical activity using only the last four days. [6]

The accelerometer returns integer values on a scale of 0 to 32,767. As the max value was recorded only 121 times in over 69 million recorded minutes, censoring is not a serious concern. Most individuals do not approach the max value, as the 99^{th} percentile of recorded intensity is approximately 4,000 for each day. For approximately 4% of the recorded minutes, the accelerometer reported errors. These observations were not included when forming the index. One benefit of the large numbers of observations per individual is that the effect of outlier observations (legitimate or erroneous) is mitigated. Each respondent was recorded for approximately 10,000 minutes over the course of the week. In the event an accelerometer error was not detected, several false max values

[5] Individuals were supposed to remove the monitor under certain conditions, e.g., bathing.

[6] I have verified that the results do not substantively change when all seven days are included in the formation of the index of actual activity, nor do they substantively change when only the first three days are included in forming the index of actual activity.

Table 1: Average Physical activity Intensity per day, by initial collection day.

	Day Activity Monitoring Began						
Monitoring Day	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Day 1	150.43	201.06	181.58	182.60	172.04	177.08	160.67
Day 2	182.30	195.54	177.55	173.74	156.71	153.58	129.92
Day 3	177.21	184.20	171.20	168.35	147.92	131.89	157.99
Day 4	173.84	179.63	161.73	143.32	123.23	155.02	154.97
Day 5	171.02	173.66	174.61	121.94	145.86	151.23	146.44
Day 6	163.64	141.29	119.55	154.31	147.05	149.81	144.44
Day 7	120.08	106.81	134.86	125.99	123.17	132.08	129.23
N	1758	1539	1069	445	424	506	621

Table 2: Distributional information on intensity of accelerometer recorded movement, by day.

	Days of wearing monitor						
Variable	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Percentage Stationary	62.86	63.34	64.50	65.03	66.69	68.46	73.57
Mean Intensity | Not Stationary	506.07	498.87	499.45	498.23	492.67	480.55	483.76
Median Intensity | Not Stationary	173.00	168.00	165.00	164.00	165.00	162.00	158.00
25^{th} Pctile Intensity | Not Stationary	35.00	34.00	33.00	33.00	33.00	33.00	32.00
75^{th} Pctile Intensity | Not Stationary	595.00	584.00	582.00	579.00	577.00	559.00	558.00
99^{th} Pctile Intensity | Not Stationary	4154.00	4097.00	4142.00	4114.00	4053.00	3982.00	4079.00

(or atypically high true values) would have a relatively small effect on the individual's total weekly average.

To make comparisons between recorded and reported physical activity, I also must account for the fact that the index of reported and recorded physical activity are on different scales and not directly comparable. It should be noted, however that both indexes represent similar values as the reported values from the accelerometer are linear in METs. To compare the two scales, I calculate the z-score for the individual's reported and recorded physical activity. The difference between the individual's reported and recorded physical activity values is thus the difference in these z-scores.[7] The cost of combining these scales is that our results can only be interpreted in an ordinal context (i.e., conditional on an average level of actual physical activity, an individual who thinks he engages in above average levels of physical activity will eat more sugar.)

[7]We have also conducted this analysis using percentiles of reported and recorded physical activity. The results do not substantively change.

Table 3: Summary Statistics

Variable	**Mean**	**Std. Dev.**	Min	Max
Demographic Variables				
Age	38.69	14.51	18	65
Black	0.24	0.43	0	1
Female	0.538	0.499	0	1
Hispanic	0.26	0.443	0	1
High School Degree	0.74	0.44	0	1
Some College	0.45	0.498	0	1
Bachelor's Degree	0.18	0.38	0	1
Income (categorical)	7.25	3.01	1	11
Anthropometry				
Body Weight, self-reported (lbs)	176.505	45.399	82	600
Body Weight, Measured (lbs)	178.43	47.04	74.14	816.20
Height (cm) Measured	168.21	10.03	139.00	204.10
Body Mass Index (kg/m**2)	28.60	6.852	14.65	130.21
Subscapular Skinfold (cm)	20.201	7.87	4.60	41.90
Reported Energy Intake				
Energy (kcal)	2296.81	1046.57	0	9353
Protein (gm)	86.08	44.27	0	415.90
Carbohydrate (gm)	281.59	138.54	0	1425.38
Total sugars (gm)	132.40	87.49	0	768.04
Dietary fiber (gm)	15.79	9.79	0	91.00
Total fat (gm)	86.01	47.29	0	415.02
Self-Reported Physical Activity				
Avg level of physical activity each day	2.105	0.837	0	4
Vigorous activity over past 30 days	0.365	0.481	0	1
Moderate activity over past 30 days	0.561	0.496	0	1
Muscle strengthening activities	0.296	0.457	0	1
Number of times each past 30 days	3.924	8.527	0	90
Hours Walked or Biked (last 30 days)	2.914	8.758	0	100
Hours of Housework (last 30 days)	6.181	11.138	0	120
Met-weighted Index	48.971	4.073	39.53	60.3
Recorded Mean Intensity Physical Activity, by Day				
Day 1	174.71	122.36	0	1189.25
Day 2	175.01	124.33	0	991.23
Day 3	169.84	127.26	0	1228.51
Day 4	164.36	123.12	0	1069.07
Day 5	158.64	126.00	0	1122.91
Day 6	146.09	122.81	0	1544.62
Day 7	121.82	113.65	0	1375.70

3 Empirics

Empirically, this paper investigates the relationship between misreported physical activity and intake of calories or grams of particular ingredients using ordinary least squares regressions. Defining K_i as food intake, A_i^0 for recorded activity, μ_i^A as the difference between reported activity A_i and recorded activity, and $\mathbf{X_i}$ as a vector of exogenous characteristics, our baseline empirical model can be written:

$$K_i = \mathbf{X_i}\beta + A_i^0\gamma_1 + \mu_i^A\gamma_2 + \epsilon_i \tag{1}$$

While these results are intended to be interpreted descriptively rather than causally, several confounding factors must still be addressed to obtain accurate descriptive estimates including correlated reporting errors for activity and intake, simultaneity or omitted variable bias, and reverse causality. While section 2 addressed reverse causality and simultaneity, measurement error and omitted variable bias are addressed here. Measurement error, classic or non-classic almost surely leads to understatement of our results. Our regression results themselves provide evidence that our results are biased downward (rather than overstated) by measurement error. While omitted variable bias cannot be eliminated, the results are strongest among individuals for whom information imperfections should be most pronounced. Several falsification tests and robustness checks are also conducted and discussed below.

3.1 Bias from measurement error

Basic econometrics and prior evidence on misreporting indicates that measurement error, classical or otherwise, causes our estimates to understate the relationship between overestimated physical activity and eating behavior. This claim is empirically supported by repeating our regressions with increasingly restricted subsamples determined by accuracy of reported body weight. As the sample is restricted to those individuals who accurately report their body weight, the estimated effect of misperceived physical activity on eating behaviors strengthens.

The NHANES data contain measured and reported body weight, recorded and reported physical activity, and a recall of all things ingested. Denoting K_i for individual's caloric intake, A_i

for physical activity/activity, and B_i for the individuals body weight, three variables are measured with error:

$$
\begin{aligned}
K_i &= K_i^0 + \mu_i^K \\
A_i &= A_i^0 + \mu_i^A \\
B_i &= B_i^0 + \mu_i^B
\end{aligned} \tag{2}
$$

where for each variable $x \in \{K, A, B\}$, x_i indicates the reported value, x_i^0 indicates the true value, and μ_i^x indicates the reporting error. Unlike most health survey data, μ_i^A and μ_i^B are observed in the NHANES. The only variable in array 2 that is unobserved is μ_i^K, the reporting error for nutritional intake. Ideally, the econometrician would perfectly observe nutritional intake and estimate:

$$K_i^0 = \mathbf{X_i}\beta + A_i^0\gamma_1 + \mu_i^A\gamma_2 + \epsilon_i \tag{3}$$

where $\mathbf{X_i}$ includes height, weight, education, BMI, income, and demographic variables.[8] Momentarily abstracting from other sources of bias, γ_2 should be an unbiased estimate of the relationship between mis-perception of physical activity and caloric intake.[9] However, K_i^0 is in not in the data set, only caloric intake measured with error, K_i, is observable. Still interested in an unbiased estimate of γ_2, equation 3 can be re written as:

$$
\begin{aligned}
K_i - \mu_i^k &= \mathbf{X_i}\beta + A_i^0\gamma_1 + \mu_i^A\gamma_2 + \epsilon_i \text{ or} \\
K_i &= \mathbf{X_i}\beta + A_i^0\gamma_1 + \mu_i^A\gamma_2 + \underbrace{\mu_i^k + \epsilon_i}_{\nu_i}
\end{aligned} \tag{4}
$$

where ν_i denotes the new, composite error term in the regression.

[8]While weight is endogenous, I treat it as 'predetermined' in some sense to the individual's eating decision that day. I have verified that our results are robust to omission of weight and other potentially endogenous control variables. Results are available upon request.

[9]The individual could, of course, be subject to some neurosis/neuroses that compel him to misperceive his physical activity and eat more/less.

Table 4: Mean misreported weight by quantile of misreported physical activity

Quartile - μ_i^A	$B_i - B_t^0$
Strong Overstatement	-3.16 lbs.
Mild Overstatement	-2.01 lbs.
Mild Understatement	-1.67 lbs.
Strong Understatement	-0.44 lbs.

Still assuming that $E[\mu_i^A \epsilon_i] = 0$, any bias on γ_2 is determined by correlation between μ_i^K and μ_i^A. Evidence from the psychology literature (Crowne and Marlowe, 1960) and economics (Cawley, 2004; Bound et al., 2002) indicates individuals exhibit social desirability bias in surveys, answering questions in ways that will be viewed favorably by others. One would expect ex ante that social desirability bias would lead individuals to understate their body weight, overstate their physical activity, and understate their nutritional intake. If this is the case, $corr(\mu_i^A, \mu_i^K) < 0$ and our estimate of γ_2 will understate the true effect of misperceived physical activity levels on eating. Cawley (2004) finds evidence of this phenomenon in the NHANES data - that most individuals tend to understate their body weight.

We also find evidence consistent with social desirability bias in NHANES data. Individuals who understate their body weight also overstate their physical activity, that $corr(\mu_i^A, \mu_i^B) = -0.12$. I compare the average underreporting of body weight for four quartiles of misreported physical activity. Table 4 shows that individuals who overestimate their physical activity the most also under report their body weight by the largest margin. All means are statistically different from one another at the 5% level except the second and third quartiles. The individuals who most strongly over-report their physical activity understate their weight by an average of 2.7 additional pounds relative to those who most strongly under-report their physical activity. If our main regression results are biased by systematic misreporting, they are biased downward.

We also provide empirical validation that our results are not driven by systematic reporting bias by restricting the sample to those individuals who accurately report their weight to within a certain percent. As the tolerance for misreported weight decreases, the key results strengthen. Thus, the main results are falsely driven by measurement error only if individuals accurately report their weight, but overestimate their physical activity and food intake. This seems unlikely, given the ancillary evidence on the nature of misreporting.

3.2 Omitted Variable Bias

Omitted variable bias is more difficult to address. If latent personal traits that lead individuals to both overestimate their physical activity and factually eat more (e.g., apathy, self delusion), then $E[\mu_i^A \epsilon_i] > 0$.[10] While this possibility cannot be eliminated, some evidence suggests that omitted variable bias is not entirely responsible for the observed relationship. I split the sample by education levels and by variance in recorded physical activity. While there is no research (to my knowledge) suggesting that individuals' propensity to self-deceive varies by education, it is likely that imperfect recall/information gap explanations will be more pronounced among individuals with less education. Splitting the sample on the basis of variance in activity stems from similar logic. All else held constant, the literature on salience holds that individuals with noisier patterns physical activity will likely estimate their "typical" level of activity with greater error (Bordalo et al., 2013). Those who overestimate their physical activity (and therefore their necessary required intake) will eat more.

I also checked that these results were robust to including misreported weight as a control variable. If these results were driven by self-delusion, incorporating μ_i^B as a control variable (rather than restricting the sample on the basis of μ_i^B) would absorb some of the effect of μ_i^A. Including misreported weight in our regressions does not change the results. I also check whether including consumption of cigarettes, alcohol, caffeine or sodium substantially affects relationship between misperceived physical activity and food intake. If the main results are driven by omitted lack of concern about health, including unhealthy behaviors (which should reflect lack of concern about health) would change the results substantially. I also regress consumption of cigarettes, alcohol, caffeine and sodium on the usual set of control variables, including the difference between recorded and reported physical activity. Unlike nutrition behavior, misperceived physical activity does not explain consumption of these goods at the extensive or intensive margin. Finally, I regress reported physical activity on recorded physical activity, the usual set of controls, and consumption of unhealthy goods. Conditional on recorded physical activity, results indicate that these other health behaviors have no explanatory power with respect to reported physical activity. While omitted variable bias cannot be definitely eliminated, the synthesis of all these these results indicate that

[10] By contrast, social desirability bias implies that $corr(\mu_i^A, \mu_i^K) < 0$, biasing our results downward.

Table 5: Summary Results for Tables 10-17, Estimated effect of overestimating physical activity by one standard deviation on nutritional intake, restricting by percent error in body weight

Variable	Full Sample	μ^B/B <0.15	μ^B/B <0.10	μ^B/B <0.5	μ^B/B <0.01
Daily Caloric Intake	26.042	30.748	37.585	41.482	42.424
	(17.375)	(17.501)*	(17.906)**	(19.414)**	(35.610)
Sugar (g)	3.657	4.037	4.341	4.262	5.868
	(1.534)**	(1.548)***	(1.587)***	(1.806)**	(3.180)*
Carbohydrate (g)	5.304	6.077	6.791	6.364	8.197
	(2.359)**	(2.377)**	(2.436)***	(2.725)**	(4.791)*
Protein (g)	0.679	0.759	1.110	0.997	0.518
	(0.742)	(0.746)	(0.768)	(0.857)	(1.527)
Fat (g)	0.696	0.812	1.075	1.100	1.533
	(0.807)	(0.816)	(0.835)	(0.935)	(1.655)
Vitamin A (mcg)	9.240	9.228	12.475	11.156	20.217
	(6.548)	(6.625)	(6.805)*	(7.636)	(14.540)
Beta carotene (mcg)	61.088	40.536	46.356	80.119	170.616
	(53.297)	(54.238)	(56.338)	(67.108)	(144.440)
Calcium (mcg)	10.827	11.488	15.819	16.177	11.371
	(9.216)	(9.373)	(9.559)*	(10.543)	(19.557)
N	5,966	5,739	5,425	4,714	1,223

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

individuals information about their physical activity is imperfect, that those imperfections about physical activity affect nutritional intake, and false positives are not present in areas where one would expect them if this relationship was driven by lack of concern about health, self delusion, or other unobserved heterogeneity.

4 Results

Results show strong associations between misperceived physical activity and nutritional intake. In all cases, control variables for demographics, income, education, height, body weight, and actual physical activity are included. First, I estimate caloric intake (or g/mg/mcg of a nutrient, as appropriate). For each regression, I restrict the estimation sample by the absolute percentage reporting error for body weight, μ_i^B/B_i^0, mitigating the bias from erroneous reporting and demonstrating the results are not driven by arbitrary restrictions.

Table 6: Summary Results for Tables 18-20, effect of overestimating physical activity by one standard deviation on nutritional intake, by percent error in body weight and education level

Variable	No College μ^B/B <0.10	No College μ^B/B <0.05	No College μ^B/B <0.01	Some College μ^B/B <0.10	Some College μ^B/B <0.05	Some College μ^B/B <0.01
Daily Caloric Intake	59.220	63.069	131.508	4.137	-6.523	-38.044
	(26.470)**	(30.948)**	(54.674)**	(23.888)	(24.922)	(46.096)
Sugar (g)	6.096	6.864	14.599	1.442	0.741	-2.771
	(2.241)***	(2.657)***	(4.699)***	(2.282)	(2.452)	(4.249)
Carbohydrate (g)	9.942	10.831	19.742	2.209	0.922	-2.679
	(3.510)***	(4.146)***	(7.134)***	(3.405)	(3.520)	(6.452)
N	2,868	2,193	580	2,557	2,167	643

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 7: Summary Results for Tables 21-23, effect of overestimating physical activity by one standard deviation on nutritional intake, by variance in exercise

Variable	Low Variance μ^B/B <0.10	Middle Variance μ^B/B <0.10	High Variance μ^B/B <0.10
Total Caloric Intake	20.503	18.205	68.032
	(28.323)	(30.364)	(34.819)*
Sugar (g)	4.505	2.056	5.549
	(2.417)*	(2.603)	(3.254)*
Carbohydrate (g)	4.565	4.882	10.485
	(3.798)	(4.111)	(4.796)**
N	1,807	1,813	1,805

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 8: Summary Results for Tables 24-26, quantile estimates of overestimating physical activity by one standard deviation on nutritional intake, weight error less than 10 percent

Variable	**Percentile**				
	10th	25th	50th	75th	90th
Daily Caloric Intake	8.877	12.462	14.92	74.907	84.636
	(19.62)	(20.127)	(21.928)	(31.514)**	(43.208)*
Sugar (g)	0.775	2.346	4.423	4.479	8.143
	(1.792)	(1.958)	(1.926)**	(2.312)*	(4.114)**
Carbohydrate (g)	5.275	4.454	3.864	7.644	13.695
	(2.935)*	(2.453)*	(2.463)	(3.852)**	(5.761)**
N	4714	4714	4714	4714	4714

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 5 contains summary estimates of the effect of overestimating physical activity by one standard deviation on nutritional intake. The only reported results are for overestimated physical activity.[11] For the full sample (column 1), overestimating one's physical activity has a positive and statistically significant effect on consumption of sugar and carbohydrates. The downward bias from social desirability in reporting shrinks as the estimation sample is restricted to individuals who accurately report their weight. When the sample is restricted to individuals who accurately report their weight within 15%, 10% and 5%, the estimated effect of overestimating physical activity on consumption of total calories, sugar and carbohydrate increases in magnitude and statistical significance. The point estimate is largest when only including individuals who report their weight within 1% error, but the reduced sample size renders the estimates marginally significant at most.

The estimated effect of overestimated physical activity on daily caloric intake in column (4) can be interpreted as "an individual who is at the mean for recorded physical activity, but reports he is in the 84th percentile (1 s.d. above) will consume 41.48 calories per day more than an individual at the mean for recorded physical activity who accurately perceives his activity level." The magnitude of this estimate is large. An individual who overestimates his physical activity by one standard deviation is expected to gain 4.3 pounds per year.[12]

The composition of these extra calories is also of interest. Eating more lean protein and vegetables as a result of imperfect information is less unhealthy than increased sugar intake. The second and third rows show that individuals who overestimate their physical activity eat more sugar and carbohydrate. Combining these estimates with the ones from the first row, approximately 60% (75%) of the additional calories from overestimation of physical activity are from sugar (carbohydrate). I also evaluate whether overestimated physical activity is linked to increased vitamins. Rows four through eight in Table 5 show that overestimation of exercise is not linked to statistically significant increases in consumption of protein, fat, vitamin A, Beta carotene, or calcium.

The magnitudes of these estimates are compared with the estimates of the effect of actual physical activity on caloric intake, sugar, and carbohydrate (see Tables 10-17). Actual physical activity should (and does) increase individuals' intake more than perceived activity. For total

[11]See Tables 10-17 in the appendix for the full results, including other covariates.

[12]The magnitude and significance of this effect is not driven by our use of standard deviation as the unit of measures. Under the same specification, but using percentiles instead of z-scores, an individual who overestimates his physical activity by one percentile is expected to consume 1.23 additional calories per day than if he accurately assessed his own activity. Extrapolating percentiles to standard deviations, the results are similar in magnitude and significance.

caloric intake, the magnitudes of the estimates for actual physical activity are approximately four times as large (1% significant) as the estimates on overestimated activity. For grams of sugar (carbohydrate), the magnitude of the estimates for actual physical activity is approximately two (three) times as large as that of overestimation of activity. Tables 13 and 14 show that while actual physical activity leads to increased protein and fat intake, the effect of overestimated physical activity is not significant. While actual physical activity is linked to increased uptake of Vitamin A, Calcium and Beta Carotene (Tables 15-17), perceived physical activity is not. Perceived physical activity may have some positive benefits as it is linked to increased intake of Vitamin C.

Table 6 contains summary estimates of the effect of overestimating physical activity on food intake, with the sample split by education.[13] Columns (1)-(3) contain results for the subsample that never attended college, columns (4)-(6) contain the subsample who attended college. These results are consistent with the notion that information concerns contribute to the relationship between overestimated physical activity and eating. The coefficients of overestimated physical activity on total caloric intake are significant at the 5% level for the subsample who has never been to college, but accurately reports their weight. The estimated effect of overestimated physical activity on grams of sugar and carbohydrate is significant at the 1% level for individuals who have not attended college.[14] The coefficients of overestimated physical activity are much smaller for the subsample who did attend college, and none are statistically significant. As less educated individuals are likely less able to process and utilize information, this is consistent with the hypothesis that information concerns contribute to the relationship between overestimated physical activity and eating.[15]

Table 7 contains summary estimates of the relationship of interest, with the sample split by variance in physical activity.[16] One possible channel for the relationship between overestimated physical activity and caloric consumption is imperfect recall of recent physical activity. For example, Bordalo et al. (2013) show that when individuals recall prior values of prices or usage of a consumer good, they are more likely to remember and attach greater salience to outlier values than central tendencies. Similarly, if individuals do not incorporate their full recent history of physical activity

[13]Tables 18-20 in the appendix contain the full results of these regressions.

[14]The unreported coefficients from the non-college subsample not restricted by percentage weight error of overestimated physical activity on caloric, sugar, and carbohydrate intake are all significant at the 5% level.

[15]Consistent with the previous section, results were insignificant for the education split-sample when protein and fat were used as the dependent variable.

[16]Tables 21-23 in the appendix contain the full results.

into characterizing their activity levels, but instead overemphasize maximal values (i.e., the day with the most activity is remembered as "typical"), the relationship between overestimated physical activity and food intake will be most pronounced among individuals with the highest variance in physical activity. To that end, the sample is split into thirds by variance in daily recorded physical activity. Table 7 shows that the effects of overestimated physical activity on caloric intake are concentrated in the "high variance" third of the sample. The coefficient on overestimated physical activity is significant at the 10% level. Overestimated physical activity is shown to have an effect on carbohydrate intake for the high variance group, significant at the 5% level. While the point estimate of overestimated physical activity on sugar is largest and 10% significant in the "high variance" group, it is also significant for the low variance group. These results suggest that imperfect recall plays some role in the observed relationship between overestimated physical activity and increased calorie/sugar/carbohydrate intake.

Table 8 contains summary results from a simultaneous quantile regression at the 10th, 25th, 50th, 75th, and 90th percentile of total caloric intake, grams of sugar, and grams of carbohydrate. Full results are available in Tables 24-26 in the appendix. Overestimation of physical activity is significantly linked to caloric intake only at the 75th (5% significance) and 90th percentiles (10% significance). Note that the effects of overestimated physical activity at the 75th and 90th percentile are roughly five times the magnitude of the effect at the median. Additionally, from Table 24, the coefficients of actual physical activity on caloric intake exhibit far less variation over the support of daily calories. An individual at the 10th percentile of caloric intake (1,166/day) is expected to consume an additional 141 calories if he increases his physical activity by one standard deviation, compared to an increase of only 166 calories per day by an individual at the 90th percentile (3638/day) of caloric intake. If an individual at the 10th percentile overestimates his physical activity by one standard deviation, he'll consume another 9 calories per day, compared to 84 calories per day by the individual at the 90th percentile. The simultaneous quantile regressions of grams of sugar and carbohydrate exhibit similar patterns. The variation of the effect of overestimated physical activity is considerably larger over the distribution of the dependent variable than the variation in the effect of actual physical activity.

We also examine how the relationship between overestimated physical activity and food intake varies by activity level. Table 9 contains estimates of calories, grams of sugar and grams of

Table 9: Results, Results by Activity Level

Variable	Calories $z^A < \overline{z}$	Sugar $z^A < \overline{z}$	Carbohydrate $z^A < \overline{z}$	Calories $z^A \geq \overline{z}$	Sugar $z^A \geq \overline{z}$	Carbohydrate $z^A \geq \overline{z}$
Overreported Physical activity (Z-score)	44.679	4.850	7.542	29.052	3.487	5.642
	(25.741)*	(2.264)**	(3.524)**	(25.072)	(2.242)	(3.395)*
N	2,419	2,419	2,419	3,006	3,006	3,006

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

carbohydrates consumed.[17] The results in the left three columns are conducted on the subsample with 'less than average activity' ($z^A < \overline{z}$) and the three right columns contain results on the more active sample. The effect of overestimating physical activity on food intake is shown to be stronger, in magnitude and significance, on the less active half of the sample. This is consistent with the notion that individuals who think they are active (but are factually inactive) eat more than those who are aware of their inactivity. These results also serve as a robustness check that our results are not driven by noisy reports by individuals who eat and engage in physical activity more than average.

4.1 Robustness and Falsification Checks

Tables 28-30 repeat the regressions that produced the calorie, sugar, and carbohydrate results from Table 5, for individuals who report their weight within 10%, 5% and 1%, but include controls for cigarette, alcohol, sodium, and caffeine consumption. The results do not significantly change when including these variables. As falsification tests, Tables 31-34 evaluates whether misperception of physical activity has any explanatory power for these non-food-related health behaviors. Regressions for each falsification behavior are run for individuals who report their weight within 10%, 5% and 1% of the true value, both to provide a falsification for each relevant estimation sample, and to demonstrate how results change as the accuracy of reports improve. None of the results for any of these falsification behaviors under any sample restriction were statistically significant. Finally, Table 35 evaluates whether smoking, drinking, caffeine or sodium have any explanatory power for reported exercise. With the exception of smoking in the sample where body weight error is allowed

[17]Full results are in Table 27 in the appendix.

to be up to 10% incorrect, no individual estimates are statistically significant. No individual estimates are statistically significant for the samples where body weight is reported within 5% or 1% accuracy. The health behaviors are not jointly significant in any specification.

5 Discussion

Overestimation of physical activity is linked to increased caloric intake, controlling for demographics, education, actual physical activity, and the size of the individual. The majority of these additional calories are comprised of carbohydrate and sugar, and contain relatively little vitamins and nutrients. These results point to the existence of a necessary condition for information treatments to be effective: individuals misperceive their activity levels in ways that set the stage for substantial weight gain. These effects are concentrated among less educated individuals and individuals with noisier patterns of physical activity, suggesting that this relationship may be treatable by carefully designed information treatments. These effects are strongest among less active individuals and individuals in the upper portion of the distribution of caloric intake.

From a policy standpoint, our results indicate that there is significant potential for well-timed, targeted information interventions to affect individuals eating behavior. Depending on the characteristics of the individual, our results indicate that such a program could decrease weight gain by up to six pounds per year. On a six foot male, that figure translates to five BMI points every five years. Experimentation with high-frequency, multidimensional information treatments is an area for planned future work.

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A Full Results

Table 10: Results, regression of caloric intake, restricting by percent error in body weight

Variable	Full Sample	μ^B/B <0.15	μ^B/B <0.10	μ^B/B <0.5	μ^B/B <0.01
Overestimated Physical activity (Z-score)	26.042	30.748	37.585	41.482	42.424
	(17.375)	(17.501)*	(17.906)**	(19.414)**	(35.610)
Physical activity Actual (Z-score)	118.377	127.413	143.187	165.056	203.043
	(26.709)***	(26.869)***	(27.560)***	(29.607)***	(54.358)***
Age	-13.235	-12.791	-12.797	-12.278	-9.735
	(0.858)***	(0.865)***	(0.891)***	(0.955)***	(1.791)***
Female	-479.790	-490.398	-492.426	-461.965	-354.265
	(35.952)***	(36.144)***	(36.608)***	(38.793)***	(74.003)***
Income	-3.210	-3.651	-4.605	-4.790	-2.038
	(4.516)	(4.523)	(4.621)	(4.861)	(8.494)
Black	-77.017	-71.584	-84.009	-84.258	37.539
	(33.277)**	(33.485)**	(34.260)**	(36.269)**	(72.191)
Hispanic	-12.461	-18.744	-24.946	-2.628	-12.964
	(33.465)	(33.933)	(34.798)	(37.405)	(65.196)
Some College	13.860	18.978	25.559	23.127	78.783
	(29.688)	(29.869)	(30.642)	(32.304)	(62.886)
Bachelor's	4.156	5.786	-7.161	14.364	-11.858
	(34.414)	(34.825)	(35.448)	(37.055)	(67.001)
Height (cm) Measured	16.510	16.180	16.350	17.299	20.023
	(1.806)***	(1.831)***	(1.868)***	(2.003)***	(3.620)***
Body Mass Index (kg/m**2)	4.245	5.688	6.613	8.530	7.458
	(1.856)**	(1.944)***	(2.020)***	(2.175)***	(3.937)*
Constant	237.108	234.212	189.315	-78.227	-713.142
	(328.584)	(333.196)	(339.814)	(363.072)	(654.410)
R^2	0.19	0.19	0.20	0.20	0.19
N	5,966	5,739	5,425	4,714	1,223

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 11: Results, regression of sugar intake (grams), restricting by percent error in body weight

Variable	Full Sample	μ^B/B <0.15	μ^B/B <0.1	μ^B/B <0.5	μ^B/B <0.01
Overestimated Physical activity (Z-score)	3.657	4.037	4.341	4.262	5.868
	(1.534)**	(1.548)***	(1.587)***	(1.806)**	(3.180)*
Physical activity Actual (Z-score)	5.884	6.547	7.192	8.512	11.126
	(2.431)**	(2.463)***	(2.538)***	(2.828)***	(4.957)**
Age	-1.165	-1.095	-1.066	-0.943	-0.881
	(0.075)***	(0.075)***	(0.077)***	(0.087)***	(0.164)***
Female	-14.548	-16.510	-16.817	-16.247	-8.000
	(3.232)***	(3.276)***	(3.346)***	(3.645)***	(6.770)
Income	-1.363	-1.263	-1.332	-1.305	-1.802
	(0.408)***	(0.408)***	(0.418)***	(0.458)***	(0.777)**
Black	0.791	2.250	1.735	4.491	10.721
	(2.881)	(2.907)	(2.984)	(3.330)	(6.242)*
Hispanic	-1.669	-1.687	-2.198	0.186	7.377
	(2.922)	(2.948)	(3.025)	(3.342)	(5.872)
Some College	-4.051	-3.315	-2.934	-4.143	0.043
	(2.713)	(2.748)	(2.829)	(3.096)	(5.936)
Bachelor's	-4.198	-4.467	-5.372	-3.201	-5.453
	(3.025)	(3.061)	(3.122)*	(3.353)	(6.167)
Height (cm) Measured	1.139	1.068	1.056	1.133	1.403
	(0.163)***	(0.166)***	(0.171)***	(0.191)***	(0.323)***
Body Mass Index (kg/m**2)	0.153	0.154	0.161	0.109	0.479
	(0.163)	(0.172)	(0.180)	(0.202)	(0.390)
Constant	1.667	9.917	10.910	-7.601	-72.981
	(29.456)	(30.111)	(31.060)	(34.377)	(58.907)
R^2	0.10	0.10	0.10	0.10	0.10
N	5,966	5,739	5,425	4,360	1,223

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 12: Results, regression of carbohydrate intake (grams), restricting by percent error in body weight

Variable	Full Sample	μ^B/B <0.15	μ^B/B <0.10	μ^B/B <0.05	μ^B/B <0.01
Overestimated Physical activity (Z-score)	5.304	6.077	6.791	6.364	8.197
	(2.359)**	(2.377)**	(2.436)***	(2.725)**	(4.791)*
Physical activity Actual (Z-score)	15.729	17.208	18.918	20.326	23.689
	(3.597)***	(3.631)***	(3.736)***	(4.132)***	(7.347)***
Age	-2.048	-1.956	-1.914	-1.742	-1.413
	(0.115)***	(0.115)***	(0.118)***	(0.132)***	(0.242)***
Female	-48.145	-50.957	-51.415	-48.537	-33.946
	(4.834)***	(4.876)***	(4.966)***	(5.465)***	(10.211)***
Income	-1.572	-1.511	-1.652	-1.410	-1.054
	(0.622)**	(0.622)**	(0.635)***	(0.691)**	(1.182)
Black	-10.868	-9.304	-9.788	-7.558	7.778
	(4.345)**	(4.372)**	(4.469)**	(4.948)	(9.308)
Hispanic	8.097	7.066	6.448	6.933	16.646
	(4.520)*	(4.557)	(4.668)	(5.107)	(9.080)*
Some College	-4.485	-3.184	-2.545	-6.320	6.942
	(4.052)	(4.103)	(4.212)	(4.539)	(8.570)
Bachelor's	4.790	4.220	2.925	6.488	2.084
	(4.588)	(4.649)	(4.738)	(5.028)	(9.438)
Height (cm) Measured	1.784	1.684	1.687	1.915	2.428
	(0.244)***	(0.248)***	(0.253)***	(0.280)***	(0.490)***
Body Mass Index (kg/m**2)	0.209	0.294	0.320	0.313	0.643
	(0.242)	(0.255)	(0.265)	(0.296)	(0.535)
Constant	95.484	105.576	103.342	55.421	-74.118
	(44.268)**	(45.015)**	(46.052)**	(50.725)	(89.163)
R^2	0.16	0.16	0.16	0.17	0.15
N	5,966	5,739	5,425	4,360	1,223

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 13: Results, regression of protein intake (grams), restricting by percent error in body weight

Variable	Full Sample	μ^B/B <0.15	μ^B/B <0.10	μ^B/B <0.05	μ^B/B <0.01
Overestimated Physical activity (Z-score)	0.679	0.759	1.110	0.997	0.518
	(0.742)	(0.746)	(0.768)	(0.857)	(1.527)
Physical activity Actual (Z-score)	3.521	3.974	4.660	4.939	7.606
	(1.134)***	(1.118)***	(1.140)***	(1.273)***	(2.300)***
Age	-0.371	-0.359	-0.365	-0.381	-0.309
	(0.037)***	(0.038)***	(0.039)***	(0.043)***	(0.078)***
Female	-20.853	-20.388	-20.211	-19.654	-18.294
	(1.574)***	(1.554)***	(1.584)***	(1.760)***	(3.295)***
Income	0.274	0.234	0.177	0.217	0.175
	(0.195)	(0.195)	(0.199)	(0.218)	(0.386)
Black	-3.674	-3.553	-4.290	-4.445	2.803
	(1.431)**	(1.428)**	(1.465)***	(1.604)***	(3.030)
Hispanic	3.945	3.782	3.282	1.933	0.802
	(1.524)***	(1.545)**	(1.591)**	(1.790)	(2.927)
Some College	2.453	2.172	2.565	1.836	4.848
	(1.296)*	(1.277)*	(1.312)*	(1.447)	(2.713)*
Bachelor's	2.887	3.269	2.547	3.076	1.312
	(1.575)*	(1.579)**	(1.604)	(1.734)*	(2.963)
Height (cm) Measured	0.532	0.560	0.592	0.581	0.595
	(0.080)***	(0.080)***	(0.082)***	(0.092)***	(0.157)***
Body Mass Index (kg/m**2)	0.330	0.419	0.474	0.616	0.607
	(0.085)***	(0.088)***	(0.092)***	(0.102)***	(0.179)***
Constant	10.046	2.074	-4.049	-5.340	-13.780
	(14.592)	(14.550)	(14.901)	(16.718)	(28.526)
R^2	0.13	0.14	0.14	0.15	0.15
N	5,966	5,739	5,425	4,360	1,223

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 14: Results, regression of fat intake (grams), restricting by percent error in body weight

Variable	Full Sample	μ^B/B <0.15	μ^B/B <0.15	μ^B/B <0.05	μ^B/B <0.01
Overestimated Physical activity (Z-score)	0.696	0.812	1.075	1.100	1.533
	(0.807)	(0.816)	(0.835)	(0.935)	(1.655)
Physical activity Actual (Z-score)	4.454	4.629	5.313	5.198	9.725
	(1.227)***	(1.241)***	(1.269)***	(1.415)***	(2.593)***
Age	-0.400	-0.389	-0.398	-0.395	-0.305
	(0.041)***	(0.041)***	(0.042)***	(0.047)***	(0.084)***
Female	-14.337	-14.444	-14.492	-13.601	-8.215
	(1.695)***	(1.709)***	(1.732)***	(1.931)***	(3.493)**
Income	0.082	0.039	0.015	0.103	0.054
	(0.210)	(0.212)	(0.216)	(0.235)	(0.405)
Black	-1.671	-1.673	-2.681	-2.695	3.279
	(1.579)	(1.599)	(1.623)*	(1.798)	(3.435)
Hispanic	-3.914	-4.074	-4.405	-5.333	-5.471
	(1.556)**	(1.584)**	(1.626)***	(1.814)***	(3.114)*
Some College	2.141	2.166	2.507	0.946	3.844
	(1.393)	(1.407)	(1.437)*	(1.557)	(2.897)
Bachelor's	-0.880	-0.695	-1.116	-0.323	-0.461
	(1.715)	(1.738)	(1.771)	(1.911)	(3.346)
Height (cm) Measured	0.748	0.748	0.755	0.757	0.860
	(0.085)***	(0.086)***	(0.088)***	(0.097)***	(0.175)***
Body Mass Index (kg/m**2)	0.393	0.468	0.538	0.641	0.442
	(0.091)***	(0.096)***	(0.100)***	(0.113)***	(0.196)**
Constant	-26.377	-28.752	-30.964	-34.149	-54.308
	(15.531)*	(15.737)*	(16.051)*	(17.719)*	(31.495)*
R^2	0.11	0.12	0.12	0.12	0.13
N	5,966	5,739	5,425	4,360	1,223

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 15: Results, regression of Vitamin A (mcg), restricting by percent error in body weight

Variable	Full Sample	μ^B/B <0.15	μ^B/B <0.10	μ^B/B <0.05	μ^B/B <0.01
Overestimated Physical activity (Z-score)	9.240	9.228	12.475	11.156	20.217
	(6.548)	(6.625)	(6.805)*	(7.636)	(14.540)
Physical activity Actual (Z-score)	30.052	30.906	39.978	47.608	75.649
	(9.903)***	(10.134)***	(10.367)***	(11.755)***	(21.816)***
Age	0.056	0.273	0.417	0.483	0.462
	(0.339)	(0.345)	(0.353)	(0.398)	(0.747)
Female	40.114	35.506	36.031	39.074	66.317
	(13.456)***	(13.765)***	(14.169)**	(15.887)**	(31.007)**
Income	1.121	0.775	0.427	1.278	-1.533
	(1.717)	(1.731)	(1.770)	(1.970)	(3.520)
Black	-98.428	-94.357	-99.883	-99.795	-68.626
	(11.724)***	(11.933)***	(12.268)***	(13.770)***	(26.315)***
Hispanic	-33.614	-34.735	-34.847	-35.424	-17.297
	(12.519)***	(12.739)***	(13.032)***	(14.594)**	(27.681)
Some College	32.516	29.543	30.540	17.767	36.060
	(11.457)***	(11.626)**	(11.914)**	(13.027)	(24.482)
Bachelor's	53.501	55.187	53.357	61.035	31.885
	(14.681)***	(14.882)***	(15.186)***	(16.381)***	(29.642)
Height (cm) Measured	4.695	4.725	5.008	5.186	6.606
	(0.682)***	(0.696)***	(0.715)***	(0.802)***	(1.484)***
Body Mass Index (kg/m**2)	0.010	0.140	0.618	0.881	2.289
	(0.698)	(0.749)	(0.791)	(0.906)	(1.851)
Constant	-305.480	-321.417	-386.808	-429.382	-719.420
	(123.937)**	(126.903)**	(130.171)***	(145.685)***	(269.528)***
R^2	0.04	0.04	0.05	0.05	0.05
N	5,810	5,590	5,282	4,245	1,190

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 16: Results, regression of Beta Carotene (mcg), restricting by percent error in body weight

Variable	Full Sample	μ^B/B <0.15	μ^B/B <0.10	μ^B/B <0.05	μ^B/B <0.01
Overestimated Physical activity (Z-score)	61.088	40.536	46.356	80.119	170.616
	(53.297)	(54.238)	(56.338)	(67.108)	(144.440)
Physical activity Actual (Z-score)	205.706	207.380	234.997	280.536	574.477
	(93.878)**	(97.056)**	(101.847)**	(117.129)**	(219.967)***
Age	14.082	14.539	15.456	13.964	9.672
	(2.957)***	(3.040)***	(3.128)***	(3.592)***	(7.264)
Female	392.284	394.537	376.748	463.136	442.040
	(154.545)**	(160.538)**	(168.093)**	(198.434)**	(405.112)
Income	11.380	8.374	5.766	15.866	37.191
	(18.014)	(18.411)	(19.116)	(22.527)	(33.580)
Black	-80.804	-65.879	-46.998	-84.308	35.609
	(103.269)	(105.916)	(110.876)	(127.001)	(241.727)
Hispanic	206.060	222.340	224.268	116.563	284.399
	(117.712)*	(121.471)*	(126.581)*	(130.504)	(333.144)
Some College	221.313	216.699	235.300	149.709	132.657
	(95.294)**	(97.826)**	(101.767)**	(111.770)	(234.073)
Bachelor's	635.713	648.072	613.038	600.074	71.513
	(168.151)***	(172.407)***	(175.190)***	(188.245)***	(238.247)
Height (cm) Measured	16.414	18.163	18.531	21.331	18.626
	(7.746)**	(8.019)**	(8.409)**	(10.081)**	(19.223)
Body Mass Index (kg/m**2)	-13.369	-13.475	-12.863	-14.572	4.114
	(6.177)**	(6.573)**	(6.965)*	(8.233)*	(15.414)
Constant	-1,748.446	-2,056.106	-2,163.295	-2,537.468	-2,373.686
	(1,307.049)	(1,351.036)	(1,414.327)	(1,661.756)	(3,212.758)
R^2	0.02	0.02	0.02	0.02	0.01
N	5,966	5,739	5,425	4,360	1,223

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 17: Results, regression of Calcium (mcg), restricting by percent error in body weight

Variable	Full Sample	μ^B/B <0.15	μ^B/B <0.10	μ^B/B <0.05	μ^B/B <0.01
Overestimated Physical activity (Z-score)	10.827	11.488	15.819	16.177	11.371
	(9.216)	(9.373)	(9.559)*	(10.543)	(19.557)
Physical activity Actual (Z-score)	26.425	32.827	39.059	45.786	63.440
	(14.636)*	(14.934)**	(15.087)***	(17.170)***	(32.241)**
Age	-4.493	-4.148	-3.894	-3.780	-3.619
	(0.468)***	(0.475)***	(0.487)***	(0.545)***	(1.062)***
Female	-28.408	-37.532	-40.034	-30.676	-15.727
	(19.318)	(19.537)*	(19.994)**	(22.044)	(42.971)
Income	3.449	3.370	2.793	4.697	1.518
	(2.424)	(2.440)	(2.483)	(2.719)*	(5.072)
Black	-213.123	-203.501	-206.407	-209.500	-138.076
	(16.353)***	(16.637)***	(17.057)***	(18.756)***	(36.709)***
Hispanic	3.577	-1.699	-1.259	-5.585	-1.670
	(18.710)	(18.909)	(19.321)	(21.158)	(39.432)
Some College	51.138	45.876	45.555	44.104	44.969
	(16.482)***	(16.642)***	(17.022)***	(18.725)**	(35.893)
Bachelor's	54.745	54.314	48.136	45.423	57.024
	(20.539)***	(20.660)***	(20.984)**	(22.620)**	(42.434)
Height (cm) Measured	7.929	7.917	8.356	8.700	10.534
	(0.983)***	(0.996)***	(1.022)***	(1.128)***	(2.098)***
Body Mass Index (kg/m**2)	2.510	2.862	3.048	3.576	4.610
	(1.010)**	(1.076)***	(1.121)***	(1.258)***	(2.409)*
Constant	-324.988	-345.635	-430.051	-520.911	-890.201
	(179.793)*	(182.741)*	(187.722)**	(206.212)**	(390.344)**
R^2	0.08	0.08	0.08	0.09	0.08
N	5,900	5,679	5,369	4,317	1,210

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 18: Results, regression of caloric intake, by percent error in body weight and education

Variable	No College μ^B/B <0.10	No College μ^B/B <0.05	No College μ^B/B <0.01	Some College μ^B/B <0.10	Some College μ^B/B <0.05	Some College μ^B/B <0.01
Overrep't'd Physical activity (Z)	59.220	63.069	131.508	4.137	-6.523	-38.044
	(26.470)**	(30.948)**	(54.674)**	(23.888)	(24.922)	(46.096)
Physical activity Actual (Z-score)	148.822	153.846	275.324	131.792	144.807	136.288
	(38.370)***	(44.272)***	(74.605)***	(39.522)***	(41.111)***	(78.348)*
Age	-13.151	-12.251	-7.159	-11.768	-11.610	-11.520
	(1.204)***	(1.370)***	(2.541)***	(1.345)***	(1.418)***	(2.565)***
Female	-480.203	-442.477	-217.651	-498.370	-475.111	-502.305
	(52.835)***	(60.818)***	(107.635)**	(50.023)***	(52.779)***	(101.393)***
Income	-10.458	-10.856	-9.454	0.853	3.252	4.495
	(7.019)	(7.938)	(13.731)	(6.071)	(6.241)	(10.781)
Black	-79.312	-67.844	195.730	-101.258	-90.175	-101.854
	(51.750)	(59.019)	(118.489)*	(44.128)**	(46.570)*	(85.164)
Hispanic	-62.495	-55.755	-18.365	44.495	12.957	64.576
	(47.151)	(53.259)	(91.351)	(53.809)	(57.001)	(97.643)
Height (cm) Measured	15.308	17.149	19.263	17.240	17.531	18.247
	(2.736)***	(3.189)***	(5.719)***	(2.514)***	(2.620)***	(4.673)***
BMI (kg/m**2)	2.719	1.829	-0.315	11.199	15.119	15.350
	(2.892)	(3.327)	(5.674)	(2.789)***	(3.019)***	(5.490)***
Bachelor's				-13.197	10.960	-30.485
				(36.643)	(38.600)	(67.230)
Constant	527.596	188.111	-515.258	-149.682	-351.288	-418.210
	(494.118)	(569.705)	(1,019.895)	(464.399)	(488.536)	(881.209)
R^2	0.19	0.19	0.18	0.22	0.23	0.24
N	2,868	2,193	580	2,557	2,167	643

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 19: Results, regression of sugar intake, by percent error in body weight and education

Variable	No College μ^B/B <0.10	No College μ^B/B <0.05	No College μ^B/B <0.01	Some College μ^B/B <0.10	Some College μ^B/B <0.05	Some College μ^B/B <0.01
Overrep't'd Physical activity (Z)	6.096	6.864	14.599	1.442	0.741	-2.771
	(2.241)***	(2.657)***	(4.699)***	(2.282)	(2.452)	(4.249)
Physical activity Actual (Z-score)	8.205	8.843	19.054	5.695	8.072	4.332
	(3.524)**	(4.083)**	(7.017)***	(3.646)	(3.890)**	(6.828)
Age	-1.122	-0.968	-0.768	-0.958	-0.864	-0.958
	(0.104)***	(0.122)***	(0.229)***	(0.118)***	(0.127)***	(0.239)***
Female	-14.614	-12.739	-1.898	-19.669	-19.717	-14.973
	(4.832)***	(5.371)**	(9.956)	(4.591)***	(4.957)***	(9.292)
Income	-1.564	-1.715	-2.397	-1.200	-1.030	-1.512
	(0.625)**	(0.714)**	(1.186)**	(0.559)**	(0.592)*	(1.025)
Black	-3.195	-0.265	11.392	6.138	8.116	8.748
	(4.601)	(5.340)	(10.660)	(3.784)	(4.047)**	(7.041)
Hispanic	-7.139	-4.093	-1.505	6.241	7.936	24.727
	(4.135)*	(4.592)	(7.526)	(4.795)	(5.199)	(10.084)**
Height (cm) Measured	1.104	1.265	1.311	0.955	0.977	1.331
	(0.253)***	(0.296)***	(0.504)***	(0.226)***	(0.243)***	(0.430)***
BMI (kg/m**2)	0.142	-0.106	0.097	0.166	0.341	0.903
	(0.267)	(0.313)	(0.564)	(0.241)	(0.262)	(0.556)
Bachelor's				-4.857	-2.697	-5.610
				(3.227)	(3.454)	(6.279)
Constant	8.491	-20.206	-49.096	18.939	3.457	-67.456
	(45.805)	(52.873)	(91.364)	(41.657)	(44.918)	(81.124)
R^2	0.11	0.10	0.11	0.09	0.10	0.12
N	2,868	2,193	580	2,557	2,167	643

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 20: Results, regression of carbohydrate intake, by percent error in body weight and education

Variable	No College μ^B/B <0.10	No College μ^B/B <0.05	No College μ^B/B <0.01	Some College μ^B/B <0.10	Some College μ^B/B <0.05	Some College μ^B/B <0.01
Overrep't'd Physical activity (Z)	9.942	10.831	19.742	2.209	0.922	-2.679
	(3.510)***	(4.146)***	(7.134)***	(3.405)	(3.520)	(6.452)
Physical activity Actual (Z-score)	21.220	22.905	35.751	15.648	17.551	13.139
	(5.155)***	(5.966)***	(10.207)***	(5.437)***	(5.724)***	(10.528)
Age	-1.978	-1.741	-1.173	-1.773	-1.661	-1.617
	(0.159)***	(0.185)***	(0.334)***	(0.178)***	(0.189)***	(0.357)***
Female	-50.113	-44.438	-22.657	-52.188	-52.009	-47.108
	(7.222)***	(8.273)***	(14.950)	(6.737)***	(7.146)***	(14.036)***
Income	-2.144	-2.247	-2.846	-1.198	-0.723	0.266
	(0.953)**	(1.106)**	(1.855)	(0.844)	(0.869)	(1.545)
Black	-12.649	-11.566	17.220	-7.500	-4.590	-1.134
	(6.895)*	(7.986)	(15.387)	(5.624)	(5.965)	(11.021)
Hispanic	1.634	3.482	5.067	13.530	12.279	38.202
	(6.321)	(7.064)	(11.845)	(7.323)*	(7.619)	(14.789)**
Height (cm) Measured	1.492	1.901	2.052	1.877	1.915	2.512
	(0.370)***	(0.431)***	(0.750)***	(0.341)***	(0.359)***	(0.654)***
BMI (kg/m**2)	0.108	-0.208	0.030	0.554	0.848	1.256
	(0.390)	(0.457)	(0.753)	(0.357)	(0.384)**	(0.769)
Bachelor's				2.297	6.047	-0.533
				(4.879)	(5.165)	(9.518)
Constant	149.088	76.626	1.832	52.036	27.222	-89.933
	(67.080)**	(77.236)	(133.973)	(62.789)	(66.706)	(124.445)
R^2	0.16	0.15	0.15	0.17	0.18	0.18
N	2,868	2,193	580	2,557	2,167	643

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 21: Results, regression of caloric intake by, variance in recorded physical activity

Variable	Low Variance μ^B/B <0.10	Middle Variance μ^B/B <0.10	High Variance μ^B/B <0.10
Overreported Physical activity (Z-score)	20.503	18.205	68.032
	(28.323)	(30.364)	(34.819)*
Physical activity Actual (Z-score)	79.142	146.192	155.712
	(42.830)*	(50.947)***	(67.519)**
Age	-13.977	-13.208	-9.589
	(1.464)***	(1.513)***	(1.938)***
Female	-384.697	-530.653	-551.453
	(60.119)***	(62.584)***	(69.965)***
Income	-0.295	-2.463	-11.330
	(7.407)	(7.531)	(9.134)
Black	34.983	-193.750	-102.326
	(56.856)	(55.366)***	(68.031)
Hispanic	14.396	-12.883	-85.163
	(53.391)	(57.296)	(69.854)
Some College	37.453	17.565	23.137
	(46.893)	(50.642)	(63.483)
Bachelor's	35.742	42.927	-117.412
	(55.756)	(58.895)	(71.482)
Height (cm) Measured	12.283	18.648	17.953
	(2.738)***	(3.206)***	(3.701)***
Body Mass Index (kg/m**2)	8.381	10.574	-2.663
	(2.952)***	(3.329)***	(4.656)
Constant	702.586	-264.602	157.038
	(504.238)	(575.691)	(683.694)
R^2	0.15	0.22	0.18
N	1,807	1,813	1,805

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 22: Results, regression of sugar intake by, variance in recorded physical activity

Variable	Low Variance μ^B/B <0.10	Middle Variance μ^B/B <0.10	High Variance μ^B/B <0.10
Overreported Physical activity (Z-score)	4.505	2.056	5.549
	(2.417)*	(2.603)	(3.254)*
Physical activity Actual (Z-score)	0.913	8.579	6.489
	(3.840)	(4.767)*	(6.247)
Age	-1.137	-1.044	-0.925
	(0.122)***	(0.137)***	(0.171)***
Female	-5.132	-20.459	-21.793
	(5.531)	(5.648)***	(6.348)***
Income	-2.037	0.058	-2.142
	(0.642)***	(0.690)	(0.839)**
Black	3.367	-2.066	2.639
	(4.568)	(4.904)	(6.085)
Hispanic	-0.921	-1.252	-6.137
	(4.769)	(5.014)	(6.024)
Some College	0.368	-3.575	-5.551
	(4.297)	(4.781)	(5.709)
Bachelor's	-1.588	-8.226	-4.811
	(4.726)	(5.291)	(6.449)
Height (cm) Measured	0.945	1.052	1.171
	(0.270)***	(0.285)***	(0.334)***
Body Mass Index (kg/m**2)	0.183	0.085	0.253
	(0.267)	(0.301)	(0.405)
Constant	21.947	8.727	-6.255
	(48.178)	(51.413)	(62.291)
R^2	0.09	0.10	0.10
N	1,807	1,813	1,805

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 23: Results, regression of carbohydrate intake by, variance in recorded physical activity

Variable	Low Variance μ^B/B <0.10	Middle Variance μ^B/B <0.10	High Variance μ^B/B <0.10
Overreported Physical activity (Z-score)	4.565	4.882	10.485
	(3.798)	(4.111)	(4.796)**
Physical activity Actual (Z-score)	5.912	23.997	21.929
	(5.759)	(6.959)***	(8.999)**
Age	-1.997	-1.971	-1.662
	(0.189)***	(0.203)***	(0.260)***
Female	-35.362	-51.506	-64.745
	(8.090)***	(8.386)***	(9.599)***
Income	-1.722	-0.215	-2.972
	(0.987)*	(1.043)	(1.262)**
Black	-0.146	-19.250	-10.981
	(6.837)	(7.397)***	(9.107)
Hispanic	8.932	9.616	-0.678
	(7.176)	(7.789)	(9.254)
Some College	-0.932	-4.513	-1.308
	(6.380)	(7.030)	(8.616)
Bachelor's	8.388	4.616	-3.655
	(7.199)	(7.918)	(9.863)
Height (cm) Measured	1.260	2.105	1.665
	(0.376)***	(0.429)***	(0.504)***
Body Mass Index (kg/m**2)	0.436	0.742	-0.542
	(0.377)	(0.443)*	(0.617)
Constant	156.797	17.146	136.977
	(68.314)**	(77.274)	(93.742)
R^2	0.13	0.17	0.15
N	1,807	1,813	1,805

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 24: Results, quantile regression of total caloric intake, weight error less than 10 percent

Variable	Percentile				
	10th	25th	50th	75th	90th
Overestimated Physical activity (Z-score)	8.877	12.462	14.92	74.907	84.636
	(19.62)	(20.127)	(21.928)	(31.514)**	(43.208)*
Physical activity Actual (Z-score)	141.101	127.953	154.018	199.999	166.450
	(36.087)***	(34.950)***	(39.191)***	(43.045)***	(59.951)***
Age	-4.799	-7.528	-11.767	-15.444	-19.271
	(1.128)***	(1.105)***	(1.139)***	(1.514)***	(2.405)***
Female	-253.494	-335.298	-429.637	-558.396	-828.852
	(43.422)***	(38.898)***	(48.141)***	(57.633)***	(105.941)***
Income	10.333	5.108	-2.315	-6.294	-15.536
	(4.753)**	(5.351)	(5.680)	(6.705)	(10.844)
Black	-132.352	-132.406	-90.58	21.662	-35.181
	(42.270)***	(38.239)***	(44.374)**	-47.826	(80.426)
Hispanic	7.729	18.509	37.845	41.506	-13.299
	(38.958)	(36.498)	(44.214)	(50.375)	(88.403)
High School Degree	70.783	83.832	54.354	99.849	160.942
	(46.382)	(43.571)*	(50.216)	(63.44)	(121.177)
Some College	67.74	61.908	4.272	-31.332	-100.374
	(38.653)*	(33.235)*	(43.692)	(50.671)	(84.745)
Bachelor's	16.606	37.838	41.882	3.041	-11.688
	(44.97)	(41.147)	(42.619)	(57.297)	(75.764)
Height (cm) Measured	9.169	12.003	16.327	19.381	19.905
	(2.545)***	(1.983)***	(2.334)***	(2.964)***	(4.869)***
Body Mass Index (kg/m**2)	4.368	8.64	9.896	11.101	12.377
	(2.218)**	(2.055)***	(2.388)***	(3.034)***	(4.450)***
Constant	-164.677	-212.749	-161.235	103.600	968.003
	(424.279)	(351.938)	(422.427)	(523.500)	(915.390)
N	4714	4714	4714	4714	4714

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 25: Results, quantile regression of sugar intake (grams), weight error less than 10 percent

Variable	Percentile				
	10th	25th	50th	75th	90th
Overestimated Physical activity (Z-score)	0.775	2.346	4.423	4.479	8.143
	(1.792)	(1.958)	(1.926)**	(2.312)*	(4.114)**
Physical activity Actual (Z-score)	6.16	7.621	8.993	9.606	5.718
	(2.011)***	(2.464)***	(2.590)***	(3.537)***	(6.677)
Age	-0.412	-0.521	-0.872	-1.26	-1.664
	(0.084)***	(0.070)***	(0.079)***	(0.116)***	(0.218)***
Female	-2.093	-8.98	-13.808	-25.282	-28.399
	(3.168)	(3.574)**	(3.470)***	(4.677)***	(9.248)***
Income	-0.517	-0.532	-1.065	-2.032	-3.075
	(0.439)	(0.417)	(0.454)**	(0.586)***	(0.937)***
Black	4.655	4.344	6.677	4.332	4.216
	(3.441)	(2.867)	(3.197)**	(4.652)	(8.649)
Hispanic	11.042	8.911	7.346	-3.541	-1.113
	(3.112)***	(3.229)***	(3.202)**	(4.467)	(7.855)
High School Degree	5.236	6.031	2.11	5.732	2.306
	(2.900)*	(2.978)**	(3.435)	(4.955)	(8.465)
Some College	-2.833	-3.802	-1.894	-6.762	-6.536
	(2.868)	(3.546)	(3.250)	(4.645)	(8.001)
Bachelor's	6.184	2.408	-1.663	-3.901	-9.476
	(2.951)**	(3.130)	(3.534)	(4.927)	(7.990)
Height (cm) Measured	0.384	0.503	0.928	1.172	2.383
	(0.160)**	(0.178)***	(0.183)***	(0.260)***	(0.570)***
Body Mass Index (kg/m**2)	-0.049	-0.112	-0.027	0.254	0.318
	(0.190)	(0.173)	(0.227)	(0.259)	(0.488)
Constant	-6.005	15.927	6.777	41.661	-78.663
	(28.886)	(33.050)	(34.324)	(45.842)	(102.108)
N	4714	4714	4714	4714	4714

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 26: Results, quantile regression of carbohydrate intake (grams), weight error less than 10 percent

Variable	Percentile				
	10th	25th	50th	75th	90th
Overestimated Physical activity (Z-score)	5.275	4.454	3.864	7.644	13.695
	(2.935)*	(2.453)*	(2.463)	(3.852)**	(5.761)**
Physical activity Actual (Z-score)	16.81	16.637	21.914	20.516	19.683
	(4.716)***	(4.686)***	(4.203)***	(5.705)***	(8.999)**
Age	-0.73	-0.923	-1.656	-2.327	-2.492
	(0.171)***	(0.105)***	(0.132)***	(0.165)***	(0.303)***
Female	-20.073	-38.944	-46.771	-56.978	-82.731
	(5.460)***	(5.560)***	(5.530)***	(7.870)***	(13.015)***
Income	-0.418	-0.107	-1.583	-1.698	-2.901
	(0.708)	(0.665)	(0.721)**	(0.889)*	(1.650)*
Black	-10.793	-7.443	-7.324	-7.048	-5.947
	(5.575)*	(4.866)	(4.900)	(6.454)	(13.641)
Hispanic	17.323	14.153	13.403	9.654	15.560
	(5.516)***	(5.015)***	(6.433)**	(7.673)	(11.158)
hsd	14.603	6.408	8.05	3.114	8.932
	(7.507)*	(4.905)	(7.069)	(7.756)	(11.735)
Some College	-1.833	0.146	-1.283	-9.237	-23.024
	(5.360)	(5.459)	(6.291)	(7.443)	(11.242)**
Bachelor's	9.691	12.863	10.098	6.173	-1.841
	(6.413)	(6.499)**	(5.966)*	(7.104)	(12.909)
Height (cm) Measured	1.003	0.956	1.411	2.366	3.174
	(0.296)***	(0.304)***	(0.301)***	(0.374)***	(0.647)***
Body Mass Index (kg/m**2)	-0.011	-0.026	0.612	0.661	0.784
	(0.334)	(0.309)	(0.353)*	(0.308)**	(0.567)
Constant	5.661	88.307	100.877	61.014	39.937
	(55.459)	(54.396)	(55.806)*	(67.333)	(121.241)
N	4714	4714	4714	4714	4714

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 27: Results, Results by Activity Level

Variable	Calories $z^A < \overline{z}$	Sugar $z^A < \overline{z}$	Carbohydrate $z^A < \overline{z}$	Calories $z^A \geq \overline{z}$	Sugar $z^A \geq \overline{z}$	Carbohydrate $z^A \geq \overline{z}$
Overreported Physical activity (Z-score)	44.679	4.850	7.542	29.052	3.487	5.642
	(25.741)*	(2.264)**	(3.524)**	(25.072)	(2.242)	(3.395)*
Physical activity Actual (Z-score)	117.817	2.279	12.450	219.267	11.532	26.927
	(48.170)**	(4.584)	(6.616)*	(67.170)***	(6.111)*	(8.982)***
Age	-12.857	-1.147	-1.982	-12.460	-0.970	-1.817
	(1.287)***	(0.114)***	(0.171)***	(1.250)***	(0.108)***	(0.166)***
Female	-450.700	-14.373	-44.056	-515.889	-17.409	-55.240
	(57.807)***	(5.100)***	(7.764)***	(47.787)***	(4.477)***	(6.520)***
Income	-3.880	-1.236	-1.632	-5.159	-1.423	-1.660
	(6.856)	(0.632)*	(0.939)*	(6.293)	(0.564)**	(0.867)*
Black	-27.002	5.391	-2.443	-140.489	-2.055	-17.342
	(48.122)	(4.220)	(6.309)	(48.891)***	(4.234)	(6.328)***
Hispanic	3.028	-3.849	5.561	-48.130	-1.380	6.535
	(52.951)	(4.532)	(7.099)	(46.386)	(4.122)	(6.236)
Some College	-16.591	-4.244	-5.228	57.708	-2.056	-0.877
	(44.867)	(4.147)	(6.120)	(41.768)	(3.862)	(5.783)
Bachelor's	-12.373	-6.469	-0.612	-3.211	-4.618	5.734
	(52.469)	(4.676)	(7.094)	(48.009)	(4.199)	(6.372)
Height (cm) Measured	16.400	0.966	1.646	16.473	1.157	1.769
	(2.721)***	(0.249)***	(0.366)***	(2.567)***	(0.237)***	(0.352)***
Body Mass Index (kg/m**2)	5.325	0.276	0.378	8.343	0.042	0.269
	(2.728)*	(0.236)	(0.350)	(3.013)***	(0.281)	(0.408)
Constant	175.519	20.373	102.276	87.564	-7.590	85.767
	(495.094)	(44.853)	(66.369)	(468.953)	(43.609)	(64.717)
R^2	0.17	0.10	0.14	0.20	0.10	0.17
N	2,419	2,419	2,419	3,006	3,006	3,006

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 28: Robustness results, caloric intake results from Table 10, controlling for smoking, alcohol, caffeine, and sodium intake

Variable	μ^B/BMI<0.10	μ^B/BMI<0.05	μ^B/BMI<0.01
Overreported Exercise (Z-score)	42.028	48.900	49.093
	(17.228)**	(18.708)***	(34.371)
Exercise Actual (Z-score)	134.024	156.464	207.593
	(26.282)***	(28.244)***	(52.446)***
Age	-14.223	-13.690	-11.042
	(0.879)***	(0.950)***	(1.760)***
Female	-385.599	-364.195	-271.855
	(35.215)***	(37.365)***	(73.400)***
Income	-5.696	-5.660	-4.162
	(4.393)	(4.661)	(8.199)
Black	-6.392	-10.858	129.826
	(34.210)	(36.306)	(72.246)*
Hispanic	46.925	64.760	58.600
	(34.298)	(37.020)*	(65.615)
Some College	14.763	7.649	76.581
	(29.457)	(31.036)	(59.733)
Bachelor's	26.051	45.590	25.810
	(34.571)	(36.386)	(66.574)
Height (cm) Measured	14.960	15.740	19.100
	(1.796)***	(1.930)***	(3.496)***
Body Mass Index (kg/m**2)	8.202	9.913	9.743
	(1.954)***	(2.115)***	(3.813)**
log cigarettes	-8.170	-7.782	-5.481
	(14.627)	(15.869)	(34.125)
Caffeine (mg)	0.508	0.530	0.423
	(0.096)***	(0.107)***	(0.140)***
Alcohol (gm)	8.582	8.360	7.723
	(0.497)***	(0.576)***	(1.039)***
Constant	164.764	-58.565	-806.614
	(326.445)	(349.666)	(632.944)
R^2	0.27	0.26	0.25
N	5,425	4,714	1,223

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 29: Robustness results, sugar intake results (g) from Table 11, controlling for smoking, alcohol, caffeine, and sodium intake

Variable	μ^B/BMI<0.10	μ^B/BMI<0.05	μ^B/BMI<0.01
Overreported Exercise (Z-score)	4.535	4.883	5.890
	(1.575)***	(1.708)***	(3.170)*
Exercise Actual (Z-score)	7.794	10.075	11.054
	(2.517)***	(2.658)***	(4.922)**
Age	-1.191	-1.095	-0.983
	(0.081)***	(0.086)***	(0.167)***
Female	-17.507	-17.159	-10.026
	(3.327)***	(3.465)***	(6.804)
Income	-1.173	-1.310	-1.817
	(0.413)***	(0.436)***	(0.782)**
Black	6.692	7.309	12.987
	(3.051)**	(3.259)**	(6.463)**
Hispanic	1.429	3.442	9.471
	(3.055)	(3.266)	(6.007)
Some College	-2.868	-3.042	-0.229
	(2.819)	(2.951)	(5.883)
Bachelor's	-3.912	-2.539	-4.765
	(3.149)	(3.313)	(6.155)
Height (cm) Measured	1.040	1.127	1.406
	(0.170)***	(0.182)***	(0.322)***
Currently Dieting	-6.588	-7.653	-16.661
	(4.073)	(4.574)*	(8.126)**
log cigarettes	2.264	2.015	-0.072
	(1.371)*	(1.447)	(3.028)
Caffeine (mg)	0.034	0.032	0.035
	(0.009)***	(0.009)***	(0.015)**
Alcohol (gm)	-0.232	-0.268	-0.291
	(0.043)***	(0.047)***	(0.103)***
Constant	12.888	-4.164	-69.980
	(30.803)	(32.649)	(58.549)
R^2	0.12	0.12	0.12
N	5,425	4,714	1,223

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 30: Robustness results, carbohydrate intake results (g) from Table 12, controlling for smoking, alcohol, caffeine, and sodium intake

Variable	μ^B/BMI<0.10	μ^B/BMI<0.05	μ^B/BMI<0.01
Overreported Exercise (Z-score)	7.012	7.535	8.342
	(2.426)***	(2.631)***	(4.769)*
Exercise Actual (Z-score)	18.529	21.590	23.332
	(3.726)***	(3.982)***	(7.313)***
Age	-2.054	-1.927	-1.528
	(0.122)***	(0.131)***	(0.245)***
Female	-48.868	-46.027	-33.413
	(4.978)***	(5.254)***	(10.328)***
Income	-1.646	-1.713	-1.248
	(0.630)***	(0.667)**	(1.200)
Black	-3.125	-3.127	11.850
	(4.631)	(4.915)	(9.696)
Hispanic	10.848	14.198	19.058
	(4.759)**	(5.092)***	(9.359)**
Some College	-3.134	-4.036	6.288
	(4.217)	(4.395)	(8.517)
Bachelor's	4.398	7.150	2.777
	(4.794)	(5.033)	(9.499)
Height (cm) Measured	1.624	1.849	2.398
	(0.253)***	(0.270)***	(0.489)***
Body Mass Index (kg/m**2)	0.307	0.328	0.647
	(0.264)	(0.283)	(0.534)
log cigarettes	-1.183	-1.411	-3.815
	(2.071)	(2.204)	(4.463)
Caffeine (mg)	0.051	0.053	0.047
	(0.013)***	(0.014)***	(0.021)**
Alcohol (gm)	0.088	0.043	0.014
	(0.064)	(0.070)	(0.145)
Constant	107.186	60.731	-71.203
	(45.959)**	(48.873)	(89.084)
R^2	0.17	0.17	0.16
N	5,425	4,714	1,223

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 31: Falsification check, results for log cigarettes per day (Tobit)

Variable	μ^B/BMI<0.10	μ^B/BMI<0.05	μ^B/BMI<0.01
Overreported Exercise (Z-score)	-0.128	-0.114	-0.131
	(0.091)	(0.102)	(0.207)
Exercise Actual (Z-score)	-0.926	-0.931	-0.636
	(0.137)***	(0.155)***	(0.308)**
Age	0.034	0.032	0.012
	(0.005)***	(0.006)***	(0.012)
Female	-0.699	-0.656	-0.774
	(0.202)***	(0.226)***	(0.468)*
Income	-0.165	-0.154	-0.162
	(0.025)***	(0.027)***	(0.055)***
Black	-0.514	-0.489	-0.904
	(0.173)***	(0.193)**	(0.414)**
Hispanic	-2.195	-2.195	-2.764
	(0.208)***	(0.232)***	(0.519)***
Some College	-0.437	-0.410	-0.565
	(0.158)***	(0.174)**	(0.350)
Bachelor's	-1.993	-2.090	-1.977
	(0.239)***	(0.260)***	(0.512)***
Height (cm) Measured	-0.005	-0.004	-0.021
	(0.010)	(0.011)	(0.024)
Body Mass Index (kg/m**2)	-0.053	-0.049	-0.045
	(0.011)***	(0.013)***	(0.027)*
Caffeine (mg)	0.004	0.004	0.005
	(0.000)***	(0.000)***	(0.001)***
Alcohol (gm)	0.016	0.016	0.012
	(0.002)***	(0.002)***	(0.005)**
Constant	-0.692	-1.127	2.339
	(1.860)	(2.089)	(4.334)
N	5,425	4,714	1,223

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 32: Falsification check, results for grams of alcohol per day (Tobit)

Variable	μ^B/BMI<0.10	μ^B/BMI<0.05	μ^B/BMI<0.01
Overreported Exercise (Z-score)	-0.005	-0.031	0.006
	(0.103)	(0.110)	(0.211)
Exercise Actual (Z-score)	0.498	0.482	0.334
	(0.159)***	(0.171)***	(0.315)
Age	0.004	0.000	0.011
	(0.006)	(0.006)	(0.012)
Female	-1.962	-1.904	-1.815
	(0.224)***	(0.240)***	(0.462)***
Income	0.094	0.082	0.076
	(0.027)***	(0.029)***	(0.054)
Black	-0.326	-0.346	-0.818
	(0.200)	(0.214)	(0.423)*
Hispanic	-0.363	-0.378	-0.232
	(0.216)*	(0.231)	(0.446)
Some College	0.488	0.462	0.370
	(0.185)***	(0.197)**	(0.370)
Bachelor's	0.444	0.582	0.444
	(0.223)**	(0.234)**	(0.433)
Height (cm) Measured	0.013	0.012	0.010
	(0.011)	(0.012)	(0.023)
Body Mass Index (kg/m**2)	-0.068	-0.072	-0.085
	(0.013)***	(0.014)***	(0.028)***
Caffeine (mg)	0.000	0.000	0.001
	(0.000)	(0.000)	(0.001)
log cigarettes	0.501	0.469	0.396
	(0.074)***	(0.080)***	(0.156)**
Constant	4.260	4.247	4.116
	(0.096)***	(0.102)***	(0.191)***
N	5,425	4,714	1,223

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 33: Falsification check, results for milligrams of caffeine per day (Tobit)

Variable	μ^B/BMI<0.10	μ^B/BMI<0.05	μ^B/BMI<0.01
Overreported Exercise (Z-score)	-0.014	-0.015	-0.128
	(0.043)	(0.046)	(0.088)
Exercise Actual (Z-score)	0.141	0.141	-0.043
	(0.065)**	(0.070)**	(0.131)
Age	0.032	0.033	0.034
	(0.002)***	(0.002)***	(0.005)***
Female	-0.230	-0.228	-0.065
	(0.092)**	(0.099)**	(0.192)
Income	0.031	0.033	0.056
	(0.011)***	(0.012)***	(0.023)**
Black	-1.514	-1.517	-1.201
	(0.080)***	(0.085)***	(0.167)***
Hispanic	-0.468	-0.446	-0.469
	(0.087)***	(0.092)***	(0.180)***
Some College	0.119	0.146	0.283
	(0.076)	(0.081)*	(0.153)*
Bachelor's	-0.048	-0.091	-0.201
	(0.095)	(0.099)	(0.184)
Height (cm) Measured	0.011	0.012	0.002
	(0.005)**	(0.005)**	(0.010)
Body Mass Index (kg/m**2)	0.006	0.004	-0.012
	(0.005)	(0.005)	(0.011)
log cigarettes	0.363	0.364	0.289
	(0.032)***	(0.034)***	(0.067)***
Alcohol (gm)	-0.000	-0.000	0.004
	(0.001)	(0.001)	(0.002)*
Constant	2.251	2.234	2.183
	(0.025)***	(0.026)***	(0.050)***
N	5,425	4,714	1,223

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 34: Falsification check, results for milligrams of sodium per day

Variable	μ^B/BMI<0.10	μ^B/BMI<0.05	μ^B/BMI<0.01
Overreported Exercise (Z-score)	45.607	48.700	77.530
	(32.588)	(35.094)	(67.330)
Exercise Actual (Z-score)	191.913	217.450	341.662
	(49.311)***	(51.359)***	(98.438)***
Age	-21.099	-21.161	-18.425
	(1.669)***	(1.760)***	(3.348)***
Female	-640.994	-613.624	-490.016
	(68.346)***	(72.367)***	(135.588)***
Income	7.344	7.891	19.189
	(8.299)	(8.756)	(16.114)
Black	-162.381	-175.781	46.089
	(64.391)**	(67.714)***	(140.444)
Hispanic	-166.103	-135.733	-182.775
	(65.907)**	(70.796)*	(124.361)
Some College	113.858	95.674	239.974
	(55.371)**	(58.142)*	(108.517)**
Bachelor's	145.225	182.226	124.775
	(68.900)**	(72.223)**	(129.556)
Height (cm) Measured	24.397	24.230	25.478
	(3.508)***	(3.716)***	(6.540)***
Body Mass Index (kg/m**2)	23.844	29.053	26.948
	(3.802)***	(4.042)***	(7.328)***
log cigarettes	-39.669	-38.909	0.032
	(26.668)	(28.621)	(64.582)
Caffeine (mg)	0.803	0.890	0.578
	(0.129)***	(0.137)***	(0.277)**
Alcohol (gm)	3.105	2.891	2.683
	(1.004)***	(1.153)**	(2.145)
Constant	-173.573	-328.207	-742.801
	(642.866)	(681.278)	(1,198.231)
R^2	0.15	0.15	0.15
N	5,425	4,714	1,223

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 35: Modeling Reported Exercise

Variable	μ^B/BMI<0.10	μ^B/BMI<0.10	μ^B/BMI<0.05	μ^B/BMI<0.05	μ^B/BMI<0.01	μ^B/BMI<0.01
Recorded Exercise	0.191	0.194	0.181	0.183	0.185	0.183
	(0.018)***	(0.018)***	(0.020)***	(0.020)***	(0.038)***	(0.039)***
Age	-0.010	-0.009	-0.009	-0.009	-0.009	-0.009
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.002)***	(0.002)***
Female	-0.145	-0.159	-0.144	-0.153	-0.092	-0.096
	(0.029)***	(0.029)***	(0.033)***	(0.033)***	(0.062)	(0.062)
Income	0.003	0.003	-0.000	-0.001	0.007	0.008
	(0.004)	(0.004)	(0.004)	(0.004)	(0.008)	(0.007)
Black	-0.034	-0.030	-0.031	-0.029	-0.046	-0.039
	(0.027)	(0.027)	(0.030)	(0.030)	(0.056)	(0.056)
Hispanic	-0.202	-0.199	-0.198	-0.192	-0.175	-0.170
	(0.027)***	(0.027)***	(0.030)***	(0.030)***	(0.058)***	(0.058)***
Some College	0.116	0.113	0.122	0.119	0.157	0.160
	(0.025)***	(0.025)***	(0.027)***	(0.027)***	(0.051)***	(0.051)***
Bachelor's	-0.092	-0.095	-0.098	-0.101	-0.181	-0.182
	(0.030)***	(0.030)***	(0.032)***	(0.032)***	(0.058)***	(0.058)***
Height (cm) Meas.	0.002	0.002	0.004	0.004	0.006	0.006
	(0.001)	(0.001)	(0.002)**	(0.002)**	(0.003)**	(0.003)*
BMI (kg/m^2)	-0.005	-0.007	-0.006	-0.007	-0.004	-0.005
	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.004)	(0.004)
log cigarettes	-0.022	-0.020	-0.018	-0.017	-0.013	-0.014
	(0.011)**	(0.011)*	(0.012)	(0.012)	(0.025)	(0.025)
log Alcohol (g)	-0.001	-0.001	-0.005	-0.005	-0.005	-0.005
	(0.007)	(0.007)	(0.007)	(0.007)	(0.014)	(0.014)
log Caffeine (mg)	-0.002	-0.002	-0.002	-0.002	-0.017	-0.016
	(0.005)	(0.005)	(0.006)	(0.006)	(0.011)	(0.011)
Sodium (mg)	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
μ^B		-0.006		-0.009		-0.040
		(0.002)***		(0.003)***		(0.021)*
Constant	0.245	0.305	0.055	0.076	-0.502	-0.445
	(0.264)	(0.264)	(0.293)	(0.293)	(0.554)	(0.558)
	Joint Significance Test for Alcohol, Smoking, Caffeine, and Sodium					
F-Statistic	1.57	1.44	0.98	0.90	1.11	1.07
P-value	0.18	0.21	0.42	0.46	0.35	0.37
R^2	0.10	0.10	0.10	0.10	0.11	0.11
N	5,425	5,425	4,360	4,360	1,223	1,223

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$