Young Food Consumers: How do Children Respond to Point-of-Purchase Interventions?

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We seek to examine how "adult-facing" food price interventions (such as junk food taxes) and warning labels may influence kids who are buying their own snacks. This work, conducted through a series of both laboratory and field experiments, also looks at the cognitive correlates of children's market behavior. A proper understanding of the development and functioning of children as autonomous consumers has important implications for the role of labelling policies for good nutritional choices on children and the economy.

The market for children's food purchases

Most traditional research has ignored the economic activity and decisions of children with a few exceptions. Children have remarkable spending power, both potential and actual. In a recent Harris Poll YouthPulse (2012), eight to 24 year olds were said to have spent $211 billion of their own money in 2012. Candy was the most significant purchase of both 8-12 year olds and 13-17 year olds, with other popular purchases for both age groups including toys, books, clothes, and entertainment. The YouthPulse results also indicate that youth significantly influence parental purchases and are not passive receivers of things, as kids have been in previous generations.

Children are extensively marketed to, and child-directed advertising is growing much more rapidly than the rate of growth of the child population in the US. In 2005, the total value of the global market for products targeted specifically to children was worth approximately US$452.6b (Nicholls & Cullen, 2004). Of this global market, roughly 18.7% of purchases were primary purchases in which children spent their own money. Although this figure is global, the US is thought to be the primary player (McNeal, 1999). In their 2004 report on child-parent purchase relationships, Nicholls and Cullen (2004) indicate that the largest single product category marketed directly to children is food.

Given that the foods advertised during children's TV viewing time are primarily energy-dense, nutrient poor (EDNP) foods (Harrison & Marske, 2005; Mink et al. 2010), it is alarming to think that food ads make up the majority of ads targeted to children. When a child views a food ad, the desire to try the food may be cultivated rapidly. It is then very difficult for parents to counter the persuasive advertisement with rational arguments to dissuade the child. The power of children to persuade their parents to purchase advertised products is commonly referred to as "pester power" (Nicholls & Cullen, 2004). Studies by Mazzonetto and Fiates (2014) and Foster et al. (2014) found that children's preferences significantly influence parents' purchasing decisions, specifically in grocery store settings.

EDNP foods, obesity, and diet-related disease

Recent studies show that the actual foods consumed by children mirror the diets promoted via food ads (Wiecha, et al., 2006). The heavy promotion and consumption of EDNP foods is problematic, with these trends having been linked to increasing rates of childhood obesity (see review by Coon & Tucker, 2002). Perhaps more alarming is the increase in the percentage of children presenting with chronic diet-related diseases that were once only observed in adults (Centers for Disease Control and Prevention, 2013). Both policymakers and the general public have been discussing whether government interventions are warranted and, if so, what measures should be undertaken (Gostin, 2007; Hawkes, 2012).

A "fat tax" on EDNP foods has been discussed as a possible tool to discourage people from buying EDNP foods by raising their price relative to the price of healthier substitutes (Brownell & Frieden, 2009; Gortmaker et al., 2011; Jacobson & Brownell, 2000; Marshall, 2000). In general, though, fat tax studies have shown adults' demand is unlikely to shift substantially in response to a price hike. This implies limited efficacy of small taxes as tools for achieving public health goals (e.g., Cash et al., 2012; Cash & Lacanilao, 2007; Kuchler, Tegene, & Harris, 2005; Powell, Chriqui, & Chaloupka, 2009; Schroeter, Lusk, & Tyner, 2008). Little is known, however, about the likely influence of a fat tax on young children's food choices since young children have not yet been studied.

Overall, the empirical evidence base for the effect of food price interventions on health outcomes is incomplete. Weaknesses in the quality of existing evidence include incomplete measurement of taxed food items, predictive studies that assume behavioral responses estimated from beyond observed ranges of data, and estimating health effects from changes in consumption of specific food items without regard for substitutions made across the whole diet (Thow et al., 2010; Cash & Lacanilao, 2007).

Why study children?

There is no reason to assume that adults' responses to price interventions would generalize to young children, but it is not clear what may differ. One might expect that, given their lower incomes, kids may be more sensitive to price changes. On the other hand, children are less experienced consumers, have fewer outside options for purchases, fewer long-term fiscal responsibilities, and a lesser understanding of future consequences, and may therefore follow simplified heuristics such as "Is there enough money in my pocket to cover this purchase?" Moreover, recent studies have shown that children's snack food choices are not always consistent with their intended choices (Branscum & Sharma, 2014) or with their self-efficacy (Branscum & Sharma, 2011), which suggests that children's snack food choices may be harder to predict or to influence than adults' choices.

Some promising research does exist about the effects of taxes on secondary school students' food purchases (French, 2003). Farrell and Shields (2007) report that unhealthy foods and beverages are "normal goods" for children (i.e., goods for which consumption increases as income increases). This implies that price interventions would have some efficacy. A review by Epstein et al. (2012) suggests that when the prices of less healthy foods increases, children substitute healthier foods, and when healthier food prices are reduced, the purchase of less healthy foods decreases. While all the studied price changes improved nutrition of the food purchased, taxes or price increases reduced the energy purchased, while subsidies increased energy purchased. But conflicting evidence argues that tax and/or subsidy initiatives may backfire and encourage children to purchase more of all sorts of food (Epstein, Handley, et al., 2006). This is an interesting contradiction that remains unresolved due to the lack of research involving children in this area. In general, the findings regarding adult consumption habits and those few involving older children may not be sufficient to inform stakeholders concerned with young children's food choices.

Children and rationality

A key question underlying the likely effectiveness of fat taxes to guide children toward healthier food choices is whether children exhibit economic rationality in product choice situations. Harbaugh and colleagues conducted a series of experiments involving child participants to determine the extent to which children's decisions are rational or not (see Harbaugh & Krause, 2000; Harbaugh, Krause, & Vesterlund, 2001, 2002). In one study, Harbaugh, Krause, and Berry (2001) showed that children generally exhibited rational preferences in an experimental setting that required them to choose between various bundles of snacks (potato chips and fruit juices), and that the number of violations of rationality was not strongly related to measured math ability. That being said, sixth graders exhibited far fewer violations of rationality than did the second graders in the study, and performed roughly on par with a comparison set of undergraduate students. It appears that age is a better predictor of rational choice among children than are math scores. Consistency of decision-making is acquired around age 11 (Harbaugh, Krause, & Berry, 2001), and characteristics of child decision-making appear to be developed innately rather than explicitly learned (Currie, 2004).

Children as purchasers and how they are influenced

It is important to examine children as a specific group of consumers, and to gauge how children make their decisions at different ages, if we wish to develop interventions that will effectively influence this market segment. In an attempt to understand the role of a child as an autonomous consumer, economists have begun to apply behavioral-economic insights to the food choices of children. In one report, Just, Mancino, and Wansink (2007) explain which behavioral insights may be most relevant for food policy formation, especially in school cafeterias. Many of these recommendations are shared with school administrators and other interested parties through an outreach website (http://www.smarterlunchrooms.org/). These initial findings, however, largely involved extrapolation of behavior observed in adults (including the aforementioned college students), rather than direct research with children.

One recent study has linked children's snack food purchases to their available money. Wang and colleagues (2007) reported that even among “lower class” families, the majority of children aged 10 to 12 years were receiving daily pocket money. Children with more pocket money were more likely to consume more fried foods, more soda, and more snacks than children with less pocket money. Similarly, among their sample of fourth- through sixth grade participants in a lower-income urban area, Borradaile and colleagues (2009) found that half of the children shopped at a corner store every day and the majority of their purchases were EDNP foods. Available funds and access to EDNP foods appear to be key factors leading to purchase of EDNP foods. In another study of low-income, urban youth, Dennisuk et al. (2011) found a strong positive association between the amount of money spent on food with both the total number of food items purchased ($p < 0.001$) and the child's age ($p < 0.05$). The majority of purchases were made in corner stores, with youth spending an average of $3.96 on all foods and beverages purchased for themselves on a typical day. Chips, candy, and soda were purchased most frequently at 2.5, 1.8, and 1.4 days out of the past seven days, respectively. "Any healthy item" also made up a substantial amount of purchases with 3.6 purchases out of seven.

In an attempt to determine factors that influence children's food purchases, Epstein, Dearing, et al. (2006, 2007) investigated dyads of mothers and their 10- to 12-year-old children. They found a significant correlation between parent and child food choice behavior. Likewise, in a simple purchasing role play, preschoolers have been found to select food items of a comparable healthiness to their parents' self-reported choices, implying heavily that children assimilate their parents' preferences at a young age (Sutherland, Beavers, Kupper, et al., 2008). Though these studies both suggest that parents influence children's food choices, both studies were conducted in experimental settings devoid of food advertising.

When food advertising is considered, parental influence appears to decline. Children are exposed to a large amount of marketing that is aimed directly at them. Many claim that this advertising influences their purchases, creates brand loyalty, and promotes consumption of EDNP foods (Institute of Medicine, 2011; Harris, Pomeranz, Lobstein, & Brownell, 2009). The average two- to seven-year-old is exposed to more than 4,000 food ads, and each year, $1.6 billion is spent on junk food ads, as compared to $2 million on ads for healthier foods (Grigsby-

Toussaint, Harrison, Nelson, Fiese, & Christoph, 2013). Cereals, fruit snacks, meal products, frozen dessert and candy make up two-thirds of food marketing to children, and only 10% of foods marketed to children meet Institute of Medicine standards (Glanz, Bader, & Iyer, 2012). Characters, cartoons, games, apps, social networking, and videos have been highlighted by several studies as primary advertising methods with the goal of persuading children (British Heart Foundation, 2011; Grigsby-Toussant et al., 2013; Harris et al., 2009; Kotler, Schiffman, & Hanson, 2012). Ads emphasis non-meal time snacking at 58%, and only 11% of ads are set in the kitchen, dining room or restaurant setting (Harris et al., 2009). In experiments where children watched advertisements and were asked to choose a product, they were more likely to choose the one advertised, despite their parents' preferences otherwise. Ferguson et al. (in press) thus conclude "Although advertising impact on children's food choices is moderate in size, it appears resilient to parental efforts to intervene."

The United Kingdom has banned advertisements for unhealthy foods and drinks during children's television programs, and may be moving towards the same ban on internet advertising and regulations to be clearer about the unhealthy nature of foods (British Heart Foundation, 2011). However in the U.S., retail food stores are not currently included in the Children's Food and Beverage Advertising Initiative, which either bans marketing to children under 12 or requires marketing healthier foods to this age group (Grigsby-Toussaint et al., 2013). Some research exists on other factors influencing children's food choices, as well as effectiveness of measures to influence them. These take on topics such as price, rewards, information, proximity, and peers.

Social and peer influences also play an important role in eating behavior. Mazzonetto and Fiates (2012) found that children associated junk foods with leisure activities, and indicated that social situations and leisure activities were thought of as "inappropriate occasions for eating fruits and vegetables". Two recent empirical reviews identified that children's food preferences have been shown to change to fit the preferences of a familiar peer or friend, with unfamiliar peers having the opposite effect (Houldcroft, Haycraft & Farrow, 2014; Salvy, Elmo, Nitecki, Kluczynski, & Roemmich, 2011). Weight status was influential, in which overweight children paired with overweight peers or friends ate more than overweight children paired with non-overweight peers. Differences in gender, age, and sibling dynamics also affect choices in food consumption. Additionally, Houldcroft, Haycraft, and Farrow noted that negative peer modeling with the introduction of new foods may have a stronger effect than positive peer modeling. The role of peers is also important especially as children move into the "tween" years (i.e., 8 to 12 years of age). Roper and La Niece (2009) studied 7-, 11-, and 14-year-olds and found that peer influence replaced family influence as the main driver of children's consumption choices around the tween years. Tweens in Roper and La Niece's study reported being too embarrassed to consume generic "store brand" food items and also claimed that unbranded items tasted inferior to commercially branded foods.

Environmental factors, like proximity, also influence children's food decisions. When Currie et al. (2010) examined child food choices, they reported that convenience of food options may play a significant role in terms of foods chosen. These researchers found that proximity of fast food restaurants to schools was directly correlated with obesity rates in the student population. Story et al. (2002) also reported proximity influencing eating behaviors, with five percent of adolescent eating at convenience store or other grocery outlets which accounted for 28% of all non-home/non-school eating occasions. Studies by Hearst, Pasch, & Laska (2011) and He et al. (2012) both explored walking distant from home to neighborhood convenience stores and found positive associations to food and beverage purchases. As distance increased, purchases decreased. Vander Veur et al. (2013) looked more specifically at youth commuting patterns from home to school, of which more than half of students stopped at corner stores in both the morning (57.4%) and in the afternoon (58.5%).

Several pricing interventions have been performed by French and colleagues (French et al., 2001; French, Jeffery, et al., 1997; French, Story, et al., 1997; Jeffery et al., 1994) with both older children and adults. French, Story, et al. (1997) attempted to determine the effects of pricing strategies on fruit and vegetable purchases in high school cafeterias. They made fruit, carrots, and salad in each cafeteria about 50 percent less expensive during the intervention period, and advertised these new prices. During the intervention period fruit sales increased approximately fourfold and carrot sales approximately doubled. Salad sales were not significantly different. With the increased sales resulting from lower prices, sales revenue was not significantly reduced. This study suggests that decreasing the price of fruits and vegetables with minimal promotion may be an effective way to increase sales of these items to high school students, while not negatively affecting revenue. Another study by French et al. (2001) gave comparable results, but with regard to decreasing prices of healthy vending machine items.

Our approach: Empirical Investigations of Children's Behavior

In order to better understand children's food-purchasing behavior, our group has undertaken several empirical investigations of how children respond to differences in price and information in both simulated and actual purchase situations. The following section outlines preliminary results from two of these studies: one lab-based, and one intervention in corner stores.

Study 1: Children's Responses to Price and Warning Labels

Methods

Fifty-eight children aged 8 to 12 were interviewed at various out-of-school care facilities in Edmonton, Alberta, Canada. Each child completed a short questionnaire pertaining to snack food purchases, participated in a purchase experiment, and completed several tasks used to evaluate various aspects of their cognitive development. These tasks included:

- **The Peabody Picture Vocabulary Test (4th edition):** This test assesses the child's receptive vocabulary by asking them to choose which of four pictures best matches each word spoken by the test administrator. This is a standardized measure appropriate for ages 2½ - 90.

- **The Stanford Binet Intelligence Scales:** This is a standardized test that assesses the child's IQ and cognitive abilities. We used the nonverbal scales from this test.

- **The Sort Task:** This test assesses executive functioning (sorting, categorization, behavior planning). The researcher asks the child to use his/her hands to sort shapes that he/she is unable to see. Sorting is done using multiple different features (e.g., shape, size, texture).

- **The Tower of London Task:** This task also measures executive functioning. It assesses the child's working memory and planning ability and uses spatial reasoning. Children move pieces on a game to match a picture, and must do so in a limited number of moves.

- **The Circle Trace Task:** This task is used to measure impulse control (one facet of executive functioning). It requires the child to trace over a circle that is printed on letter-sized paper as slowly as possible.

- **The Stroop Test**: This test asks the child to read words and name colors on a page as quickly as possible. It assesses impulse control and working memory.

The Sort task, Tower of London task, Circle Trace task, and Stroop test values are rescored as a percentage of either the maximum possible score or the maximum score obtained within the sample if there is no limit (the Circle Task and Stroop test), then these values are averaged to generate an overall measure of Executive Functioning. The developmental variables included in the analysis are therefore IQ (from the Stanford Binet task), Verbal Mental Age (from the Peabody Picture Vocabulary Test), and the composite Executive Functioning score.

Choice experiments have been used extensively to explore how adult consumers would respond to products with attributes, or combinations thereof, which do not currently exist in the market place, and differ from other stated preference methods in that they ask participants to choose between alternative bundles of attributes rather than rating or ranking them, making them consistent with random utility theory.[18] Because of the nature of choice experiments, they provide a thorough description of tradeoffs respondents are willing to make between various product attributes, thereby revealing whether or not individuals are sensitive to attribute levels or even to the attributes themselves. For this study, the attributes of interest are fat taxes (represented by a higher price) and warning labels, and the interactions of these attributes with child-specific characteristics.

A 96 choice set efficient design based on a fractional factorial design and some initial (prior) parameter estimates was generated using Ngene. These choice sets were broken down into 8 blocks of 12. Each participant was randomly assigned a block of 12 choice sets, each of which gave the child 2 snack options in addition to a 'neither' option (A, B, or none). Each child was given $2.00 in Canadian coins to keep or use in the task, and real packaged snacks were used in the experiment. Upon completion of the 12 choice sets, one was drawn at random and the transaction actually carried out with the snacks and prices in question – making this a non-hypothetical or incentive compatible choice experiment. The fact that the children were aware that one of their choices would be binding makes them more likely to make choices that reflect their true purchasing behavior. Any of the 4 price levels could be associated with any of the 4 brands, but the warning labels were only ever applied to 2 brands (the original Lay's potato chips and the Cheetos cheese puffs) that are higher in fat than the other two options. All analysis was conducted using the Nlogit 5 statistical software package.

The sample size is 58 children with an average age of 9.9 years old; 70% of the respondents are female.

Figure 1: Traffic light label used in choice experiment.

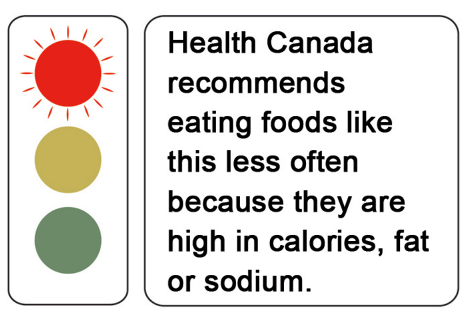

Table 1: Attributes included in purchase experiment

Brand	Price	Warning Label
Original Lay's Potato Chips	$0.75	Yes
Baked Lay's Potato Chips	$1.00	No
Cheetos Cheese Puffs	$1.25	-
Rold Gold Pretzels	$1.75	-

Results

Based on answers to the questionnaire, we found that within our sample, 44% of children receive a weekly allowance. Of those who do receive an allowance, the average weekly amount is $6.46, and 69% of kids say that they sometimes spend this money on food purchases. The majority of the children in this sample (80%) said that their parents sometimes give them money with which to purchase food. Given these numbers, it is entirely appropriate to think of children in this age range as autonomous consumers when it comes to purchasing food. When asked about the types of foods purchased autonomously, the children reported predominantly choosing energy-dense nutrient-poor foods, with candy and potato chips being the most common.

To analyze the choice experiment data, the basic multinomial logit model is first run with only the brands (omitting the pretzels for normalization), price, warning label, and a 'neither' option (the alternative specific constant).

Table 2: Results from the basic multinomial logit regression.

	Coefficient	Standard Error
Price	-0.94646***	0.16632
Baked Lay's	-0.42216***	0.12885
Lay's Classic	0.40862***	0.09961
Cheetos	0.04775	0.10540
Warning label	-0.20064*	0.10425
None	-0.46779**	0.20022
LLF	-659.102	
AIC	2.034	
BIC	2.075	

(***, **, and * indicate statistical significance at 1%, 5%, and 10% respectively)

This basic model indicates that children prefer products with lower prices, and when holding prices constant prefer Lay's classic potato chips to Rold Gold pretzels (omitted as the base case), yet prefer Rold Gold pretzels to Baked Lay's chips. These results also show that children would avoid products with a warning label. Based on these values, we can determine what children are willing to pay for the various attributes by dividing the coefficient for the attribute in question by the negative of the price coefficient. In this sample, children are willing on average to pay $0.45 to avoid Baked Lay's chips (relative to pretzels), $0.43 to get Lay's Classic chips (relative to pretzels), and $0.21 to avoid a product with a warning label.

Next, in order to determine the effects of the development measures with respect to changes in price and the inclusion of a warning label, interaction variables are included in the model. The child-specific cognitive characteristics as well as age and gender are first interacted with price, generating the results shown in Table 3.

Table 3: Results from the multinomial logit regression with price interactions.

	Coefficient	Standard Error
Price	0.164	0.757
Baked Lay's	-0.453***	0.130
Lay's Classic	0.436***	0.102
Cheetos	0.046	0.107
Warning label	-0.216**	0.107
None	-0.738***	0.208
Price*Executive Functioning	-2.635***	0.840
Price*Verbal Mental Age	-1.280	1.147
Price*IQ	1.862**	0.810
Price*female	1.128***	0.175
Price*age	-0.070	0.101
LLF	-609.614	
AIC	1.970	
BIC	2.048	

(***, **, and * indicate statistical significance at 1%, 5%, and 10% respectively)

In addition to providing the same inferences as the basic model, these results also indicate that children with higher executive functioning scores are more price sensitive and children with higher IQs are less price sensitive. It also shows that boys are also more price sensitive than girls in our sample.

The same child-specific characteristics were also interacted with the warning label, but the lack of statistically significant interaction coefficients in this model showed that children with differing cognitive abilities or age/gender do not respond differently to a warning label.

Study 2: Influencing Children's Purchases in Corner Stores

The Coupons for Healthier Options for Minors Purchasing Snacks (CHOMPS) intervention is a USDA-funded pilot project aimed at assessing the potential for kids-only coupons to guide children away from energy-dense nutrient-poor (EDNP) foods towards more healthful snack purchases in non-school environments. Here we discuss the results of work in three convenience stores located near K-8 schools in Somerville, MA. These stores were chosen due to their walking proximity to local schools, which serve racially, ethnically, and economically diverse population.

Methods

The three-step intervention involves a natural observation phase, a "coupon intervention" phase, and an individual assessment phase. Beginning in October of 2014, the CHOMPS project conducted one round of natural observations and the coupon intervention in one store in the Somerville community.

Prior to phase one, the CHOMPS project conducted a series of four focus groups with youth in after-school and summer programs in Somerville, MA during the spring & summer of 2014. Nineteen students, ages 9-15 years old, participated in the discussions, in which we covered information regarding their snacking habits, their shopping habits, and their understanding of coupons. The coupons and poster designs were pilot tested during these sessions, and the students also provided suggestions of stores in which they and their peers shop, which provided a starting point for the CHOMPS projects' potential intervention partners.

During the natural observation phase, researchers used the Kids Purchase Observation Tool (KPOT), developed specifically for this pilot, to collect baseline data about children's existing food purchase behaviors in partner stores. Simultaneously, the Store Assessment (SA) tool was used to gather information about the product offerings in each store. Using the SA data, discount schedules were developed for each store, which included the healthier or unhealthy snack to be discounted each week and the amount of the discount. CHOMPS uses the Institute of Medicine's (IOM) guidelines for competitive foods in schools as the definition for the intervention's Tier A healthier snacks, but due to limited offerings of snacks in certain stores in the pilot, we expanded those guidelines to include a Tier B that allows for slightly higher calorie and sodium content. As the goal of the CHOMPS pilot is to steer children towards healthier analogues of competing snacks, the slightly higher standards for Tier B snacks still works to support that outcome. Additionally, the project has an interest in using this pilot to gauge children's price response to discounts on less healthy snacks, as well, which is the motivation behind occasionally discounting those items.

The coupon intervention phase provided kids-only coupons of varying discounts on both healthier snacks and less healthy alternatives. The discount amount on the coupons was based on focus group findings and previous research outlined above in Study 1 above. The coupons were provided in a rotation of two per week – one offering Monday - Wednesday and another Thursday – Friday.

Preliminary Evaluation Results

Preliminary data presented here focuses on the observed purchase patterns of children in the first three convenience stores, and their responses to the coupon intervention in these stores. Totaling data from all stores, we recorded over 2,500 purchase observations equaling approximately $5,100. Of the students observed shopping in all stores, there was an almost equal split between males and females, and about 57% of shoppers were estimated to be 10-12 years of age (Table 1).

Table 1. Shopper Demographics, % Age and Sex

	Approximate Age Category (years)		
n=2,525	less than 9	10-12	13 or older
Male	25.42	56.16	16.73
Female	21.04	57.66	20.91

% may not equal 100 due to inability to estimate sex or age, and exclusion of purchases including grocery items and those items unable to code.

During the coupon intervention, 1,640 observations were recorded. About 2.6% of those purchases utilized a coupon for a targeted item and 3.6% for a competing item. The most popular discounted items were Doritos with 18 coupons used and fresh fruit (including both sliced and whole) with 16 coupons used. When targeted products were being discounted, children spent an average of $0.40 more per visit, as compared to the natural observation phase (Table 3). Children during the natural observation phase were observed purchasing slightly more items per visit (2.3 items) than during the targeted item discount phase (2.0 items), which may indicate that the value of the coupon allowed children to purchase slightly more expensive but healthier products (Table 2). More generally, children were observed purchasing a range of items, but the majority of them were unhealthy snacks (Table 3). Changes in average nutrient intakes in different phases of the intervention are shown in Table 4.

Table 2. Breakdown of Item Purchases as % of Total, by Discount Type

	No Discount (n=2,181)**	Discount on Targeted Item (n=2,822)**	Discount on Competing Item (n=1,319)**
Chips	37.14	37.1	35.48
Candy	18.43	13.68	18.35
Drink	16.6	18.92	16.68
Packaged baked goods	14.67	7.62	15.01
Chocolate	6.69	4.61	5.69
Fruit snacks	3.9	1.95	2.81
Granola bars	0.41	0.43	0
Ice cream	0.18	5.28	1.59
Sandwich	0.41	1.45	0.08
Nuts & seeds	0.41	1.67	0.38
Fruit or vegetable	0.32	3.05	0.99
Other food*	0.14	0.46	0.15

*Other foods includes pickles, meat sticks, assorted breakfast deli items.

**Column totals may not equal 100%, due to exclusion of groceries & items unable to code.

Table 3. Purchase Pattern Pre- and Post-coupon Intervention, by Discount Type^^

	Before coupons (n=885)	Targeted item discount (n=1,109)	Competing item discount (n=531)	X^2	0 v. 1	0 v. 2	1 v. 2
Individual purchase total^	$1.86 ($1.42)	$2.24 ($1.92)	$1.83 ($1.38)	***	***	ns	***
Items per purchase^	2.28 (1.34)	2.00 (1.38)	2.21 (1.37)	***	***	ns	***
Targeted items^ (for all purchase events)	0.02 (0.13)	0.05 (0.23)	0.02 (0.15)	***	***	ns	***
Total targeted items purchased~	17	91	16	-	-	-	-
Number of coupons used (% of purchases)	-	29 (2.61%)	19 (3.58%)	-	-	-	-

^Data represented in mean (standard deviation) unless otherwise indicated.

^^Excludes purchases made by adults and those including grocery items or items were unable to be identified.

*p-value <0.05, **p-value <0.01, ***p-value <0.001

~Targeted items include those that were identified and discounted with CHOMPS coupons. The total includes any instance in which targeted items were purchased, not exclusively during a discount period.

Table 4. Average Nutrient Intake for Select Nutrients, Dependent on Coupon Presence^							
	No Coupon (n=885)	Targeted Item Discounted (n=1,109)	Competing Item Discounted (n=531)	X^2	0 v. 1	0 v. 2	1 v. 2
Calories (kcal)	436.47 (359.96)	404.20 (393.79)	418.52 (372.03)	**	ns	ns	ns
Calories from total fat (%)	34.90 (20.93)	30.75 (23.96)	33.19 (21.43)	**	**	ns	ns
Calories from sat. fat (%)	9.09 (7.66)	7.41 (7.18)	9.23 (8.04)	**	**	ns	**
Calories from sugar (%)	23.3(24.79)	16.95 (25.36)	21.26 (23.94)	ns	**	ns	**
Fiber (g)	2.09 (2.65)	2.63 (3.34)	2.05 (2.55)	**	**	ns	**
Cholesterol (mg)	4.24 (16.51)	10.67 (60.56)	2.97 (6.37)	**	**	ns	**
Sodium (mg)	476.07 (537.87)	558.29 (846.74)	442.41 (518.29)	**	**	ns	**
Vitamin C (%DV)	7.82 (27.92)	12.98 (45.83)	7.01 (31.07)	**	**	ns	**
Vitamin A (%DV)	2.52 (7.59)	4.67 (15.72)	2.32 (9.9)	**	**	ns	**
Calcium (%DV)	4.61 (7.94)	5.29 (10.79)	4.43 (7.11)	**	ns	ns	ns

*p-value significant when <0.05, **p-value significant when <0.01
^Data presented as mean (standard error) in the units indicated, unless otherwise noted. Drinks were not included in the nutrition analysis. Also excluded are purchases made by adults and those including grocery items or items were unable to be identified.
%DV = percent Daily Value

Discussion

The goal of Study 1 was to determine whether food price interventions and warning labels might be effective in encouraging children to choose healthier snack foods, and whether this effectiveness would differ based on the level of cognitive development among children. In order to address this, we conducted choice experiments, cognitive assessment tasks, and food questionnaires with Canadian children aged 8 to 12. The results suggest that both taxes and warning labels could be effective tools in combating childhood obesity, but that the effect of taxes would likely not be uniform across children with different cognitive abilities, while labels appear to have a more uniform effect.

Our data set, although not overly large, is considerably unique and thorough in the sense that it combines various facets of cognitive development (verbal mental age, IQ, and executive functioning) with information about decision-making. Previous studies either assume homogeneity among respondents or only go so far as to distinguish them by age, gender, or in Harbaugh et al's (2001) case, a math test score. This study, therefore, provides novel insight into how cognitive development affects choice behavior.

The objective of the lab study was to determine the potential effectiveness of using a price or label mechanism to help children make healthier snack food choices. The price response varied based on executive functioning and IQ, meaning that if a price mechanism was the recommended policy, its effects would not impact children's choices homogeneously. The label mechanism, on the other hand, did not appear to vary by child by any significant degree. Overall, this study has provided evidence as to how children would respond to two types of diet-improving policy instruments; policy makers can use this information to determine which would better suit their individual situation in order to promote healthy choices among their young constituents.

In study 2, we present results that show that kids-only coupons could play a role in shifting children's snacking behavior. Chips, candy, and drinks were found to be the most frequently purchased items. On average, children spent significantly more money and purchased slightly fewer items when targeted items were discounted, as opposed to either no discount or a competing item discount. This may indicate that the coupons for targeted products were allowing children to spend more on healthier snacks without the barrier of a higher price. Additionally, a significantly higher number of targeted items were purchased during targeted item discount days. While this difference is slight, it may indicate that coupons for healthier snacks could increase children's interest in purchasing those items. When targeted coupons were present in the stores, the nutritional content of purchases were significantly better in almost all cases except for total calories and calcium.

Public Health Implications

It is in the best interest of both individuals and society if we can improve children's diets. One important component of this is to help children make healthier food choices for themselves when they are not with a parent or guardian. Our experimental work suggests that children are price sensitive and could be persuaded to make healthier choices by making the less healthy options more expensive. This approach needs to be balanced against the overall affordability of food offerings to children, however, as autonomous snack purchases may play a non-trivial role in meeting basic caloric intake needs in some children from food insecure households. Therefore this could be an effective policy tool in situations where healthy options are available at a low price, for example in a school cafeteria. Our pilot intervention work has shown that use of a kids-only coupon to deliver these discounts may be a feasible approach for achieving at least moderate improvements in snack choice.

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