

Healthy convenience: nudging students toward healthier choices in the lunchroom

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ABSTRACT

Background In the context of food, convenience is generally associated with less healthy foods. Given the reality of present-biased preferences, if convenience was associated with healthier foods and less healthy foods were less convenient, people would likely consume healthier foods. This study examines the application of this principle in a school lunchroom where healthier foods were made more convenient relative to less healthy foods.

Methods One of two lunch lines in a cafeteria was arranged so as to display only healthier foods and flavored milk. Trained field researchers collected purchase and consumption data before and after the conversion. Mean comparisons were used to identify differences in selection and consumption of healthier foods, less healthy foods and chocolate milk.

Results Sales of healthier foods increased by 18% and grams of less healthy foods consumed decreased by nearly 28%. Also, healthier foods' share of total consumption increased from 33 to 36%. Lastly, we find that students increased their consumption of flavored milk, but flavored milk's share of total consumption did not increase.

Conclusions In a school lunchroom, a convenience line that offered only healthier food options nudged students to consume fewer unhealthy foods. This result has key implications for encouraging healthy behavior in public schools nation wide, cafeterias and other food establishments.

Keywords children, food and nutrition, obesity

Introduction

Despite nutrition labels and dietary guidelines, convenience and taste are still the overwhelmingly strongest determinants of food choice.^{1–3} In other words, nutrition does not sell, but convenience and taste do. In 2010, there were 67 290 non-gas station convenience stores and 91 800 gas stations with convenience stores in the USA. In 2010, these two industries earned \$52.6 billion and \$335.5 billion, respectively.^{4,5} Fast food restaurants earned \$161.9 billion in revenues in 2010⁶ and in recent years, fast food chains have begun offering healthier options such as salads, wraps and even oatmeal. Yet, convenience is still generally associated with palatable but less healthy food options.

Behavioral scientists have identified various psychological biases that can explain anomalous behavior regarding food choice. Among these biases are reactance to paternalistic

policies (forced behavior),^{7,8} the *status quo* bias where individuals tend to choose the default choice,^{9–11} the sunk cost fallacy where individuals over eat to 'get their money's worth',^{12,13} and the tendency to place disproportionate weight on current benefits and costs relative to future benefits and costs—referred to as present-biased preferences.⁹ In present-biased preferences, individuals can be driven by convenience, especially in food choices. Unfortunately, these foods tend to be less healthy so disproportionate weight is placed on the benefit of eating unhealthy foods.

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There is reason to suspect, however, that an environmental change that *reverses* the association—makes healthier foods more convenient—can lead individuals to select and eat healthier foods.^{9,10,14} When healthier foods are more convenient, the disproportionate cost is on less healthy foods, so in principle, people should be drawn to consume more of the healthier foods and fewer less healthy foods. As a result this reversal in favor of healthy foods should have a positive impact on health.

What if the simple behavioral principle of convenience were applied in a school lunchroom setting? In other words, what if quick and easy were associated with healthier foods—fruits, vegetables and lower calorie entrées—whereas less healthy options were not as convenient? This could be as easy as retrofitting one lunch line in a school lunchroom to only offer the healthier options.¹⁵ A convenience line for healthy foods both preserves choice (students are not forced to take healthy foods) and encourages healthier behavior. As a result, one would expect that a convenience line for healthier options would nudge¹⁶ students to select and consume healthier lunches.

From a public health perspective, this has numerous ramifications, one of which is directly related to childhood obesity. As of 2008, more than one-third of school-aged children in the USA were either overweight or obese.¹⁷ Given that 70% of K-12 students eat a school lunch program meal at least three times a week¹⁸ it makes sense to target a school lunchroom as an appropriate setting to associate convenience with healthy food options. Although the childhood obesity problem cannot be solved with a convenience line in school cafeterias, it is a low-cost way to encourage healthy choices in schools and promote life-long habits, which can help in the battle.

To test the effectiveness of a convenience line, we converted one cafeteria line at a high school into a convenience line that sold only healthier food options, along with flavored milk.¹⁵ We predict that such a change will increase the amount of healthier foods children take and eat. In addition to changes in selection of healthier foods, we also predict that students will choose a lower quantity of less healthy foods and consequently decrease their consumption of these foods. We also predict the consumption of flavored milk will increase since it has the potential to replace the less healthy food items as the lunchtime treat.¹⁹

Experimental design

Since convenience is generally associated with less healthy foods and beverages, we introduced a convenience line in a high school cafeteria that contained only the healthier food

options, as well as flavored milks. The experiment lasted over the course of a 16-week period where the first 8 weeks were the control period and the second 8 weeks were the intervention period. The first 8 weeks ran from 1 February 2011 to 31 March 2011 and the second 8 weeks ran from 1 April 2011 to 31 May 2011. During the first period we visited the school on Thursday, 3 February and Friday, 25 March to collect consumption data. During the second period, we visited the school on Thursday, 12 May and Friday, 27 May to collect consumption data. We will refer to these four dates as the observation dates.

To gather the appropriate consumption data, we pre-weighed and recorded each item offered during a lunch period. Students who participated in the experiment filled out a small card that asked for their gender, activities they participate in at school—athletics, music, student, government, theater, no activity specified—and which lunch items they selected. After each meal, leftovers on each individual tray were weighed to calculate the amount of food each student consumed. On each observation date, students were given a new observation number so we were not able to track consumption over time. Therefore, each date represents a new sample of students in the cafeteria.

In the school where we conducted the study, the cafeteria has two lunch lines and both lunch lines display the same food options. On any given day these options may include chicken patties, sub sandwiches, tacos, hamburgers, salad, whole fruit, fruit parfait, flavored milk (chocolate or strawberry), white (skim, 1 or 2%), a vegetable and some type of dessert. When we introduced the convenience line, we only allowed for what we considered the healthier food options to be placed in this line—sub sandwich bar, salad bar, vegetables, whole fruit and fruit parfait—as well as flavored milk. We included sub sandwiches on the line, not because they are necessarily the healthiest options, but because they are a healthy alternative—include some type of vegetable—for the other entrée choices. The other line included all the choices, both healthy and less healthy, as before. Furthermore, in the convenience line students could prepare their own sub sandwiches but in the standard line, the sandwiches were pre-wrapped.

Results

We collected data from a public high school in Corning, New York. In each of the three lunch periods at the high school, field researchers collected data from as many students as possible. On the first second third and fourth observation dates, waste data were collected for 362, 240, 262 and 220 students, respectively. Thus, before the convenience

Table 1 Convenient lines increase the selection of healthier foods and decrease the consumption of less healthy foods [means (standard errors) and *t*-statistics (*P*-values)]

	Before the introduction of convenient lines	After the introduction of convenient lines	<i>t</i> -stat
Food items chosen per student			
Healthier foods	0.66 (0.02)	0.79 (0.02)	4.50* (0.00)
Less healthy foods	0.73 (0.02)	0.75 (0.02)	0.61 (0.54)
White milk	0.12 (0.01)	0.11 (0.01)	0.29 (0.77)
Flavored milk	0.74 (0.02)	0.85 (0.02)	3.91* (0.00)
Total milk	0.86 (0.02)	0.96 (0.02)	4.45* (0.00)
Total foods and milk	1.63 (0.04)	1.76 (0.04)	2.41* (0.02)
Grams consumed per student			
Healthier foods	282.4 (13.27)	282.4 (14.01)	0.00 (1.00)
Less healthy foods	182.5 (8.79)	131.5 (6.62)	-4.42* (0.00)
White milk	27.9 (3.37)	23.6 (3.33)	-0.88 (0.38)
Flavored milk	190.7 (5.64)	211.0 (6.04)	2.43* (0.02)
Total milk	218.6 (5.29)	234.6 (5.28)	2.10* (0.04)
Total foods and milk	683.5 (17.48)	648.5 (15.73)	-1.45 (0.15)
Percent of total grams consumed per student			
Healthier foods	0.33 (0.01)	0.37 (0.01)	1.97* (0.05)
Less healthy foods	0.28 (0.01)	0.23 (0.01)	-3.24* (0.00)
White milk	0.05 (0.01)	0.04 (0.01)	-1.16 (0.25)
Flavored milk	0.34 (0.01)	0.36 (0.01)	1.33 (0.18)
Total milk	0.39 (0.01)	0.41 (0.01)	0.68 (0.50)

Note: *t*-statistics marked with an asterisk are significant at the 0.05 level.

line was introduced, we collected 602 observations and after the convenience line was introduced, we collected 482 observations. While overall student consumption of less healthy foods decreased, the data hint at some differences by gender and extracurricular activities that may be worthy of future research. For example, female students did not change their selection of unhealthy foods but male students and students who did not specify an extracurricular activity significantly increased selection of unhealthy foods ($P < 0.10$ in both cases). Yet, for all the cohorts, consumption of the less healthy foods decreased ($P < 0.10$). We leave exploration of such results to future efforts with larger samples of these subgroups.

In terms of quantities chosen, we find that after the intervention period, the number of healthier foods students selected significantly increased by 18.8% (0.66–0.79 foods per student; $t = 4.50$, $P = 0.00$) (Table 1 and Figure 1). We also find that students chose 2.2% more

unhealthy foods (0.73–0.75 foods per student; $t = 0.61$, $P = 0.55$). White and flavored milks were offered during the four observations dates and we find that average quantities of white milk selected changed very little (0.12–0.11 cartons per student; $t = -0.29$, $P = 0.77$) but the average quantities of flavored milks selected increased by 14.6% (0.74–0.85 cartons per student; $t = 3.91$, $P = 0.00$). Total milk selected increased by 12% (0.86–0.96 cartons per student; $t = 4.46$, $P = 0.00$). Finally, students increased the number of items they selected by 7.9% (1.63–1.76 items per student; $t = 2.41$, $P = 0.02$).

While the quantities of items chosen per student help us understand how the convenience line affects choices, actual consumption amounts reveal behavioral adjustments in food consumption (Table 1 and Figure 2). Even though the average quantity of healthier foods chosen increased per student, there is negligible difference in the amount actually consumed. Specifically, the percentage increase in consumption of healthier foods is roughly equal to 0% (282.4–282.4 g per student; $t = 0.00$, $P = 1.00$). On the other hand, consumption of less healthy foods dramatically dropped by 27.9% (182.49–131.51 g per student; $t = 4.42$, $P = 0.00$). Grams per student of white milk decreased by an insignificant amount (27.85–23.60 g per student; $t = -0.88$, $P = 0.38$), but grams per student of flavored milk consumed increased by 10.6% (190.74–210.95 g per student; $t = 2.43$, $P = 0.02$). Total milk consumption, largely driven by the increase in consumption of flavored milks, increased by 7.3% (218.60–234.55 g per student; $t = 2.10$, $P = 0.04$). Finally, total consumption in grams per student actually fell but by an insignificant amount (683.48–648.46 g per student; $t = -1.45$, $P = 0.15$).

Another way to study the impact of convenience lines on consumption behavior is to examine how diet composition adjusted (Table 1). In other words, as a percentage of total grams consumed, how did students change consumption behavior? As expected, we find that the percentage of healthier foods consumed—in terms of total grams consumed—increased from 33% of total grams per student to 36.6% of total grams per student ($t = 1.97$, $P = 0.05$), a statistically significant difference. Less healthy foods' share of total grams consumed fell from 27.6 to 22.8% ($t = -3.24$, $P = 0.00$), also a statistically significant difference. There is no statistically significant difference in unsweetened or flavored milk's share of total grams consumed, though the change in flavored milk's share of total grams consumed is similar to that of healthier foods' share of total grams consumed. When we consider these results in terms of amounts consumed versus diet composition, we see that students substituted away from less healthy items to flavored

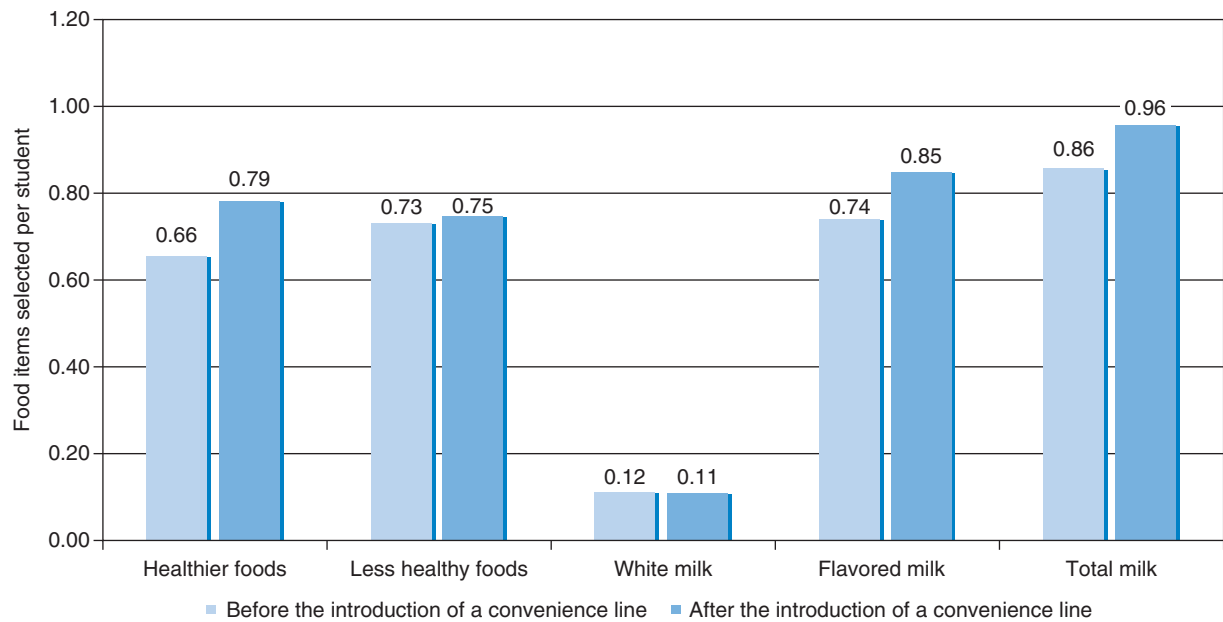


Fig. 1 The convenience line nudged students to take more healthier foods and flavored milk.

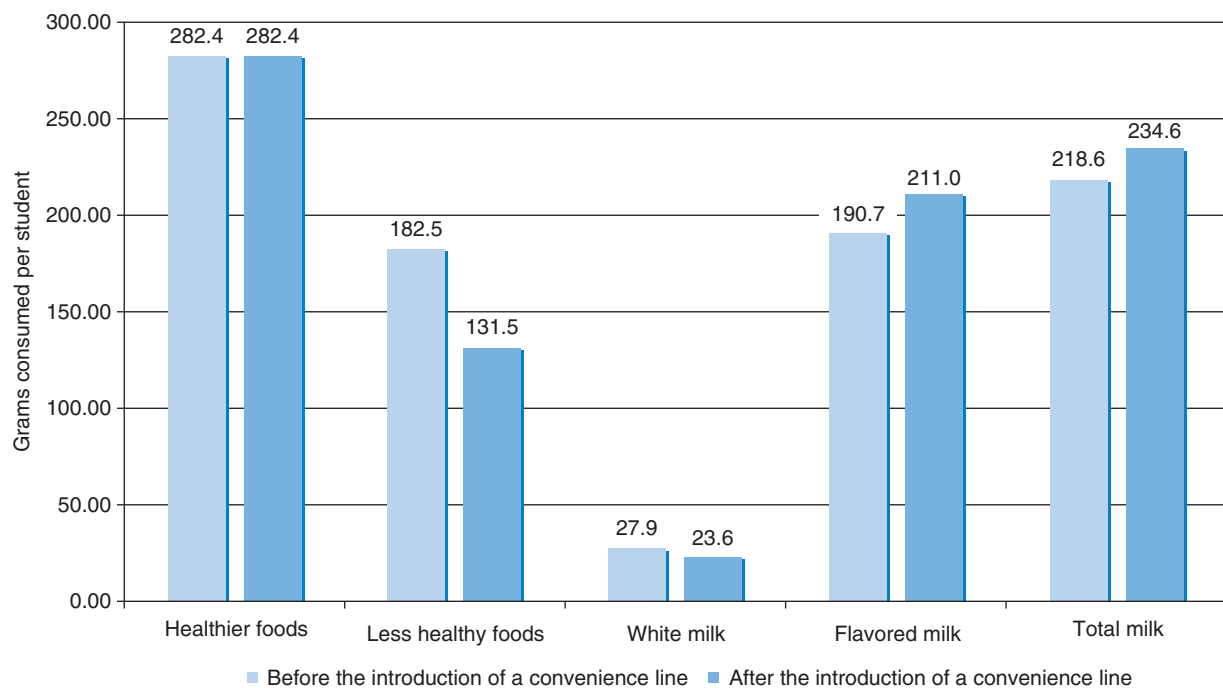


Fig. 2 The convenience line nudged students to consume fewer grams of less healthy foods and more grams of flavored milk.

milk but diet composition tells us that healthier food items claimed a greater share of total grams consumed. Flavored milks also claimed a larger share of total grams consumed, but the increase is not statistically significant.

Up to this point, our results suggest substitution away from less healthy foods to flavored milk. To examine this assessment in another way, we study the ratio of grams of

flavored milk consumed to grams of less healthy and healthy foods consumed. In Table 2 we report the ratios of white to flavored milk, flavored milk to less healthy foods, and flavored milk to healthier foods. The most striking result is that the ratio of grams of flavored milk consumed per gram of less healthy food consumed increased by nearly 42% (1.20–1.70; $t = 4.87$, $P = 0.00$). Thus, after the

Table 2 Students 'substitute' away from less healthy foods to chocolate milk [means (standard errors) and *t*-statistics (*P*-values)]

	<i>Before the introduction of a convenient line</i>	<i>After the introduction of a convenient line</i>	<i>t-stat</i>
Food items chosen per student			
Ratio of white to flavored milk	0.01 (0.01)	0.01 (0.01)	-0.79 (0.43)
Ratio of flavored milk to less healthy foods	0.77 (0.02)	0.87 (0.02)	3.23* (0.00)
Ratio of flavored milk to healthier foods	0.73 (0.02)	0.83 (0.02)	3.08* (0.00)
Grams consumed per student			
Ratio of white to flavored milk	0.01 (0.01)	0.01 (0.01)	-0.30 (0.77)
Ratio of flavored milk to less healthy foods	1.20 (0.07)	1.70 (0.08)	4.87* (0.00)
Ratio of flavored milk to healthier foods	1.48 (0.23)	1.27 (0.10)	-0.83 (0.41)

Note: *t*-statistics marked with an asterisk are significant at the 0.05 level.

convenience line, students consumed 1.7 g of flavored milk for each gram of less healthy foods. We also find that the ratio of grams of flavored milk to healthy foods decreased by 14% (1.48–1.27; $t = -0.83$, $P = 0.41$). After introduction of the convenience line, students consumed roughly 1.3 g of flavored milk to each gram of healthy foods, though the result is not statistically significant. Also, there is no statistical difference in the ratio of white to flavored milk before and after the convenience line.

Discussion

Main findings of this study

Our main results reveal that when a convenience line is introduced into a cafeteria and the convenience line has only healthier foods, students took more items all together, but they ended up selecting significantly more healthier foods and significantly more flavored milk. Even though students selected greater quantities of healthier foods, they did not increase consumption of these foods, so students wasted more of these foods. Convenience most likely nudged the students to take these foods but food preferences may have lead them to limit their consumption. Nonetheless, students exposed themselves to healthier foods, which will result in greater familiarity with healthier foods and could lead to greater future consumption of these foods. Furthermore, we find that consumption of less healthy foods decreases by 27.9%, so even though students are not eating additional healthy items, they are at least eating fewer less healthy foods. As a corollary to this result, diet composition adjusted such that healthy foods' share of total grams increased from 33 to 37% and less healthy foods' share of total grams decreased from 28 to 23%. Thus, when convenience is associated with healthier foods, children tend to

consume fewer grams of less healthy foods, but the challenge still lies in encouraging consumption of healthier food options.

We also find that consumption of flavored milk increased by 10.6%, a result that requires further reflection. While flavored milk may not be considered a healthier option, it is important to note that it contains the same nutritional content as regular milk, with additional sugar and calories. Yet, the nutrient/calorie trade off is much better for flavored milk than for an alternative sweetened beverage such as soft drinks, or even desserts served in the cafeteria. To put these results into perspective, consider the tradeoff between cherry cobbler (one of the available desserts at our high school) and chocolate milk. According to the Self Nutrition Data website, a 179 g serving of cherry cobbler contains 460 calories.²⁰ This equates to ~2.57 calories per gram. We find that on average, students consumed ~50 fewer grams of less healthy foods—cherry cobbler. This equals 128.5 fewer calories. Nonetheless, students did consume an average of 20 more grams of chocolate milk. According to the same website, a cup of chocolate milk (250 g) contains 157 calories, which equates to 0.785 calories per gram.²¹ As a result, students consumed an additional 16 more calories from chocolate milk. Thus, net calorie consumption decreased by ~112 calories during one lunch period. Even though cherry cobbler was not the only less healthy option available, this does warrant attention. Since students substituted to chocolate milk, this substitution increased lunchtime calorie intake by only 16 calories, which is most likely less than the addition of any other less healthy option. Yet this increase in calories is accompanied by a substantive increase in calcium and protein. While chocolate milk is a good source of nutrients, and a healthier alternative for certain options, there is opportunity to

identify ways to encourage students to consume the healthier alternative to chocolate (or flavored) milk—white milk.

What is already known?

In the market place, convenience is generally associated with less healthy foods.^{4–6} Since less healthy foods are generally more convenient than healthier foods, present-biased preferences predict that people will select and consume less healthy foods.⁹ A reversal, however, of the association between health and convenience can lead individuals to make healthier food choices.^{10,15}

Given the current obesity trends, especially among children,¹⁷ and that many school age children participate in the school lunch program,¹⁸ school lunchrooms are an ideal setting to promote healthy behavior among children. Simply making healthy foods more convenient in cafeterias can nudge students to make healthier choices.¹⁵ This is as easy as rearranging food items such that one line serves only healthier options.

What this study adds

This study applies the principle of present-biased preferences in a school lunchroom setting. To test the impact of this principle, we convert one of two lunch lines into a convenience line that offers only healthier options, so the less healthy options are now less convenient. Until now, no other study has examined the impact that such a conversion has on food choice and consumption in school lunchrooms. In a more general sense, this study supports the present-biased preference principle that when less healthy foods are made less convenient, individuals will select healthier meals.

In addition to providing support for the principle of present-biased preferences, the relatively simple and low-cost nature of our lunch line conversion has broad implications for wide-scale implementation in schools and in other food service settings. Given the current obesity crisis and very tight budgetary constraints in schools, a low-cost change that can help fight obesity trends is a refreshing, and actionable, concept. Furthermore, cafeterias in hospitals, office buildings and in other locations can also promote healthy choices with this simple conversion.

Limitations of this study

While our results are very promising, there are certain limitations to the experimental design. First, students who line up in the convenience line are not prohibited from also lining up in the regular line. This is likely not a big problem, but we have no way of determining the effect. Second, school lunch menus change every day. Although all foods

were measured and recorded, only the food items that were consistently offered throughout the experiment were utilized in the analysis. Observation days were selected based on menu to ensure a consistent selection of foods across the observation days. This selection of days also alleviates some of the problems of seasonality associated with school lunchroom studies. We also did not track individual consumption across days so we were only able to examine effects in the aggregate.

Limitations that we faced in our study represent opportunities for future research. First of all, if school food service staff were willing to cooperate, menus on measurement days could be coordinated to minimize variability in food options. This would allow researchers to identify which foods students treat as substitutes, especially for flavored milk. Another option would be to track individual consumption during the study and include a post-intervention period where the convenience line is converted back to the normal line. This design would allow researchers to study longer term behavioral effects of the convenience line.

Conclusions

Convenience is generally associated with sweet, salty and fatty foods, but what if convenience was linked to healthier food options? To determine the effect of associating convenience with healthier foods, we made healthier options more convenient in a cafeteria by offering only the healthier options in one of two lunch lines. As a result, students consumed 28% fewer grams of less healthy foods. This strong result, combined with the low cost and simple nature of the lunch line conversion, suggests that a convenience line is a very effective method for combating the current obesity crisis. We do recognize, however, that there is a great need to study ways to encourage students to eat more of the healthier foods they select. This could be done through education, improving food quality, or other environmental changes.

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References

- 1 Glanz K, Basil M, Maibach E *et al*. Why Americans eat what they do: taste, nutrition, cost, convenience, and weight control concerns as influences on food consumption. *J Am Diet Assoc* 1998;**98**(10): 1118–26.
- 2 Uraia N, Lähteenmäki L. Reasons behind consumers' functional food choices. *Nutr Food Sci* 2003;**33**(4):148–58.
- 3 Barriero-Hurić J, Gracia A, de-Magistris T. Does nutrition information on food products lead to healthier food choices? *Food Policy* 2010;**35**(3):221–9.
- 4 Snyder S. Convenience stores in the US: 2010. IBISWorld Industry Report 44512, 2010.
- 5 Molavi J. Gas stations with convenience stores in the US: 2010. IBISWorld Industry World Report 44711, 2010.
- 6 Samadi N. Fast food restaurants in the US: 2010. IBISWorld Industry Report 72221a, 2010.
- 7 Just DR, Wansink B. Smarter lunchrooms: using behavioral economics to improve meal selection. *Choices* 2009;**24**(3):1–7.
- 8 Price J, Just D. Getting kids to eat their veggies. In: International Association of Agricultural Economists 27th Triennial Conference, Beijing, 2010.
- 9 Loewenstein G, Brennan T, Volpp KG. Asymmetric paternalism to improve health behaviors. *J Am Med Assoc*, 2007;**298**(20):2415–7.
- 10 Downs JS, Loewenstein G, Wisdom J. Strategies for promoting healthier food choices. *Am Econ Rev* 2009;**99**(2): 159–64.
- 11 Just DR, Mancino L, Wansink B. Could behavioral economics help improve diet quality for nutrition assistance program participants? Economic Research Service: Economic Research Report Number 43, 2007,1–34.
- 12 Clark RA, Goldsmith RE. Market mavens: psychological influences. *Psychol Market* 2005;**22**(4):289–312.
- 13 Just D, Wansink B. The flat-rate pricing paradox: conflicting effects of 'all-you-can-eat' buffet pricing. *Rev Econ Statist* 2011;**93**(1):193–200.
- 14 Wansink B, Just D, Payne C. Mindless eating and healthy heuristics for the irrational. *Am Econ Rev* 2009;**99**(2):165–9.
- 15 Smith LE, Just DR, Wansink B *et al*. Healthy convenience: nudging students to make healthier choices in the lunchroom. *J Fed Am Soc Exp Bio* 2011;**25**(781.25):Abstract.
- 16 Thaler RH, Sunstein CR. *Nudge: Improving Decisions about Health, Wealth, Happiness*. New Haven, CT: Yale University Press, 2009.
- 17 Ogden CL, Carroll MD, Curtin LR *et al*. Prevalence of high body mass index in US children and adolescents, 2007–2008. *J Am Med Assoc* 2010;**303**(3):242–9.
- 18 Moshfegh A, Goldman J, Cleveland L. What we eat in America, NHANES 2001–2002: usual nutrient intakes from food compared to dietary reference intakes. US Department of Agriculture, Agricultural Research Service, 2005,1–56.
- 19 Smith LE, Just DR, Wansink B *et al*. Disrupting the default choice: the contentious case of chocolate milk. *J Fed Am Soc Exp Bio* 2011;**25**(781.24):Abstract.
- 20 Self Nutrition Data: Cherry Cobbler. <http://nutritiondata.self.com/facts/foods-from-back-yard-burgers/8371/2>. Accessed September 9, 2011.
- 21 Self Nutrition Data: Chocolate Milk. <http://nutritiondata.self.com/facts/dairy-and-egg-products/92/2>. Accessed September 9, 2011.