Economics and Human Biology 28 (2018) 92–106

Contents lists available at ScienceDirect

Economics and Human Biology

journal homepage: www.elsevier.com/locate/ehb

The intergenerational transmission of obesity: The role of time preferences and self-control

Michal Stoklosa[a,*], Kerem Shuval[a], Jeffrey Drope[a], Rusty Tchernis[b], Mark Pachucki[c,d], Amy Yaroch[e], Matthew Harding[f]

[a] Economic and Health Policy Research Program, American Cancer Society, 250 Williams St., Atlanta, GA, 30303, USA
[b] Department of Economics, Georgia State University, 14 Marietta St. NW, Atlanta, GA, 30303, USA
[c] Computational Social Science Institute, University of Massachusetts, 40 Campus Center Way, Amherst, MA 01003, USA
[d] Department of Sociology, University of Massachusetts, 200 Hicks Way, Amherst, MA, 01003, USA
[e] The Gretchen Swanson Center for Nutrition, 8401 W Dodge Rd., Omaha, NE, 68114, USA
[f] Department of Economics, University of California, Irvine, 3151 Social Science Plaza, Irvine, CA, 92697, USA

ARTICLE INFO

Article history:
Received 27 October 2017
Accepted 15 December 2017
Available online 20 December 2017

Keywords:
Obesity
Time preferences
Present bias
Intergenerational effects

ABSTRACT

Previous research has found that impatient time preferences and self-control problems (present bias) are related to increased obesity risk. However, scant evidence exists pertaining to whether parents' impatience and self-control problems impact the obesity status of their children, too. Accordingly, we explore this study question among a large national sample of US adults and their children. Study results confirm previous findings indicating that intertemporal preferences are related to adults' obesity status. Moreover, these results extend the literature by finding that children of impatient or present-biased parents have a significantly higher likelihood of being obese, too. Specifically, parents' low levels of patience and present bias were each independently related to a five-percentage point increase in the likelihood of obesity of their children. These findings were more pronounced when all children were combined in analyses and for the first child; however, they varied for the second and third child. Thus, findings suggest that parents' time preferences and self-control problems likely affect not only their own weight status but that of their children.

1. Introduction

Obesity has been a growing problem in the United States (US) and worldwide over the past several decades. In the US, among adults aged 20 years and above, there has been a 2.8-fold increase in the prevalence of obesity from 13.4% in the 1960s to 37.7% in 2013–2014 (Centers for Disease Control and Prevention, 2017a; Flegal et al., 2016; National Institute of Diabetes and Digestive and Kidney Diseases, 2015). Furthermore, 17.0% of US children and adolescents between the ages of 2 and 19 years were defined as obese in 2011–2014 (Ogden et al., 2016). The high prevalence of obesity has resulted in increased rates of chronic diseases, such as cardiovascular disease, type 2 diabetes, and certain cancers (Centers for Disease Control and Prevention, 2017b). In fact, obesity in the US has been found to account for 21% of health care costs (Cawley and Meyerhoefer, 2012). Finkelstein et al. (2012) estimated that by 2030, 51% of the US population will be obese, which calls for improved cost-containment efforts through preventive medicine programs that encourage physical activity and healthful eating, which in turn, lower health care costs and increase productivity.

The sedentary lifestyle and poor diet resulting in today's obesity epidemic, is unsurprising given the current "obesogenic" environment which consists of automated energy "saving" machinery (e.g., use of cars instead of bikes) and the abundance of palatable unhealthful foods that surround us at home, at school, and on the job. Behavioral economists acknowledge that individuals often take the path of least resistance (status quo bias) and place a disproportionate emphasis on immediate gratification (e.g., watching a favorite TV show) rather than future benefits, such as reducing obesity risk through exercise (Loewenstein et al., 2007). The decision to be physically active or prepare a healthful

* Corresponding author at: 250 Williams Street, Atlanta, GA, 30303, USA.
E-mail address: michal.stoklosa@cancer.org (M. Stoklosa).

https://doi.org/10.1016/j.ehb.2017.12.004
1570-677X/

meal at home is costly in terms of energy and time at present, whereas the benefits, such as obesity prevention, are in the distant future and often not salient. Thus, individuals who place a larger emphasis on the 'here and now' (i.e., myopic), are less likely to engage in healthful behaviors, including preparing nutritious meals and exercising (de Oliveira et al., 2016; Leonard et al., 2013). These decisions, in turn, lead to higher obesity rates among those who are impatient.

In contrast, individuals who are more future oriented, that is, are willing to delay the immediate gratification of 'want' behaviors for future benefits are regarded as having more patient time preferences. Intertemporal preferences have been shown in numerous studies to be linked with dietary habits and obesity (Borghans and Golsteyn, 2006; Schlam et al., 2013; Sutter et al., 2013; Zhang and Rashad, 2008). For example, Zhang and Rashad (2008) observed a relationship between time preferences and the body mass index (BMI) among adults, while Sutter et al. (2013) observed this same relationship among children. Notably, a study by Schlam et al. (2013) observed that preschoolers' ability to delay gratification was significantly associated with reduced obesity risk 30 years later.

Whereas abundant evidence exists pertaining to the relationship between time preferences and obesity, more recent studies have focused on the effects of inconsistent time preferences and health outcomes. While time preferences could be consistent over time, they often are not, particularly when faced with temptation. For example, one may decide not to eat ice cream tomorrow, only to indulge the next day when watching a TV commercial featuring a family enjoying a banana split; this exposure evokes (or primes) a 'hot' state which could change preferences and behaviors (Loewenstein, 1996). Loewenstein refers to this as a 'hot-cold' empathy gap, where individuals find it difficult in a 'cold' (or calm) state to anticipate the impact of emotions on the preferences and behaviors of their 'future selves' (Loewenstein, 2005). This phenomenon often leads to inconsistent time preferences (or self-control problems) when temptation arises. However, only relatively recently have studies begun to examine the relationship between inconsistent time preferences and obesity. For example, Courtemanche et al. (2015) found that both consistent and inconsistent time preferences are associated with obesity. Similarly, Kang and Ikeda (2016) found that severe obesity is associated with both inconsistent time preferences and impatient time preferences.

Thus, in the current endeavor, beyond examining the (in) consistent time preferences- obesity relationship, we extend the literature by exploring whether parents' self-control problems have a "spill-over" effect onto their children in the form of increased obesity risk. While previous research has documented intergenerational pathways between parents' and children's obesity (Black et al., 2016; Li et al., 2009; Pachucki et al., 2014; Whitaker et al., 2010), the intergenerational effects of parents' self-control problems on children's obesity has yet to be empirically explored. With regard to the intergenerational transmission of obesity, this phenomenon could occur directly, such as through genetic mechanisms or via a shared household environment that affects the weight status of both parents and children (Classen and Thompson, 2016). It could also occur indirectly where parents model unhealthy behaviors to their children (Moore et al., 1991).

This indirect and direct relationship is likely tied to parents' intertemporal decision making and their children's health behaviors and outcomes. While this relationship has yet to be examined with obesity as an outcome, it has been investigated with smoking as the dependent variable in a small number of studies. For example, Brown and van der Pol (Brown and van der Pol, 2014), examined the relationship between a proxy of parents' patience (financial planning horizon) and the smoking practices of their young-adult children. Notably, they observed that children of impatient mothers who were smokers had an increased likelihood to smoke themselves. Their study, however, did not include a measure of inconsistent time preferences (indicative of self-control problems) and focused on older children/adolescents rather than a wider age range of children in our study (2–17 years old). Further, a study by Hübler and Kucher (2016) found that parents' (both father and mother) patience was significantly related to a lower propensity of their children being current smokers. However, only the father's self-control problems were associated with smoking risk.

To fill this gap in the literature, in the current study, we focus on how parents' time-consistent and inconsistent choices are related to the obesity of their children. We first examine this relationship among all children, and then assess whether it differs among the first and second and third child. We utilize individual-level data from a national sample in the US, the Family Health Habits Survey (FHHS). These data are cross-sectional and as a result a temporal and causal relationship cannot be established. Thus, findings should be considered descriptive, and longitudinal research on this topic is needed. Nonetheless, due to scant evidence on this topic, the current study fills an important gap in the health economics literature.

2. Background

Standard microeconomic theory assumes that individuals make intertemporal choices rationally by maximizing the sum of all future expected utilities, weighing both the present and future costs and benefits of their choices. In doing so, individuals discount future utility relative to present utility. The traditional discounting function is the exponential function, where the discounting from any time period to the subsequent period is constant at factor δ (Samuelson, 1937). In this model, at time $t = 0$ one's utility is: $U = \sum_{t=0}^{T} \delta^t u_t$. The model essentially reduces the intertemporal choice to one that is independent of time. The present is more important than the future (by factor δ); preferences are time-consistent.

More recent models, however, acknowledge time-inconsistent decision making. A quasi-hyperbolic discount model is a case in point regarding time-inconsistent preferences. In this model, as with the standard exponential discounting model, the future periods are discounted at a constant rate (δ). However, for the discounting in the present period, this model introduces parameter β to account for self-control problems and the effects of temptations. Specifically, in this model the discounting from the current period to the subsequent period is $\beta\delta$ (Laibson, 1997). At time $t = 0$, the utility function exhibits the following form: $U = u_0 + \beta \sum_{t=1}^{T} \delta^t u_t$. The standard model and the quasi-hyperbolic discount model are the same at $\beta = 1$, while $\beta < 1$ indicates that individuals are present biased (self-control problem), and $\beta > 1$ refers to one being future biased.

The standard exponential model has been used to explore relationships between patience, health behaviors and obesity, as previously mentioned. Specifically, more patient preferences among adults, measured by questions about choices between immediate and delayed hypothetical monetary rewards, have been related to lower BMI (Chabris et al., 2008). Using real monetary payoffs to measure patience, resulted in similar findings among adolescents (Sutter et al., 2013). In comparison, studies utilizing the quasi-hyperbolic model, have found that inconsistent preferences are related to more tobacco use (Gruber and Koszegi, 2004), alcohol misuse (Richards and Hamilton, 2012), and unhealthy dietary intake among Supplemental Nutrition Assistance Program

Table 1
Descriptive statistics of adults by obesity status.

	Non-Obese	Obese	Total	
Characteristics	n (row percentage)			P-value for Pearson χ2
Age (years)				
21–39	564 (71.66)	223 (28.34)	787	0.002
40–59	2248 (66.02)	1157 (33.98)	3405	
≥60	1084 (64.56)	595 (35.44)	1679	
Race/ethnicity				
Hispanic	194 (62.99)	114 (37.01)	308	0.000
Non-Hispanic Black	231 (54.23)	195 (45.77)	426	
Non-Hispanic White	3205 (66.87)	1588 (33.13)	4793	
Asian	193 (82.83)	40 (17.17)	233	
Other	73 (65.77)	38 (34.23)	111	
College graduate				
No	1993 (62.42)	1200 (37.58)	3193	0.000
Yes	1903 (71.06)	775 (28.94)	2678	
Annual household income				
<$30,000	654 (60.00)	436 (40.00)	1090	0.001
$30,000–44,999	660 (63.89)	373 (36.11)	1033	
$45,000–69,999	1007 (64.51)	554 (35.49)	1561	
≥$70,000	1575 (72.02)	612 (27.98)	2187	
Married				
No	1108 (63.17)	646 (36.83)	1754	0.010
Yes	2788 (67.72)	1329 (32.28)	4117	
Patience				
Patient	1695 (69.58)	741 (30.42)	2436	0.001
Medium Patience	1230 (66.81)	611 (33.19)	1841	
Impatient	971 (60.92)	623 (39.08)	1594	
Self-control				
"Future bias"	1291 (64.55)	709 (35.45)	2000	0.000
Time Consistent	2351 (68.11)	1101 (31.89)	3452	
Present bias	254 (60.62)	165 (39.38)	419	
Total	3896 (66.36)	1975 (33.64)	5871	–

Note: Patience: Patient: $\delta = 0.83\ \delta > 0.67$; Medium patience: $\delta = 0.56 \vee 0.67$; Impatient: $\delta < 0.56$; Self-control: "Future bias": $\beta > 1$; Time Consistent: $\beta = 1$; Present bias: $\beta < 1$.

(SNAP) recipients (Shapiro, 2005). This research demonstrates that not only time-consistent discounting (δ) but also time inconsistent choices, indicative of self-control problems (i.e., $\beta < 1$), are associated with unhealthy behaviors. However, the research pertaining to time inconsistent preferences and obesity is not as vast as with consistent time preferences.

3. Data and methods

Data on intertemporal preferences, obesity status of parents and their children, as well as information about other individual characteristics and lifestyle behaviors were obtained from the FHHS. The FHHS is an Internet-based survey that was conducted in 2011 among the participants of the Nielsen National Consumer Panel (NCP). NCP is a stratified, proportionate sample of American households in the contiguous US. The FHHS survey design is described in more detail by Pachucki et al. (2014). Survey participants included in the current study were adults ≥21 years who responded to the FHHS survey, and provided demographic data, and their height and weight. Specifically, of 7071 survey respondents, 5871 participants responded to questions about their height and weight, intertemporal preferences, and other socio-demographic questions. For families with children, the children's obesity status information was provided for 2387 firstborns, 1193 second-born, and 328 third-born children. In analyses, due to the small sample size of the third child, the second and third child were grouped together.

3.1. Dependent variables

The primary dependent variable is obesity for adults and children. In adults, BMI was computed for all adults based on reported height and weight using the standard formula (weight/height^2). We then omitted observations with extreme BMI values, either below 18.5 kg/m^2 or above 51 kg/m^2, due to the potential for underlying medical conditions (Cao et al., 2014). BMI was then dichotomized into obese (BMI ≥ 30): yes/no, based on the World Health Organization (2015) categorization. This was done because this cutoff point is clinically meaningful; that is, obesity is a significant risk factor in chronic disease morbidity (e.g., diabetes, cancer) and premature death (Centers for Disease Control and Prevention, 2017b; Hossain et al., 2007). We took a similar approach in children; however, BMI z-scores were utilized, since this is a measure of the relative weight adjusted for the child's age and gender (Must and Anderson, 2006). Children's BMI z-scores were then categorized as obese (yes/no) using gender and age specific cutoff points based on the Centers for Disease Control and Prevention 2000 Growth Charts (Kuczmarski et al., 2000; Pachucki et al., 2014).

It should be noted that BMI was calculated based on reported height and weight, which could include reporting errors (Rowland, 1990). To examine whether reporting errors meaningfully impact study findings, we adhered to an approach used by Cawley (2004) and others (e.g., Courtemanche et al., 2015), where self-reported height and weight are adjusted for using data from a different national survey that contains information on both objectively measured and reported height and weight of adult participants.[1] Specifically, data from the 2011–2012 wave of the National Health and Nutrition Examination Survey (Centers for Disease Control and Prevention, 2017c), were used to regress objectively-measured weight as a quadratic function of self-reported weight by race/ethnicity and age groups. We then adjusted adults' weight from the

[1] NHANES 2011–2012 does not have self-reported data on the height and weight of children (<16 years). Therefore, this approach was used among adults, where both self-reported and objectively measured data on height and weight is available.

Table 2
Descriptive statistics by children's obesity status.

Characteristics	All children non-obese	All children obese	All children Total		First child non-obese	First child obese	First child Total		Second and third child non-obese	Second and third child obese	Second and third child Total	
	n (row percentage)			P-value for Pearson $\chi 2$	n (row percentage)			P-value for Pearson $\chi 2$	n (row percentage)			P-value for Pearson $\chi 2$
Child's Age (years)												
2–7	893 (85.05)	157 (14.95)	1050	0.000	395 (88.17)	53 (11.83)	448	0.005	498 (82.72)	104 (17.28)	602	0.000
8–12	1072 (88.74)	136 (11.26)	1208		541 (87.12)	80 (12.88)	621		531 (90.46)	56 (9.54)	587	
13–17	1514 (91.76)	136 (8.24)	1650		1207 (91.58)	111 (8.42)	1318		307 (92.47)	25 (7.53)	332	
Child's Gender												
Male	1803 (88.73)	229 (11.27)	2032	0.543	1131 (89.41)	134 (10.59)	1265	0.525	672 (87.61)	95 (12.39)	767	0.789
Female	1676 (89.34)	200 (10.66)	1876		1012 (90.2)	110 (9.8)	1122		664 (88.06)	90 (11.94)	754	
Parent's Obesity Status												
No	4575 (92.99)	345 (7.01)	4920	0.000	1525 (92.99)	115 (7.01)	1640	0.000	3050 (92.99)	230 (7.01)	3280	0.000
Yes	1854 (82.73)	387 (17.27)	2241		618 (82.73)	129 (17.27)	747		1236 (82.73)	258 (17.27)	1494	
Parent's patience												
Patient	1436 (90.83)	145 (9.17)	1581	0.000	886 (91.53)	82 (8.47)	968	0.006	550 (89.72)	63 (10.28)	613	0.007
Medium Patience	1166 (89.69)	134 (10.31)	1300		707 (90.18)	77 (9.82)	784		459 (88.95)	57 (11.05)	516	
Impatient	877 (85.39)	150 (14.61)	1027		550 (86.61)	85 (13.39)	635		327 (83.42)	65 (16.58)	392	
Parent's self-control												
"Future bias"	1227 (89.43)	145 (10.57)	1372	0.370	743 (89.52)	87 (10.48)	830	0.037	484 (89.3)	58 (10.7)	542	0.248
Time Consistent	2043 (89.06)	251 (10.94)	2294		1268 (90.57)	132 (9.43)	1400		775 (86.69)	119 (13.31)	894	
Present bias	209 (86.36)	33 (13.64)	242		132 (84.08)	25 (15.92)	157		77 (90.59)	8 (9.41)	85	
Total	3479 (89.02)	429 (10.98)	3908	–	2143 (89.78)	244 (10.22)	2387	–	1336 (87.84)	185 (12.16)	1521	–

Note: Patience: Patient: $\delta = 0.83$ $\delta > 0.67$; Medium patience: $\delta = 0.56 \vee 0.67$; Impatient: $\delta < 0.56$; Self-control: "Future bias": $\beta > 1$; Time Consistent: $\beta = 1$; Present bias: $\beta < 1$

FHHS survey using the estimated regression coefficients. The same procedure was repeated for height. Finally, we calculated new BMI values using the adjusted measures. Consistent with findings from other studies (Courtemanche et al., 2015; Ikeda et al., 2010), the present results from models using the adjusted BMI were similar to those of the current BMI in the FHHS survey (see Appendix A Tables A4–A7). Therefore, we opted to use the original, self-reported data in the study.

3.2. Primary independent variables

Time preferences were based on two survey questions asking participants to select a hypothetical dollar amount today versus a larger sum in 30 days in the first question; and a hypothetical dollar amount in 30 days or a higher sum in 60 days in the second question (Shuval et al., 2016). More specifically, participants were asked to choose one of two binary options for steps 1, 2, and 3. In the first question, participants were asked about their preferences between: 1. (A) $10 today or (B) $12 in 30 days; 2. (A) $10 today or (B) $15 in 30 days; and 3. (A) $10 today or (B) $18 in 30 days. In the second question, participants were asked to choose between: 1. (A) $10 in 30 days or (B) $12 in 60 days; 2. (A) $10 in 30 days or (B) $15 in 60 days; and 3. (A) $10 in 30 days or (B) $18 in 60 days.

These two time preference survey questions were utilized to derive parameters δ (time consistent preferences) and β (time-inconsistent preferences) from Laibson's (1997) quasi-hyperbolic discount model. In this model, individuals discount between any two consecutive future time periods at rate δ. Therefore, based on the second survey question, parameter δ was calculated using the following formula:

δ = $10/(minimum amount of money willing to accept in 60 days over $10 in 30 days)

Similarly, according to the quasi-hyperbolic discounting model (Laibson, 1997), individuals discount between now and the next period at a rate of $\delta\beta$. We calculated parameter β, based on responses to the first question and the previously computed δ parameter. The formula used is as follows:

β = $10/(minimum amount of money willing to accept in 30 days over receiving $10 now)/$\delta$

Since the time preference questions were multiple-choice, there are only four possible values for the δ parameter: $\delta = 0.83$, $\delta = 0.67$, $\delta = 0.56$, and $\delta < 0.56$.[2] However, due to the relatively small number of participants with a value of $\delta = 0.56$,[3] categories $\delta = 0.67$ and $\delta = 0.56$ were combined. Consequently, patience was categorized into the following three groups: 1. High patience (i.e., patience): $\delta = 0.83$ (41% of respondents); 2. Medium patience:

[2] For example, an individual whose responses to the second intertemporal time question were: 1. (A); 2. (B); and 3. (B)- the derived parameter δ was: δ = $10/$15 = 0.67.

[3] Only 11% of adult participants had a value of parameter δ=0.56.

Table 3
Intertemporal preferences and obesity status among adults: probit models.

	Obesity status					
	Coefficient	Robust SE	Marginal effects	Coefficient	Robust SE	Marginal effects
Patience						
Patient *(reference)*						
Medium Patience	0.07	0.05	0.02	0.03	0.05	0.01
Impatient	0.19***	0.05	0.07	0.13**	0.05	0.05
Self-control						
"Future bias" *(reference)*						
Time Consistent	−0.02	0.05	−0.01	−0.04	0.05	−0.01
Present bias	0.15**	0.07	0.06	0.14*	0.07	0.05
Age (years)						
21–39 *(reference)*+56++						
40–59	0.15***	0.05	0.05	0.13**	0.05	0.05
≥60	0.15**	0.06	0.05	0.13**	0.06	0.05
Race/ethnicity						
Non-Hispanic White *(reference)*						
Non-Hispanic Black	0.30***	0.07	0.11	0.33***	0.07	0.12
Asian	−0.39***	0.10	−0.13	−0.40***	0.10	−0.13
Hispanic	0.13*	0.08	0.05	0.14*	0.08	0.05
Other	−0.01	0.12	−0.002	0.04	0.13	0.01
College graduate						
No *(reference)*						
Yes	−0.15***	0.04	−0.05	−0.11***	0.04	−0.04
Annual household income						
≥$70,000 *(reference)*						
$45,000–69,999	0.16***	0.04	0.06	0.10**	0.05	0.04
$30,000–44,999	0.14***	0.05	0.05	0.06	0.05	0.02
<$30,000	0.23***	0.05	0.08	0.11**	0.05	0.04
Married No *(reference)*						
Yes	−0.03	0.04	−0.01	−0.05	0.04	−0.02
Vigorous activity last week						
0 times *(reference)*						
1				−0.16***	0.05	−0.06
2–3				−0.33***	0.05	−0.12
4–6				−0.67***	0.06	−0.22
7–10				−0.64***	0.13	−0.21
10+				−0.79***	0.27	−0.25
Alcohol consumption						
Never or Infrequently *(reference)*						
Once a week or more				0.35***	0.04	0.12
Constant	−0.67***	0.09		−0.66***	0.10	
Number of observations	5871			5871		

Note: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$; Patience: Patient: $\delta = 0.83$ $\delta > 0.67$; Medium patience: $\delta = 0.56 \vee 0.67$; Impatient: $\delta < 0.56$; Self-control: "Future bias": $\beta > 1$; Time Consistent: $\beta = 1$; Present bias: $\beta < 1$; Marginal effects estimated at the means of covariates.

$\delta = 0.56 \vee 0.67$ (31% of respondents); and 3. Low patience (i.e., impatient): $\delta < 0.56$ (27% of respondents). In addition, the calculated parameter β, was grouped into three categories based on Laibson's (1997) model: 1. Present bias: $\beta < 1$ (7% of respondents); 2. No present bias: β=1[4] (59% of respondents, including individuals who consistently preferred $10 for each choice in each question); and 3. "Future bias"[5];: $\beta > 1$ (34% of respondents).

3.3. Covariates

Other variables included in the multivariate analyses were parents' age (21–29, 30–39, 40–49, 50–59, ≥60 years), college education (yes/no), annual household income (< $30,000, $30,000-44,999, $45,000-69,999, ≥$70,000), marital status (yes/no), race/ethnicity (non-Hispanic black, non-Hispanic white, Asian, Hispanic, other), and self-reported health status (poor/not so good, fair, good/excellent). In addition, to examine the robustness of the relationship between time (in)consistent preferences and obesity, additional health behavior measures (namely, parents' frequency of vigorous physical activity and alcohol intake) were taken into account in multivariate analyses. It should be noted that since this survey focused on gleaning responses from heads of households, many adults did not indicate their gender leading to a low response rate (26%). Consequently, we did not use the adults' gender.[6] In addition, child-specific variables were included in pertinent models and consisted of the child's age (2–7, 9–12, 13–17 years) and gender.

[4] β=1 is indicative of not being present or future biased. That is, consistent time preferences. Similarly, consistently choosing $10 for each question is also indicative of consistent time preferences. Hence, these two groups are conceptually similar and therefore grouped together. We performed sensitivity analysis to examine whether results change once participants who consistently chose $10 are excluded from regression models. This exclusion did not change results materially, therefore this categorization approach was retained.

[5] "Future bias" refers to preferring later rather than immediate gratification (Crawford, 2014), while exhibiting inconsistent preferences. Examples of "future bias" could be a resolution to watch more TV next year instead of today; or a decision to eat donuts tomorrow instead of today, only to wind up avoiding donuts the next day and eating healthful snacks instead. The current study does not focus on this phenomenon since this behavior has insufficiently been explored. For example, in the Laibson (1997) study, while "future bias" can be determined, the focus is on quasi-hyperbolic versus exponential discounting.

[6] We used multiple imputation to estimate the missing gender variable among adults. Including the imputed gender in models did not change results materially. Thus, we opted to omit this variable in analyses.

Table 4
Parents' intertemporal preferences and their children's obesity status: probit models.

	All children			First Child			Second and third child		
	Obesity status								
	Coef.	Clustered SE	Marginal effects	Coef.	Robust SE	Marginal effects	Coef.	Clustered SE	Marginal effects
Parent's BMI	0.03***	0.004	0.01	0.04***	0.01	0.01	0.02***	0.01	0.004
Parent's patience									
Patient *(reference)*									
Medium Patience	0.17**	0.08	0.03	0.12	0.10	0.02	0.22*	0.12	0.04
Impatient	0.30***	0.09	0.05	0.25**	0.11	0.04	0.38***	0.13	0.07
Parent's self-control									
"Future bias" *(reference)*									
Time Consistent	0.17**	0.08	0.03	0.07	0.09	0.01	0.32***	0.12	0.06
Present bias	0.30**	0.13	0.05	0.36**	0.15	0.06	0.18	0.22	0.03
Child's Age (years)									
2–7 *(reference)*									
8–12	−0.21***	0.07	−0.04	0.02	0.10	0.003	−0.40***	0.10	−0.07
13–17	−0.43***	0.07	−0.07	−0.28***	0.10	−0.04	−0.53***	0.12	−0.1
Child's gender									
Male (reference)									
Female	−0.05	0.06	−0.01	−0.08	0.07	−0.01	−0.01	0.09	−0.002
Race/ethnicity									
Non-Hispanic White *(reference)*									
Non-Hispanic Black	0.02	0.11	0.003	0.05	0.13	0.01	−0.06	0.16	−0.01
Asian	0.04	0.14	0.01	−0.02	0.17	−0.002	0.11	0.20	0.02
Hispanic	−0.05	0.10	−0.01	−0.08	0.14	−0.01	0.03	0.15	0.01
Other	−0.23	0.22	−0.04	−0.93**	0.42	−0.15	0.17	0.31	0.03
Parent- college graduate									
No *(reference)*									
Yes	−0.16**	0.07	−0.03	−0.13	0.08	−0.02	−0.21**	0.10	−0.04
Annual household income									
≥$70,000 *(reference)*									
$45,000–69,999	0.09	0.07	0.02	0.08	0.09	0.01	0.08	0.11	0.02
$30,000–44,999	0.10	0.09	0.02	0.20*	0.11	0.03	−0.07	0.14	−0.01
<$30,000	0.31***	0.10	0.05	0.35***	0.12	0.06	0.21	0.16	0.04
Parent- Married									
No *(reference)*									
Yes	0.10	0.09	0.02	0.21*	0.11	0.03	−0.06	0.14	−0.01
Constant	−2.25***	0.19		−2.68***	0.24		−1.77***	0.29	
Number of observations	3908			2387			1521		

Note: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$; Patience: Patient: $\delta = 0.83$ $\delta > 0.67$; Medium patience: $\delta = 0.56 \vee 0.67$; Impatient: $\delta < 0.56$; Self-control: "Future bias": $\beta > 1$; Time Consistent: $\beta = 1$; Present bias: $\beta < 1$; Marginal effects estimated at the means of covariates.

3.4. Statistical analysis

To estimate the relationship between adults' patience and present bias and their obesity status (obese yes/no), we employed maximum-likelihood probit regressions. The primary independent variables in the model were patience and present bias and the dependent variable was the binary obesity variable. The basic model controlled for age, college education, annual household income, marital status, and race/ethnicity; the second model also adjusted for the frequency of vigorous physical activity and alcohol intake. These two additional explanatory variables were used as a robustness check.

In a separate set of models, we examined how parents' patience and present bias were associated with their children's obesity status. Three models were estimated for: (1) all children combined, (2) the first child,[7] and (3) the second and third child combined. In all three models, maximum-likelihood probit regression was used with children's obesity status as the dependent variable. The key regressors were: parents' BMI, and parents' patience and present bias. Other explanatory variables included children's age and gender, as well as parents' education, marital status, race/ethnicity, and income.

Beyond examining obesity as a dichotomous dependent variable, we estimated models with BMI and BMI z-scores for adults and children, respectively, as outcome measures. Specifically, ordinary least squares regression was used to examine the relationships between adults' intertemporal preferences and their continuous BMI, and association between adults' intertemporal preferences and their children's continuous BMI z-score. In all models, the Huber-White covariance estimator was utilized to obtain robust standard errors. In models for all children combined as well as in the models for the second and the third child combined, the Huber-White estimator allowed for standard errors to be correlated within households (clusters).

Furthermore, there is another dynamic in the relationship between parents and children that should be taken into account when performing analyses. Specifically, parents' weight status, if not considered, could affect both the independent variable (intertemporal preferences) and the dependent variable (children's obesity). Beyond controlling for parents' weight status in pertinent multivariate models, we tested for endogeneity using the Hausman test. This test indicated no endogeneity in the probit and OLS regressions.[8] Thus, an instrumental variable (IV) approach was

[7] We did not focus on one-child families due to the smaller sample size (N = 1178). When estimating models for single-child families (see Table 4 for first child results) the coefficient for patience was almost identical to the first child (0.24 versus 0.25), yet with reaching significance at the 0.10 level, but not the 0.05 level. The present bias coefficient was markedly smaller in single child families versus the first child (0.14 versus 0.36) and did not reach statistical significance.

[8] P-values for the Hausman tests were respectively 1.00 and 0.98 for probit and OLS models for all children.

Table 5
Parents' intertemporal preferences and their children's BMI z-scores: OLS models.

	All children		First Child		Second and Third Child	
	BMI z-scores					
	Coefficient	Clustered SE	Coefficient	Robust SE	Coefficient	Clustered SE
Parent's BMI	0.04***	0.004	0.04***	0.004	0.03***	0.01
Parent's patience						
Patient *(reference)*						
Medium Patience	0.13*	0.07	0.15**	0.08	0.08	0.12
Impatient	0.24***	0.08	0.22***	0.09	0.27*	0.14
Parent's self-control						
"Future bias" *(reference)*						
Time Consistent	0.12*	0.07	0.03	0.07	0.27**	0.12
Present bias	0.14	0.11	0.06	0.12	0.31*	0.19
Child's Age (years)						
2–7 *(reference)*						
8–12	0.10	0.08	0.19*	0.10	0.01	0.11
13–17	0.15**	0.07	0.21**	0.09	0.14	0.11
Child's gender						
Male (reference)						
Female	−0.11**	0.05	−0.11**	0.06	−0.11	0.08
Race/ethnicity						
Non-Hispanic White *(reference)*						
Non-Hispanic Black	0.16*	0.09	0.13	0.11	0.21	0.16
Asian	−0.12	0.13	−0.19	0.14	−0.01	0.21
Hispanic	0.02	0.11	−0.09	0.12	0.16	0.15
Other	−0.25	0.22	0.03	0.17	−0.62	0.43
Parent- college graduate						
No *(reference)*						
Yes	−0.05	0.06	−0.02	0.06	−0.11	0.09
Annual household income						
≥$70,000 *(reference)*						
$45,000–69,999	0.12*	0.07	0.08	0.07	0.17	0.11
$30,000–44,999	0.15*	0.09	0.16*	0.09	0.14	0.14
<$30,000	0.22**	0.10	0.18*	0.1	0.29*	0.18
Parent- Married						
No *(reference)*						
Yes	0.04	0.08	0.05	0.08	0.02	0.14
Constant	−1.15***	0.18	−1.20***	0.20	−1.10***	0.30
Number of observations	3908		2387	1521		

Note: ***$p < 0.01$; **$p > 0.05$; *$p < 0.1$; Patience: Patient: $\delta = 0.83$ $\delta > 0.67$; Medium patience: $\delta = 0.56 \vee 0.67$; Impatient: $\delta <$ 0.56; Self-control: "Future bias": $\beta > 1$; Time Consistent: $\beta = 1$; Present bias: $\beta < 1$

not necessarily needed in this case. Nonetheless, we decided to examine whether results differed when employing the IV approach, particularly since other variables in the literature (e.g., proximity to fast food) might affect both the independent and dependent variables (Currie et al., 2010; DeVoe et al., 2013). When using IV regressions (Bowden and Turkington, 1990), results were similar in both approaches (see Appendix A Tables A2 and A3).[9]

4. Results

Adults' and children's characteristics stratified by obesity status are presented in Tables 1 and 2, respectively. A total of 33.6% of adults were obese in the sample, whereas 10.2%, 11.4% and 14.9% of the first, second, and third child (respectively) were obese. With regards to time preferences and obesity, 39.1% of impatient adults were obese, in comparison to 30.4% of patient adults. Similarly, 39.4% of present-bias adults were obese, whereas 35.5% and 31.9% of adults with "future bias" and time consistent preferences (respectively) were obese. Moreover, children's obesity rates were significantly related to parents' patience. Specifically, 9.2% of all children of patient parents were obese in comparison to 14.6% of children of impatient parents. With regards to children's obesity and parents present bias, the relationship was significant only for the first child (see Table 2).

The relationship between adults' intertemporal preferences and obesity status is depicted in Table 3. Multivariate results reveal that the coefficients for both patience and present bias are significant, suggesting that both variables are independently associated with increased likelihood of obesity in adults. Specifically, the predicted likelihood of being obese was 7 percentage points greater for impatient individuals in comparison to those who were patient. Moreover, the likelihood of being obese increased by 6 percentage points for present-biased individuals, compared to the reference group ("future bias"). We estimated an additional model adjusting for the same covariates plus vigorous physical activity and alcohol consumption. In this model, both impatience and present bias were each independently related to a 5-percentage point increase in the likelihood of obesity. In addition, in OLS models where the primary dependent variable

[9] It should be noted that the instrumental variable method requires that there is at least one variable (i.e., instrument), which is not associated with children's obesity, but is associated with parent's obesity. In the FHHS, we identified four such variables: parent's age, height, vigorous physical activity, and alcohol drinking. Consequently, we used these four variables in the instrumental variable models, along with the other above-mentioned socio-economic characteristics, as instruments for parent's BMI. We utilized the maximum-likelihood probit model with an endogenous regressor (IV probit) to estimate three instrumental variable models of children's obesity status for: (1) all children, (2) the first child, and (3) the second and third child combined. Similarly, we used two-stage least squares (2SLS) regression to estimate three instrumental variable models of children's BMI z-scores. All the models with parents' BMI instrumented controlled for the same variables as the models that did not instrument the parents' BMI. See Appendix A Tables A2 and A3.

was BMI (continuous), findings were consistent with the binary obesity variable.[10]

The relationships between parents' patience and present bias to their children's obesity status are presented in Table 4. The relationships are examined among all children, the first child, and then the second and third child combined. Specifically, parents' impatience was related to a 5-percentage point higher likelihood of all children being obese. Regarding the first child only, the effect of parents' impatience was slightly lower (4 percentage points), whereas it was higher (7 percentage points) for the second and third child combined. Similarly, parents' present bias status was associated with a 5-percentage point higher likelihood of all children being obese, whereas a 6-percentage point increased likelihood for the first child being obese. While parents' present bias was related to an increase in the second/third child's obesity risk (by 3 percentage points), this relationship was not statistically significant.

In addition, OLS regression was employed to estimate the relationship between parents' intertemporal decisions and children's BMI z-scores (Table 5). Analysis reveals that impatient parents' children had a 0.24 higher BMI z-score than children of patient parents. Similarly, the first as well as the second and third children of impatient parents had a 0.22 and 0.27 higher BMI z-scores (respectively). However, the relationship of the second and third child did not reach statistical significance at the 0.05 level. In comparison, the associations between present-biased parents and their children's BMI z-scores did not reach statistical significance at 0.05.

5. Discussion and conclusion

The findings pertaining to the associations between parents' intertemporal choices and their children's obesity status are novel and have important implications for the public's health and wellbeing. Previous research found that parents' obesity has a spillover effect onto their children, but the mechanism leading to this phenomenon has not been clear. This research provides preliminary and compelling evidence that parents' intertemporal decisions play an integral role in the transfer of obesity from one generation to the next. These results are found in a large national sample of adults and their children while considering parents' obesity status. More specifically, study findings indicate that parents' impatience was significantly related to increased likelihood of obesity among all children: not only the first child, but also the second and third children. In comparison, parents' present bias was significantly associated with a higher likelihood of obesity among all children combined and the first child, but not the second and third child, where the coefficients were in a similar direction, though at a smaller magnitude.

While this discrepancy is unclear, it most likely stems from the markedly smaller sample size of the second and third child. We attempted to overcome this limitation by combining the second and third child together in analyses, but even with this approach the sample size for the first child was $\sim$1.6 times larger than the second and third combined. In addition, when examining the relationship between parents' impatience and children's continuous BMI z-scores, impatience is incrementally related to a higher BMI z-score among children. In contrast, the relationship of parents' present bias with children's continuous BMI z-scores is not incremental; rather a threshold effect is apparent. That is, parents' present bias affects children primarily at the obesity cutoff point, rather than the overweight threshold. This might stem from different effects of parental consistent versus inconsistent decision making on children's behavior and health (Schneider et al., 2014). Consistent patient time preferences could be operationalized, for example, as parents who consistently have "healthful preferences" which engenders a home environment with abundant health-promoting foods (e.g., whole grains, fruits and vegetables). Parents who deviate from these preferences even slightly, such as from high to medium patience levels, might incrementally increase their children's BMI (as presented in current findings). In comparison, exposure to parents with inconsistent preferences (self-control problems), might have a detrimental "threshold effect" on children. That is, parents who do not model self-control to their children by exhibiting decision making consistent with virtuous goals (e.g., healthful foods) over vice choices, such as hedonic foods (Frankel et al., 2012), will likely increase their children's obesity risk. This supposition, however, warrants further empirical examination.

In the domain of eating behavior, it is particularly difficult for individuals (even those with high levels of self-control) to resist tempting hedonic foods, since humans are genetically predisposed to prefer energy dense foods with high fat and sugar content (Dube, 2010; Montmayeur and le Coutre, 2010). Thus, in nearly all societies, filled with abundant cues to consume highly palatable foods, it is important for parents, and particularly those with impatient preferences and low self-control, to implement strategies to prevent themselves (and children) from consuming unhealthful foods (Ello-Martin et al., 2005; Hoch and Loewenstein, 1991). Walter Mischel, in his renowned "marshmallow experiments", observed that children who delayed gratification the longest, used mental mechanisms to distract themselves (e.g., singing songs, fidgeting) from being tempted by "hot" stimulus (Lange et al., 2011). Similar strategies could be used by adults too, where one is instructed to think about tempting foods in terms of their abstract 'cooler" features (i.e., cognitive reconstrual) (Mischel et al., 2011). However, many of the decisions pertaining to food consumption are automatic (i.e., "mindless eating") (Wansink et al., 2009), therefore plans and strategies should be designed when in a "cooler" state to prevent one's future self from engaging in harmful behaviors when in an aroused state (Lange et al., 2011). An implementation intention (if-then) plan is an established strategy where one develops a plan to implement 'X' when temptation 'Y' arises to meet one's goals (e.g., eating healthy) (Milkman et al., 2011). Once implemented consistency the if-then implementation plans become reflexive, where cognitive effort in maintaining a diet, for example, is no longer necessary (Lange et al., 2011).

Beyond individual strategies to overcome self-control problems, policy approaches for consumer health and wellbeing are instrumental in facilitating sustained behavior change. For instance, since people tend to take the 'path of least resistance' (i.e., status quo bias), making healthful decisions easier to make will significantly increase the likelihood of making these choices (Loewenstein et al., 2007). For example, in a school cafeteria experiment, making fruit more convenient and attractive in lunchrooms significantly increased children's selection and consumption of fruit (Greene et al., 2017). Similarly, in the Netherlands, for example, where the social and built environment are conducive to walking and cycling, the likelihood of achieving health benefits through active transport dramatically increases (Fishman et al., 2015). Making healthful alternatives an easier choice can be regarded as an Asymmetric Libertarian Paternalism approach (Downs et al., 2009; Loewenstein et al., 2007; Thaler and Sunstein, 2009). In this approach, individuals are 'nudged' towards acting in their own self-interest, while still maintaining freedom of choice, hence the term libertarian. Thus, these policies are intended to help those behaving in a self-destructive fashion, affecting less the choices of those who behave in line with their self-interest. Additionally, pre-commitment

[10] Impatience and present bias were related to a 0.81 and 0.77 higher BMI (respectively) among adults in the fully adjusted model. See Appendix A Table A1.

mechanisms can shift the deferred costs associated with an 'obesogenic decision' to the present, thereby encouraging healthier choices (Schwartz et al., 2014; Shuval et al., 2017). For example, introducing pre-commitment mechanisms into a loyalty program for grocery shoppers to promote healthful food purchases has been shown to increase healthful purchases of groceries (Schwartz et al., 2014). Moreover, people can be financially incentivized toward healthier decisions, by being paid to choose healthier options or by being required to pay more for less healthful options. For example, financial incentives to participate in a weight-monitoring program were found to produce significant weight loss among participants (John et al., 2011).

The current study has several limitations that should be noted. First, we examined intertemporal preferences based on hypothetical intertemporal trade-offs, which is frequently used in the literature (Courtemanche et al., 2015; Harrison et al., 2002; Meier and Sprenger, 2007). However, determining intertemporal preferences via incentivized economic experiments where actual monetary compensation is provided might yield different results (de Oliveira et al., 2016). Second, while study findings pertaining to the association between parents' intertemporal choices and children's obesity are novel, a key element is missing: children's own intertemporal preferences. This information was not available in the dataset, and therefore was not included in the analysis. Third, the study design is cross-sectional, which necessitates additional longitudinal research to determine causality. Fourth, while the study sample is a diverse national sample of US adults, it is not representative and survey weights were not available. Finally, smoking data were not available in the dataset and therefore not taken into account. Other health behaviors (physical activity and alcohol intake), however, were included in the models as robustness checks.

Nonetheless, present study findings provide initial evidence that parents' consistent and inconsistent decision making are linked to both their own obesity risk and that of their children. Therefore, implementing strategies that increase the likelihood of consistently making healthful lifestyle choices and enhancing one's ability to 'handle' temptation will likely affect both adults and children. Using strategies such as implementation-intentions plans and pre-commitment contracts have potential to address these challenges because they have been proven to increase virtuous decision making. However, these strategies should be coupled with policy approaches, such as the asymmetric paternalism, where the easier, more beneficial (healthful) choice, is the easier one to make to affect change at the societal level.

Funding

Matthew Harding was supported by grant #69294 from the Robert Wood Johnson Foundation through its Healthy Eating Research program. He was also funded by grant #59-5000-4-0062 from the USDA. Mark Pachucki's contributions to survey development and data preparation were supported by a post-doctoral fellowship through the Robert Wood Johnson Foundation Health & Society Scholars program, and by the Robert Wood Johnson Foundation Healthy Eating ResearchGrant #69294.

Appendix A.

Table A1
Intertemporal preferences and BMI among adults: OLS models.

	Continuous BMI			
	Coefficient	Robust SE	Coefficient	Robust SE
Patience				
Patient *(reference)*				
Medium Patience	0.34	0.22	0.18	0.22
Impatient	1.08***	0.25	0.81***	0.24
Self-control				
"Future bias" *(reference)*				
Time Consistent	0.12	0.22	0.01	0.22
Present bias	0.87**	0.35	0.77**	0.35
Age (years)				
21–39 *(reference)*				
40–59	0.93***	0.25	0.87***	0.24
≥60	0.95***	0.27	0.87***	0.26
Race/ethnicity				
Non-Hispanic White *(reference)*				
Non-Hispanic Black	1.56***	0.32	1.61***	0.31
Asian	−2.31***	0.35	−2.34***	0.35
Hispanic	0.71*	0.38	0.74**	0.37
Other	−0.06	0.50	0.14	0.50
College graduate				
No *(reference)*				
Yes	−0.85***	0.17	−0.64***	0.16
Annual household income				
≥$70,000 *(reference)*				
$45,000–69,999	0.62***	0.20	0.32	0.19
$30,000–44,999	0.52**	0.24	0.13	0.23
<$30,000	1.6***	0.27	1.02***	0.26
Married				
No *(reference)*				
Yes	−0.26	0.19	−0.38**	0.19
Vigorous activity last week				
0 times *(reference)*				
1			−0.81***	0.24
2–3			−1.61***	0.19
4–6			−2.94***	0.22
7–10			−3.13***	0.46

Table A1 (*Continued*)

	Continuous BMI			
	Coefficient	Robust SE	Coefficient	Robust SE
10+			−3.56***	0.81
Alcohol consumption				
Never or Infrequently *(reference)*				
Once a week or more			1.65***	0.16
Constant	27.05***	0.40	27.22***	0.42
Number of observations	5871		5871	

Note: ***p < 0.01; **p < 0.05; *p < 0.1; Patience: Patient: δ = 0.83 δ > 0.67; Medium patience: δ = 0.56 ∨ 0.67; Impatient: δ < 0.56; Self-control: "Future bias": β > 1; Time Consistent: β = 1; Present bias: β < 1.

Table A2
Parents' intertemporal preferences and their children's obesity status: IV probit models.

	All children				First Child			Second and third child	
	Obesity status								
	Coef.	Clustered SE	Marginal effects	Coef.	Robust SE	Marginal effects	Coef.	Clustered SE	Marginal effects
Parent's BMI (instrumented)	0.04**	0.02	0.01	0.05*	0.03	0.01	0.04	0.04	0.003
Parent's patience									
Patient *(reference)*									
Medium Patience	0.16*	0.08	0.03	0.12	0.10	0.02	0.21*	0.13	0.04
Impatient	0.28***	0.09	0.05	0.25**	0.11	0.04	0.33**	0.17	0.07
Parent's self-control									
"Future bias" *(reference)*									
Time Consistent	0.16**	0.08	0.03	0.07	0.09	0.01	0.30**	0.12	0.06
Present bias	0.29**	0.13	0.05	0.35**	0.15	0.06	0.15	0.23	0.03
Child's Age (years)									
2–7 *(reference)*									
8–12	−0.21***	0.07	−0.04	0.02	0.10	0.003	−0.41***	0.10	−0.07
13–17	−0.43***	0.07	−0.07	−0.28***	0.10	−0.04	−0.54***	0.12	−0.10
Child's gender									
Male (reference)									
Female	−0.05	0.06	−0.01	−0.08	0.07	−0.01	−0.01	0.09	−0.002
Race/ethnicity									
Non-Hispanic White *(reference)*									
Non-Hispanic Black	−0.003	0.12	0.003	0.04	0.13	0.01	−0.11	0.19	−0.01
Asian	0.07	0.15	0.01	−0.004	0.18	−0.003	0.15	0.21	0.02
Hispanic	−0.06	0.10	−0.01	−0.09	0.14	−0.01	0.01	0.15	0.01
Other	−0.24	0.22	−0.04	−0.93**	0.42	−0.15	0.14	0.31	0.03
Parent- college graduate									
No *(reference)*									
Yes	−0.15**	0.07	−0.03	−0.12	0.08	−0.02	−0.19	0.12	−0.04
Annual household income									
≥$70,000 *(reference)*									
$45,000–69,999	0.08	0.07	0.01	0.08	0.10	0.01	0.06	0.11	0.01
$30,000–44,999	0.09	0.10	0.02	0.19*	0.11	0.03	−0.10	0.15	−0.01
<$30,000	0.28**	0.12	0.05	0.34**	0.14	0.06	0.12	0.23	0.04
Parent- Married									
No *(reference)*									
Yes	0.10	0.09	0.02	0.21*	0.11	0.03	−0.07	0.14	−0.01
Constant	−2.53***	0.59		−2.83***	0.77		−2.33**	1.09	
Number of observations	3908			2387			1521		
Joint significance of instruments in the first stage regression	chi2(10) = 201.26			chi2 (11) = 194.61		chi2 (11) = 130.17			
(H0: nonsignificant)	Prob > chi2 = 0.00			Prob > chi2 = 0.00		Prob > chi2 = 0.00			
Joint significance of instruments if included in the second stage regression	chi2(10) = 15.60			chi2 (10) = 11.95		chi2 (11) = 25.70			
(H0: nonsignificant)	Prob > chi2 = 0.16			Prob > chi2 = 0.29		Prob > chi2 = 0.01			

Note: ***p < 0.01; **p < 0.05; *p < 0.1; Patience: Patient: δ = 0.83 δ > 0.67; Medium patience: δ = 0.56 ∨ 0.67; Impatient: δ < 0.56; Self-control: "Future bias": β > 1; Time Consistent: β = 1; Present bias: β < 1; Marginal effects estimated at the means of covariates.

Table A3
Parents' intertemporal preferences and their children's BMI z-scores: 2SLS models.

	All children		First Child		Second and third child	
	BMI z-scores					
	Coef.	Clustered SE	Coef.	Robust SE	Coef.	Clustered SE
Parent's BMI (instrumented)	−0.01	0.02	0.01	0.02	−0.03	0.03
Parent's patience						
Patient *(reference)*						
Medium Patience	0.14*	0.08	0.16**	0.08	0.10	0.13
Impatient	0.31***	0.09	0.26***	0.09	0.39**	0.16
Parent's self-control						
"Future bias" *(reference)*						
Time Consistent	0.15**	0.08	0.05	0.08	0.31**	0.13
Present bias	0.19	0.12	0.09	0.13	0.39*	0.20
Child's Age (years)						
2–7 *(reference)*						
8–12	0.10	0.08	0.19*	0.10	0.04	0.11
13–17	0.18**	0.07	0.23**	0.09	0.18	0.11
Child's gender						
Male (reference)						
Female	−0.11**	0.05	−0.10*	0.06	−0.13	0.09
Race/ethnicity						
Non-Hispanic White *(reference)*						
Non-Hispanic Black	0.24**	0.10	0.18	0.11	0.35**	0.17
Asian	−0.20	0.13	−0.25*	0.14	−0.11	0.21
Hispanic	0.06	0.11	−0.06	0.12	0.21	0.16
Other	−0.23	0.24	0.04	0.17	−0.55	0.46
Parent- college graduate						
No *(reference)*						
Yes	0.04	0.08	0.04	0.08	0.06	0.14
Household income						
≥$70,000 *(reference)*						
$45,000–69,999	0.15**	0.07	0.10	0.07	0.23**	0.11
$30,000–44,999	0.19**	0.09	0.18*	0.09	0.22	0.15
<$30,000	0.34***	0.11	0.25**	0.12	0.52**	0.20
Parent- Married						
No *(reference)*						
Yes	−0.10	0.06	−0.05	0.06	−0.18*	0.11
Constant	−0.06	0.50	−0.47	0.54	0.43	0.78
Number of observations	3908		2387		1521	
Joint significance of instruments in the first stage regression	F(11, 2615) = 19.08		F(11, 2615) = 18.66		F(11,1333) = 12.93	
(H0: nonsignificant)	Prob > F = 0.00		Prob > F = 0.00		Prob > F = 0.00	
Joint significance of instruments if included in the second stage regression	F(11, 2425) = 0.86		F(11, 2667) = 0.69		F(11,1340) = 0.79	
(H0: nonsignificant)	Prob > F = 0.58		Prob > F = 0.74		Prob > F = 0.65	

Note: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$; Patience: Patient: $\delta = 0.83$ $\delta > 0.67$; Medium patience: $\delta = 0.56 \vee 0.67$; Impatient: $\delta < 0.56$; Self-control: "Future bias": $\beta > 1$; Time Consistent: $\beta = 1$; Present bias: $\beta < 1$.

Table A4
Intertemporal preferences and obesity status among adults: probit models (adults' obesity adjusted for self-reporting using NHANES data).

	Obesity status					
	Coefficient	Robust SE	Marginal effects	Coefficient	Robust SE	Marginal effects
Patience						
Patient *(reference)*						
Medium Patience	0.06	0.05	0.02	0.02	0.05	−0.01
Impatient	0.17***	0.05	0.06	0.11**	0.05	0.05
Self-control						
"Future bias" *(reference)*						
Time Consistent	−0.01	0.05	0.004	−0.04	0.05	0.01
Present bias	0.14*	0.07	0.05	0.12	0.07	0.04
Age (years)						
21–39 *(reference)*						
40–59	0.15***	0.05	0.06	0.15***	0.05	0.05
≥60	0.22***	0.06	0.08	0.21***	0.06	0.08
Race/ethnicity						
Non-Hispanic White *(reference)*						
Non-Hispanic Black	0.27***	0.07	0.10	0.29***	0.07	0.11
Asian	−0.46***	0.10	−0.15	−0.47***	0.1	−0.16
Hispanic	0.15**	0.08	0.06	0.16**	0.08	0.06
Other	−0.02	0.12	−0.01	0.02	0.12	0.01
College graduate						
No *(reference)*						
Yes	−0.14***	0.04	−0.05	−0.10***	0.04	−0.04

Table A4 (*Continued*)

	Obesity status					
	Coefficient	Robust SE	Marginal effects	Coefficient	Robust SE	Marginal effects
Annual household income						
≥$70,000 *(reference)*						
$45,000–69,999	0.14***	0.04	0.05	0.08*	0.04	0.03
$30,000–44,999	0.11**	0.05	0.04	0.04	0.05	0.01
<$30,000	0.22***	0.05	0.08	0.10*	0.05	0.04
Married						
No *(reference)*						
Yes	−0.03	0.04	−0.01	−0.05	0.04	−0.02
Vigorous activity last week						
0 times *(reference)*						
1				−0.12**	0.05	−0.05
2–3				−0.34***	0.04	−0.13
4–6				−0.66***	0.06	−0.23
7–10				−0.66***	0.13	−0.23
10+				−0.75***	0.26	−0.25
Alcohol consumption						
Never or Infrequently *(reference)*						
Once a week or more				0.34***	0.04	
Constant	−0.58***	0.09		−0.57***	0.09	0.12
Number of observations	5871			5871		

Note: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$; Patience: Patient: $\delta = 0.83$ $\delta > 0.67$; Medium patience: $\delta = 0.56 \vee 0.67$; Impatient: $\delta < 0.56$; Self-control: "Future bias": $\beta > 1$; Time Consistent: $\beta = 1$; Present bias: $\beta < 1$; Marginal effects estimated at the means of covariates.

Table A5

Intertemporal preferences BMI among adults: OLS models (adults' BMI adjusted for self-reporting using NHANES data).

	Continuous BMI			
	Coefficient	Robust SE	Coefficient	Robust SE
Patience				
Patient *(reference)*				
Medium Patience	0.33	0.22	0.18	0.22
Impatient	1.05***	0.25	0.78***	0.24
Self-control				
"Future bias" *(reference)*				
Time Consistent	0.11	0.22	−0.001	0.22
Present bias	0.87**	0.36	0.77**	0.35
Age (years)				
21–39 *(reference)*				
40–59	0.93***	0.25	0.86***	0.25
≥60	1.31***	0.27	1.22***	0.27
Race/ethnicity				
Non-Hispanic White *(reference)*				
Non-Hispanic Black	1.36***	0.32	1.42***	0.32
Asian	−2.59***	0.36	−2.61***	0.36
Hispanic	0.84**	0.38	0.86**	0.37
Other	−0.35	0.52	−0.15	0.51
College graduate				
No *(reference)*				
Yes	−0.84***	0.17	−0.63***	0.17
Annual household income				
≥$70,000 *(reference)*				
$45,000–69,999	0.61***	0.20	0.30	0.19
$30,000–44,999	0.47**	0.24	0.09	0.24
<$30,000	1.56***	0.27	0.98***	0.26
Married				
No *(reference)*				
Yes	−0.26	0.19	−0.37**	0.19
Vigorous activity last week				
0 times *(reference)*				
1			−0.80***	0.24
2–3			−1.61***	0.19
4–6			−2.95***	0.22
7–10			−3.12***	0.47
10+			−3.56***	0.82
Alcohol consumption				
Never or Infrequently *(reference)*				
Once a week or more			1.61***	0.16
Constant	27.65***	0.40	27.85***	0.42
Number of observations	5871		5871	

Note: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$; Patience: Patient: $\delta = 0.83$ $\delta > 0.67$; Medium patience: $\delta = 0.56 \vee 0.67$; Impatient: $\delta < 0.56$; Self-control: "Future bias": $\beta > 1$; Time Consistent: $\beta = 1$; Present bias: $\beta < 1$.

Table A6
Parents' intertemporal preferences and their children's obesity status: probit models (parents' BMI adjusted for self-reporting using NHANES data).

	All children			First Child			Second and third child		
	Obesity status								
	Coef.	Clustered SE	Marginal effects	Coef.	Robust SE	Marginal effects	Coef.	Clustered SE	Marginal effects
Parent's BMI	0.03***	0.004	0.01	0.04***	0.01	0.01	0.02***	0.01	0.004
Parent's patience									
Patient *(reference)*									
Medium Patience	0.17**	0.08	0.03	0.12	0.10	0.02	0.22*	0.12	0.04
Impatient	0.3***	0.09	0.05	0.26**	0.11	0.04	0.38***	0.13	0.07
Parent's self-control									
"Future bias" *(reference)*									
Time Consistent	0.17**	0.08	0.03	0.07	0.09	0.01	0.32***	0.12	0.06
Present bias	0.3**	0.13	0.05	0.36**	0.15	0.06	0.18	0.22	0.03
Child's Age (years)									
2–7 *(reference)*									
8–12	−0.21***	0.07	−0.04	0.02	0.10	0.003	−0.40***	0.10	−0.07
13–17	−0.43***	0.07	−0.07	−0.28***	0.10	−0.04	−0.52***	0.12	−0.10
Child's gender									
Male (reference)									
Female	−0.05	0.06	−0.01	−0.08	0.07	−0.01	−0.01	0.09	−0.002
Race/ethnicity									
Non-Hispanic White *(reference)*									
Non-Hispanic Black	0.02	0.11	0.004	0.06	0.13	0.01	−0.05	0.16	−0.01
Asian	0.05	0.14	0.01	−0.01	0.17	0.001	0.12	0.20	0.02
Hispanic	−0.05	0.10	−0.01	−0.09	0.14	−0.01	0.03	0.15	0.01
Other	−0.23	0.22	−0.04	−0.93**	0.42	−0.15	0.17	0.31	0.03
Parent- college graduate									
No *(reference)*									
Yes	−0.16**	0.07	−0.03	−0.13	0.08	−0.02	−0.21**	0.10	−0.04
Annual household income									
≥$70,000 *(reference)*									
$45,000–69,999	0.09	0.07	0.02	0.08	0.09	0.01	0.09	0.11	0.02
$30,000–44,999	0.10	0.09	0.02	0.20*	0.11	0.03	−0.07	0.14	−0.01
<$30,000	0.31***	0.10	0.05	0.35***	0.12	0.06	0.21	0.16	0.04
Parent- Married									
No *(reference)*									
Yes	0.10	0.09	0.02	0.21*	0.11	0.03	−0.06	0.14	−0.01
Constant	−2.26***	0.19		−2.70***	0.24		−1.77***	0.29	
Number of observations	3908			2387			1521		

Note: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$; Patience: Patient: $\delta = 0.83$ $\delta > 0.67$; Medium patience: $\delta = 0.56 \vee 0.67$; Impatient: $\delta <$ 0.56; Self-control: "Future bias": $\beta > 1$; Time Consistent: $\beta = 1$; Present bias: $\beta < 1$; Marginal effects estimated at the means of covariates.

Table A7
Parents' intertemporal preferences and their children's BMI z-scores: OLS models (parents' BMI adjusted for self-reporting using NHANES data).

	All children		First Child		Second and Third Child	
	BMI z-scores					
	Coefficient	Clustered SE	Coefficient	Robust SE	Coefficient	Clustered SE
Parent's BMI	0.04***	0.004	0.04***	0.005	0.03***	0.01
Parent's patience						
Patient *(reference)*						
Medium Patience	0.13*	0.07	0.15**	0.08	0.08	0.12
Impatient	0.25***	0.08	0.23***	0.09	0.28*	0.14
Parent's self-control						
"Future bias" *(reference)*						
Time Consistent	0.12*	0.07	0.03	0.07	0.27**	0.12
Present bias	0.15	0.11	0.06	0.12	0.31*	0.19
Child's Age (years)						
2–7 *(reference)*						
8–12	0.10	0.08	0.19*	0.10	0.01	0.11
13–17	0.15**	0.07	0.21**	0.09	0.14	0.11
Child's gender						
Male (reference)						
Female	−0.11**	0.05	−0.11**	0.06	−0.11	0.08
Race/ethnicity						
Non-Hispanic White *(reference)*						
Non-Hispanic Black	0.16*	0.09	0.14	0.11	0.22	0.16
Asian	−0.11	0.13	−0.19	0.14	0.002	0.21
Hispanic	0.02	0.11	−0.09	0.12	0.16	0.15
Other	−0.24	0.22	0.04	0.17	−0.61	0.43
Parent- college graduate						
No *(reference)*						
Yes	−0.05	0.06	−0.02	0.06	−0.11	0.09

Table A7 (*Continued*)

	All children		First Child		Second and Third Child	
	BMI z-scores					
	Coefficient	Clustered SE	Coefficient	Robust SE	Coefficient	Clustered SE
Annual household income						
≥$70,000 *(reference)*						
$45,000–69,999	0.12*	0.07	0.08	0.07	0.17	0.11
$30,000–44,999	0.15*	0.09	0.16*	0.09	0.14	0.14
<$30,000	0.22**	0.10	0.18*	0.10	0.30*	0.18
Parent- Married						
No *(reference)*						
Yes	0.04	0.08	0.05	0.08	0.02	0.14
Constant	−1.15***	0.18	−1.21***	0.20	−1.11***	0.31
Number of observations	3908		2387	1521		

Note: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$; Patience: Patient: $\delta = 0.83$ $\delta > 0.67$; Medium patience: $\delta = 0.56 \vee 0.67$; Impatient: $\delta < 0.56$; Self-control: "Future bias": $\beta > 1$; Time Consistent: $\beta = 1$; Present bias: $\beta < 1$.

References

Borghans, L., Golsteyn, B.H.H., 2006. Time discounting and the body mass index. Evidence from the Netherlands. Econ. Hum. Biol. 4, 39–61. doi:http://dx.doi.org/10.1016/j.ehb.2005.10.001.

Bowden, R.J., Turkington, D.A., 1990. Instrumental Variables. Cambridge University Press, New York.

Brown, H., van der Pol, M., 2014. The role of time preferences in the intergenerational transfer of smoking. Health Econ. 23, 1493–1501. doi:http://dx.doi.org/10.1002/hec.2987.

Cao, S., Moineddin, R., Urquia, M.L., Razak, F., Ray, J.G., 2014. J-shapedness: an often missed, often miscalculated relation: the example of weight and mortality. J. Epidemiol. Community Health 2013–203439. doi:http://dx.doi.org/10.1136/jech-2013-203439.

Cawley, J., Meyerhoefer, C., 2012. The medical care costs of obesity: an instrumental variables approach. J. Health Econ. 31, 219–230. doi:http://dx.doi.org/10.1016/j.jhealeco.2011.10.003.

Cawley, J., 2004. The impact of obesity on wages. J. Hum. Resour. 39, 451–474. doi:http://dx.doi.org/10.2307/3559022.

Centers for Disease Control and Prevention, 2017. Adult Obesity Facts [WWW Document]. URL https://www.cdc.gov/obesity/data/adult.html (accessed 10.14.17).

Centers for Disease Control and Prevention, 2017. The Health Effects of Overweight and Obesity [WWW Document]. Healthy Weight. URL https://www.cdc.gov/healthyweight/effects/index.html (accessed 9.15.17).

Centers for Disease Control and Prevention, 2017. National Health and Nutrition Examination Survey [WWW Document]. URL https://www.cdc.gov/nchs/nhanes/index.htm (accessed 1.9.17).

Chabris, C.F., Laibson, D., Morris, C.L., Schuldt, J.P., Taubinsky, D., 2008. Individual laboratory-measured discount rates predict field behavior. J. Risk Uncertain. 37, 237–269. doi:http://dx.doi.org/10.1007/s11166-008-9053-x.

Classen, T.J., Thompson, O., 2016. Genes and the intergenerational transmission of BMI and obesity. Econ. Hum. Biol. 23, 121–133. doi:http://dx.doi.org/10.1016/j.ehb.2016.08.001.

Courtemanche, C., Heutel, G., McAlvanah, P., 2015. Impatience, incentives and obesity. Econ. J. 125, 1–31. doi:http://dx.doi.org/10.1111/ecoj.12124.

Crawford, V.P., 2014. Now or Later? Present-Bias and Time-Inconsistency in Intertemporal Choice.. .

Currie, J., DellaVigna, S., Moretti, E., Pathania, V., 2010. The effect of fast food restaurants on obesity and weight gain. Am. Econ. J. Econ. Policy 2, 32–63.

DeVoe, S.E., House, J., Zhong, C.-B., 2013. Fast food and financial impatience: a socioecological approach. J. Pers. Soc. Psychol. 105, 476–494. doi:http://dx.doi.org/10.1037/a0033484.

Downs, J.S., Loewenstein, G., Wisdom, J., 2009. Strategies for promoting healthier food choices. Am. Econ. Rev. 99, 159–164.

Dube, L., 2010. Obesity Prevention: The Role of Brain and Society on Individual Behavior. Academic Press.

Ello-Martin, J.A., Ledikwe, J.H., Rolls, B.J., 2005. The influence of food portion size and energy density on energy intake: implications for weight management. Am. J. Clin. Nutr. 82, 236S–241S.

Finkelstein, E.A., Khavjou, O.A., Thompson, H., Trogdon, J.G., Pan, L., Sherry, B., Dietz, W., 2012. Obesity and severe obesity forecasts through 2030. Am. J. Prev. Med. 42, 563–570. doi:http://dx.doi.org/10.1016/j.amepre.2011.10.026.

Fishman, E., Schepers, P., Kamphuis, C.B.M., 2015. Dutch cycling: quantifying the health and related economic benefits. Am. J. Public Health 105, e13–15. doi:http://dx.doi.org/10.2105/AJPH.2015.302724.

Flegal, K.M., Kruszon-Moran, D., Carroll, M.D., Fryar, C.D., Ogden, C.L., 2016. Trends in obesity among adults in the United States, 2005 to 2014. JAMA 315, 2284–2291. doi:http://dx.doi.org/10.1001/jama.2016.6458.

Frankel, L.A., Hughes, S.O., O'Connor, T.M., Power, T.G., Fisher, J.O., Hazen, N.L., 2012. Parental Influences on Children's Self-Regulation of Energy Intake: Insights from Developmental Literature on Emotion Regulation [WWW Document]. J. Obes. URL https://www.hindawi.com/journals/jobe/2012/327259/ (accessed 9.22.17).

Greene, K.N., Gabrielyan, G., Just, D.R., Wansink, B., 2017. Fruit-promoting smarter lunchrooms interventions: results from a cluster RCT. Am. J. Prev. Med. 52, 451–458. doi:http://dx.doi.org/10.1016/j.amepre.2016.12.015.

Gruber, J., Koszegi, B., 2004. Tax incidence when individuals are time-inconsistent: the case of cigarette excise taxes. J. Public Econ. 88, 1959–1987.

Hübler, P., Kucher, A., 2016. Ashes to Ashes, Time to Time – Parental Time Discounting and Its Role in the Intergenerational Transmission of Smoking (Discussion Paper Series No. 326). Universitaet Augsburg, Institute for Economics.

Harrison, G.W., Lau, M.I., Williams, M.B., 2002. Estimating individual discount rates in Denmark. A field experiment. Am. Econ. Rev. 92, 1606–1617.

Hoch, S.J., Loewenstein, G.F., 1991. Time-inconsistent preferences and consumer self-control. J. Consum. Res. 17, 492–507. doi:http://dx.doi.org/10.1086/208573.

Hossain, P., Kawar, B., El Nahas, M., 2007. Obesity and diabetes in the developing world—a growing challenge. N. Engl. J. Med. 356, 213–215. doi:http://dx.doi.org/10.1056/NEJMp068177.

Ikeda, S., Kang, M.-I., Ohtake, F., 2010. Hyperbolic discounting, the sign effect, and the body mass index. J. Health Econ. 29, 268–284. doi:http://dx.doi.org/10.1016/j.jhealeco.2010.01.002.

John, L.K., Loewenstein, G., Troxel, A.B., Norton, L., Fassbender, J.E., Volpp, K.G., 2011. Financial incentives for extended weight loss: a randomized, controlled trial. J. Gen. Intern. Med. 26, 621–626. doi:http://dx.doi.org/10.1007/s11606-010-1628-y.

Kang, M.-I., Ikeda, S., 2016. Time discounting, present biases, and health-related behaviors: evidence from Japan. Econ. Hum. Biol. 21, 122–136. doi:http://dx.doi.org/10.1016/j.ehb.2015.09.005.

Kuczmarski, R.J., Ogden, C.L., Grummer-Strawn, L.M., Flegal, K.M., Guo, S.S., Wei, R., Mei, Z., Curtin, L.R., Roche, A.F., Johnson, C.L., 2000. CDC growth charts: United States. Adv. Data 1–27.

Laibson, D., 1997. Golden eggs and hyperbolic discounting. Q. J. Econ. 112, 443–478. doi:http://dx.doi.org/10.1162/003355397555253.

Self-Control theory. In: Lange, P.A.M.V., Kruglanski, A.W., Higgins, E.T. (Eds.), Handbook of Theories of Social Psychology. SAGE Publications Ltd, Los Angeles, pp. 1–22.

Leonard, T., Shuval, K., de Oliveira, A., Skinner, C.S., Eckel, C., Murdoch, J.C., 2013. Health behavior and behavioral economics: economic preferences and physical activity stages of change in a low-income African-American community. Am. J. Health Promot. AJHP 27, 211–221. doi:http://dx.doi.org/10.4278/ajhp.110624-QUAN-264.

Li, L., Law, C., Lo Conte, R., Power, c., 2009. Intergenerational influences on childhood body mass index: the effect of parental body mass index trajectories. Am. J. Clin. Nutr. 89, 551–557. doi:http://dx.doi.org/10.3945/ajcn.2008.26759.

Loewenstein, G., Brennan, T., Volpp, K.G., 2007. Asymmetric paternalism to improve health behaviors. JAMA 298, 2415–2417. doi:http://dx.doi.org/10.1001/jama.298.20.2415.

Loewenstein, G., 1996. Out of control: visceral influences on behavior. Organ. Behav. Hum. Decis. Process. 65, 272–292. doi:http://dx.doi.org/10.1006/obhd.1996.0028.

Loewenstein, G., 2005. Hot-cold empathy gaps and medical decision making. Health Psychol. Off. J. Div. Health Psychol. Am. Psychol. Assoc. 24, S49–56. doi:http://dx.doi.org/10.1037/0278-6133.24.4.S49.

Meier, S., Sprenger, C., 2007. Impatience and Credit Behavior: Evidence from a Field Experiment Working Paper Series//Federal Reserve Bank of Boston, No. 07-3. .

Milkman, K.L., Beshears, J., Choi, J.J., Laibson, D., Madrian, B.C., 2011. Using implementation intentions prompts to enhance influenza vaccination rates. Proc. Natl. Acad. Sci. 108, 10415–10420.

Mischel, W., Ayduk, O., Berman, M.G., Casey, B.J., Gotlib, I.H., Jonides, J., Kross, E., Teslovich, T., Wilson, N.L., Zayas, V., Shoda, Y., 2011. 'Willpower' over the life span: decomposing self-regulation. Soc. Cogn. Affect. Neurosci. 6, 252–256. doi:http://dx.doi.org/10.1093/scan/nsq081.

Fat detection: taste, texture, and post ingestive effects. In: Montmayeur, J.-P., le Coutre, J. (Eds.), Frontiers in Neuroscience. CRC Press/Taylor & Francis, Boca Raton (FL).
Moore, L.L., Lombardi, D.A., White, M.J., Campbell, J.L., Oliveria, S.A., Ellison, R.C., 1991. Influence of parents' physical activity levels on activity levels of young children. J. Pediatr. 118, 215–219.
Must, A., Anderson, S.E., 2006. Body mass index in children and adolescents: considerations for population-based applications. Int. J. Obes. 30, 590–594. doi:http://dx.doi.org/10.1038/sj.ijo.0803300.
National Institute of Diabetes and Digestive and Kidney Diseases, 2015. Overweight and Obesity Statistics [WWW Document]. Natl. Inst. Diabetes Dig. Kidney Dis. URL https://www.niddk.nih.gov/health-information/health-statistics/overweight-obesity (accessed 10.14.17).
Ogden, C.L., Carroll, M.D., Lawman, H.G., Fryar, C.D., Kruszon-Moran, D., Kit, B.K., Flegal, K.M., 2016. Trends in obesity prevalence among children and adolescents in the United States, 1988–1994 through 2013–2014. JAMA 315, 2292–2299. doi:http://dx.doi.org/10.1001/jama.2016.6361.
Pachucki, M.C., Lovenheim, M.F., Harding, M., 2014. Within-family obesity associations: evaluation of parent, child, and sibling relationships. Am. J. Prev. Med. 47, 382–391. doi:http://dx.doi.org/10.1016/j.amepre.2014.05.018.
Richards, T.J., Hamilton, S.F., 2012. Obesity and hyperbolic discounting: an experimental analysis. J. Agric. Resour. Econ. 37, 181.
Rowland, M.L., 1990. Self-reported weight and height. Am. J. Clin. Nutr. 52, 1125–1133.
Samuelson, P.A., 1937. A note on measurement of utility. Rev. Econ. Stud. 4, 155–161. doi:http://dx.doi.org/10.2307/2967612.
Schlam, T.R., Wilson, N.L., Shoda, Y., Mischel, W., Ayduk, O., 2013. Preschoolers' delay of gratification predicts their body mass 30 years later. J. Pediatr. 162, 90–93. doi:http://dx.doi.org/10.1016/j.jpeds.2012.06.049.
Schneider, S., Peters, J., Peth, J.M., Büchel, C., 2014. Parental inconsistency, impulsive choice and neural value representations in healthy adolescents. Transl. Psychiatry 4, e382. doi:http://dx.doi.org/10.1038/tp.2014.20.
Schwartz, J., Mochon, D., Wyper, L., Maroba, J., Patel, D., Ariely, D., 2014. Healthier by precommitment. Psychol. Sci. 25, 538–546.
Shapiro, J.M., 2005. Is there a daily discount rate? Evidence from the food stamp nutrition cycle. J. Public Econ. 89, 303–325. doi:http://dx.doi.org/10.1016/j.jpubeco.2004.05.003.
Shuval, K., Stoklosa, M., Pachucki, M.C., Yaroch, A.L., Drope, J., Harding, M., 2016. Economic preferences and fast food consumption in US adults: insights from behavioral economics. Prev. Med. 93, 204–210. doi:http://dx.doi.org/10.1016/j.ypmed.2016.10.016.
Shuval, K., Leonard, T., Drope, J., Katz, D.L., Patel, A.V., Maitin-Shepard, M., Amir, O., Grinstein, A., 2017. Physical activity counseling in primary care: insights from public health and behavioral economics. CA. Cancer J. Clin. n/a-n/a. doi:http://dx.doi.org/10.3322/caac.21394.
Sutter, M., Kocher, M.G., Glätzle-Rützler, D., Trautmann, S.T., 2013. Impatience and uncertainty: experimental decisions predict adolescents' field behavior. Am. Econ. Rev. 103, 510–531.
Thaler, R.H., Sunstein, C.R., 2009. Nudge: Improving Decisions About Health, Wealth, and Happiness. Penguin Books, New York.
Wansink, B., Just, D.R., Payne, C.R., 2009. Mindless eating and healthy heuristics for the irrational. Am. Econ. Rev. 99, 165–169. doi:http://dx.doi.org/10.1257/aer.99.2.165.
Whitaker, K.L., Jarvis, M.J., Beeken, R.J., Boniface, D., Wardle, J., 2010. Comparing maternal and paternal intergenerational transmission of obesity risk in a large population-based sample. Am. J. Clin. Nutr. 91, 1560–1567. doi:http://dx.doi.org/10.3945/ajcn.2009.28838.
World Health Organization, 2015. Obesity and overweight [WWW Document]. URL http://www.who.int/mediacentre/factsheets/fs311/en/ (accessed 3.10.16).
Zhang, L., Rashad, I., 2008. Obesity and time preference: the health consequences of discounting the future. J. Biosoc. Sci. 40, 97–113. doi:http://dx.doi.org/10.1017/S0021932007002039.
de Oliveira, A.C.M., Leonard, T.C.M., Shuval, K., Skinner, C.S., Eckel, C., Murdoch, J.C., 2016. Economic preferences and obesity among a low-income African American community. J. Econ. Behav. Organ. 131, 196–208. doi:http://dx.doi.org/10.1016/j.jebo.2015.11.002.