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Eating Better for Less: A National Discount Program for Healthy Food Purchases in South Africa

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Abstract

Background—Improving diet quality is a key health promotion strategy. The HealthyFood program provides up to a 25% discount on selected food items to about 260,000 households across South Africa.

Objectives—Examine whether reducing prices for healthy food purchases leads to changes in self-reported measures of food consumption and weight status.

Methods—Repeated surveys of about 350,000 HealthyFood participants and nonparticipants.

Results—Program participation is associated with more consumption of fruits/vegetables and wholegrain foods, and less consumption of high sugar/salt foods, fried foods, processed meats, and fast-food. There is no strong evidence that participation reduces obesity.

Conclusions—A substantial price intervention might be effective in improving diets.

Introduction

Improving diet quality is a key health promotion strategy. Released in June 2011, the National Prevention Strategy: America's Plan for Better Health and Wellness, considers healthy eating a priority area and calls for increased access to affordable healthy foods in communities (National Prevention Council, 2011). A hotly debated topic is the role of food prices: Nutrient-rich foods including fruits and vegetables, have become more expensive relative to calorie-dense, nutrient-poor foods, and some researchers believe that the increasing price differential contributes to obesity and sociodemographic health disparities (Drewnowski and Specter, 2004; Drewnowski and Darmon, 2005; Monsivais and Drewnowski, 2007; Drewnowski, 2010).

It is not known whether a price discount on fruits, vegetables, or other healthy foods can meaningfully change dietary behaviors in the population, let alone reduce the prevalence of obesity. The Food, Conservation, and Energy Act of 2008 (Public Law 6124, also known as the Farm Bill, Senate and House of Representatives, 2008) requires the U.S. Department of

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Agriculture (USDA) to field a pilot project - the Healthy Incentives Pilot. It is expected to enroll individuals eligible for the Supplemental Food Assistance Program in one Massachusetts county, and offer them a 30% cash back on healthy food purchases during 2012 (USDA, 2011). This pilot project will not be able to report results until 2013.

However, a much larger discount program has been operating nationwide since 2009– but in South Africa. The program is known as the "HealthyFood" benefit and is available to members of Discovery, South Africa's largest private health insurance company. Under the HealthyFood benefit, members receive up to 25% cash back on healthy food purchases. To our knowledge, Discovery's HealthyFood program is the only price intervention to promote healthy diet that is fully funded by a private firm on an ongoing basis, rather than as a short-term study project. The program may also be unique worldwide due to its size (about 260,000 households are enrolled) and geographic scope (nationwide across South Africa with about 800 participating supermarkets). This paper reports the first results on this discount program based on repeated surveys on members of Discovery. We examine whether a discount on healthy food purchases in the HealthyFood program is associated with self-reported changes in dietary behaviors and weight status.

Methods

The HealthyFood Program

The HealthyFood program was launched in February 2009 by the South African health and life insurance company Discovery, as part of Discovery's health promotion program Vitality. Vitality is a supplemental program to augment Discovery's health insurance plan. Vitality membership is a pre-requisite for the HealthyFood benefit. Everyone enrolled in Vitality is automatically eligible for the benefit, but one needs to activate it either online or with a phone call. Upon activation of the benefit, Vitality members immediately receive a 10% discount on healthy food purchases and become eligible for a 25% discount as soon as the policy holder and spouse, if applicable, have both completed an online health risk assessment questionnaire. Currently about 260,000 households from all 9 provinces in South Africa are enrolled in the HealthyFood benefit. The discount on healthy food items is available at about 800 supermarkets of the Pick n Pay Group, and is operationalized as a cash-back program with a maximum monthly refund of 4000 rands (about 500 US dollars) for a family and 2000 rands for single members.

A panel consisting of nutritionists, physicians and behavioral scientists has systematically reviewed food items in six categories – fruit and vegetables, carbohydrate-rich foods, protein-rich foods, dairy and dairy alternatives, legumes and lentils, and oils, spreads, nuts and seeds – to determine which are included in the HealthyFood catalogue. Selection is based on South African, U.S., and other international dietary guidelines on healthy nutrition (Vorster et al., 2001; HHS and USDA, 2005) and is continuously updated. A complete list of eligible items can be found on Discovery's website (http://www.discovery.co.za/portal/loggedout-individual/healthy-food-catalogue), and is also distributed as brochures to program participants.

The Health Risk Assessment Survey

A health risk assessment (HRA) is a standardized questionnaire to elicit information about a respondent's health status and health-related habits and risks (Philyaw Perez et al., 2009). Discovery regularly fields a HRA survey on its Vitality members. Participation is voluntary, and there is no penalty associated with nonparticipation, but in order to receive (or keep) a 25% discount on healthy food purchases, at least one survey needs to be completed on a rolling 12-month basis. During the study period from February 2009 to November 2011, a

total of 351,319 (35%) Vitality members took the survey. On average, each individual took the survey twice. About 58% of the survey respondents activated the benefit, and among them 44% met the HRA completion requirement and thus received a 25% rebate rate. The average duration in a 10% discount (i.e., time between benefit activation and completion of the first HRA) among HealthyFood participants is 10.9 months, and that in the 25% discount (i.e., time between completion of the first HRA and end of the study period) is 14.3 months.

Unlike more complete assessments of diet such as a food-frequency questionnaire or 24-hour dietary recall, question items on dietary behaviors in the HRA are very limited. The specific items include:

- "How many servings of vegetables and fruit do you eat on average in a day?";
- "How often do you eat wholegrain products (such as whole grain bread, cereal, oats, barley, millet, whole corn, whole grain crackers, brown rice or whole wheat pasta)? –Never, less than three servings a day, or three or more servings a day";
- "How salty do you like your food? –Not salted, lightly salted, or very salty";
- and "How often do you eat any of the following? (a) Cakes, cookies, pastries, muffins, chocolate, regular ice cream or sweets – Never, sometimes, often; (b) Fried foods like chips, fried chicken or fritters – Never or occasionally, weekly, or daily; (c) Processed meats like viennas and other deli meats – Never or occasionally, weekly, or daily; and (d) Fast-food Never or occasionally, weekly, or daily."

The HRA also includes a question on body weight and height.

Variable Construction

The dependent variables in the multivariate analysis include:

- number of daily servings of fruit and vegetables;
- dichotomous variable for eating three or more servings of wholegrain foods per day;
- dichotomous variable for often consuming foods high in sugar (with zero indicating "never" or "sometimes");
- four dichotomous variables for "daily or "weekly" consumption of (a) foods high in salt, (b) fried foods, (c) processed meats, and (d) fast-food, respectively (with zero indicating "never or occasionally");
- continuous variable for body mass index (BMI, i.e., ratio of weight in kilograms to height in square meters) calculated from self-reported height and weight;
- and two dichotomous variables for overweight (BMI ≥25) and obesity (BMI ≥30), respectively.

The main explanatory variables are two dichotomous variables for receiving a 10% or a 25% discount (mutually exclusive) at time of the survey. Individuals who had not activated the benefit and thus had not received any discount prior to the survey date have a zero value on both variables.

To analyze whether duration in the program affects outcomes, we construct two interactions between the number of months in a specific discount policy (either 10% or 25%) and the corresponding dichotomous variable for receiving that discount rate (either 10% or 25%) at time of the survey.

Other explanatory variables include:

- dichotomous variable for male (only in random-effects models);
- age in years at the time of survey;
- and the number of chronic conditions that a respondent ever had (0 – 19) prior to the survey.

There are 693,373 observations in the HRA survey data, but 133,539 (19%) have missing values in one or more of the constructed variables, such as dietary behaviors and BMI. Our main analysis as reported here uses only cases with complete data. For sensitivity analysis, we reanalyze the data after missing values are imputed using the MI procedures in STATA 12 (StataCorp, College Station, TX).

Statistical Models

The associations between discounts and daily servings of fruits/vegetables or BMI are estimated using linear regressions with individual random effects. Dichotomous dependent variables are analyzed using random-effects logistic regressions. For each type of regression (i.e., random-effects linear and random-effects logistic regression), one main effects model and one interaction model are estimated. Standard errors are estimated using the Eicker-Huber-White sandwich estimator. All statistical analyses are conducted in STATA 12.

As a sensitivity analysis, we reanalyze the data using individual fixed-effects models (i.e., fixed-effects linear and conditional logistic regressions). In fixed-effects linear models, identification requires multiple observations per individual, but 49% of the sample was surveyed only once. For dichotomous variables, identification using conditional logistic regressions is even more restricted to those "switchers" whose outcome measure changed between surveys. That is an unusual group of people and, depending on the outcome variables, accounts for merely 3% to 15% of the total sample. Due to the sample restriction imposed by individual fixed-effects models, we consider them only for sensitivity analysis.

Results

Table 1 shows the descriptive statistics of the HRA survey participants. On average, they consumed 3.5 servings of fruits and vegetables daily. Twenty five percent of them had three or more servings of wholegrain foods per day, and 12%, 6%, 29%, 22%, and 28% had foods high in sugar, foods high in salt, fried foods, processed meats, and fast-food on a regular basis, respectively. Prevalence of overweight and obesity were 55% and 20%, respectively.

Table 2 reports the results of multivariate analysis on dietary behaviors. The estimated main effects on dietary behaviors of a 10% or 25% discount on healthy food purchases, compared to no discount, are all significant at $P < 0.0001$ and in the expected directions. The 25% discount is always associated with a larger effect than the 10% discount, although the difference between a 10% and 25% discount is not always significant at $P < 0.05$.

In Table 2, a 10% and 25% discount on healthy food purchases is associated with an increase in daily fruits and vegetables consumption by 0.38 (95% CI: 0.37 – 0.39) and 0.64 (95% CI: 0.62 – 0.65) servings, respectively. Individuals receiving a 10% and 25% discount are significantly more likely to have three or more servings of wholegrain foods in a daily basis with an odds ratio (OR) of 2.05 (95% CI: 1.97 – 2.13) and 2.96 (95% CI: 2.84 – 3.08) respectively, but less likely to regularly have foods high in sugar with an OR of 0.73 (95% CI: 0.69 – 0.76) and 0.35 (95% CI: 0.34 – 0.37), foods high in salt with an OR of 0.59 (95% CI: 0.55 – 0.62) and 0.26 (95% CI: 0.25 – 0.28), fried foods with an OR of 0.53 (95% CI: 0.50 – 0.55) and 0.26 (95% CI: 0.25 – 0.27), processed meats with an OR of 0.71 (95% CI:

0.68 – 0.74) and 0.33 (95% CI: 0.31 – 0.34), and fast-food with an OR of 0.54 (95% CI: 0.51 – 0.56) and 0.28 (95% CI: 0.27 – 0.29), respectively.

Table 2 also shows the results of multivariate analysis on weight status. There is no strong evidence that participation in the HealthyFood program reduces obesity rates or lower BMI. The only statistically significant relationship is between a 25% discount on healthy food purchases and lower obesity with an OR of 0.86 (95% CI: 0.81 – 0.91). This would be a substantial effect, but it is not replicated in other measures that should parallel obesity prevalence (e.g., BMI or overweight rates).

Our second set of models allows for an interaction between duration in the program and discount. Time in the program does not appear to play a large role and the estimated coefficients are relatively small (results not shown in the tables). Among models with dietary intake as the dependent variable, the coefficients of the interaction term are always statistically significant and in the same direction as their corresponding main effect, which might indicate a slow habit-forming process.

In the sensitivity analysis, we perform individual fixed-effects models. While the numerical estimates are not identical to the random-effects models (which should not be surprising as the fixed-effects models limit the analysis to a small subset of the sample), magnitudes are similar. The substantive relationship between the discount policy and dietary behaviors or weight status remains unaltered (results not shown in the tables).

As a final sensitivity analysis, we reanalyze the data after missing values are imputed using multiple imputations (Rubin, 1987). It produces similar results as the complete data (results not shown in the tables).

Discussion

This study examines whether discounts on nutritionally more desirable foods predict dietary behaviors and weight status. The HealthyFood program started in February 2009 and has since enrolled about 260,000 households who are eligible for up to 25% discount on healthier food choices in about 800 supermarkets across South Africa. The data were collected through repeated online health risk assessments. HealthyFood Program participation is associated with more consumption of fruit/vegetables and wholegrain foods, and less consumption of high sugar/salt foods, fried foods, processed meats, and fast-food. There is no strong evidence that participation is associated with lower BMI or obesity prevention.

Poor diet quality and physical inactivity are among the most pressing health challenges in the U.S., and are associated with major causes of morbidity and mortality, including cardiovascular disease, hypertension, type 2 diabetes, and some types of cancer (USDA and HHS, 2010). Since 1980, to increase consumption of nutrient-dense foods and reduce consumption of energy-dense foods has been a major theme of Federal dietary guidelines (USDA and HHS, 2010). However, using National Health and Nutrition Examination Survey 2001–2004 data, it was found that a large majority of the U.S. population fails to meet those guidelines, with insufficient consumption of nutrient-rich foods and excessive discretionary calorie intake (Smith et al., 2010). There is much interest in the role of prices and financial incentives to encourage healthier diets, but little data is available and none come from interventions in a large population. This paper provides some initial results from a promising intervention, although we need to take the findings with some reservation due to the limitations of the study.

The first set of limitations concerns the measures. HRA surveys do not comprehensively capture diet, but only have some general questions on eating behaviors. Items are not specific in relation to type of food, unit of measurement, and frequency of intake, and respondents are provided with limited instructions on how to frame their responses. For example, the survey did not tell people how to assess a serving size for fruits/vegetables and wholegrain foods. Both diets and height/weight were self-reported and thus subject to measurement errors.

For an online survey, the response rate of the HRA (35%) is very good, and actually not very different from telephone household surveys in the U.S., including the California Health Interview Surveys (CHIS) and the Behavioral Risk Factor Surveillance System (BRFSS) whose response rates have been falling (CHIS, 2011; BRFSS, 2011). Nevertheless, our results are based on a minority of individuals eligible for the HealthyFood benefit.

Arguably, the biggest limitation of the study stems from potential selection biases into the HealthyFood benefit. While all Vitality members were eligible to participate, 74% of families did not activate the benefit, and among the participants, 56% did not complete the HRA to become eligible for the full 25% discount. If the enrollees were those who could potentially gain the most from the program in healthier diet and weight loss, our estimates would overstate the true effects in the population and thus should be interpreted as an upper bound of what can be achieved with a price intervention.

While the HealthyFood program addresses a hot policy question worldwide, its generalizability to other populations remains uncertain. Employers or health insurers in other countries may not be as committed to improving diets and reducing obesity through food subsidies. In the U.S., food subsidy programs funded by the federal government are considered an entitlement program that often carries negative political implications, but the U.S. is the only place where a similar discount program will be piloted soon.

While not conclusive, this study serves as a preliminary analysis of an ongoing effort to quantify the role of prices on dietary behaviors by evaluating the HealthyFood program. So far, subsidizing healthy food purchases among health plan members appears to be a promising intervention. As a next step, we will obtain scanner data from participating supermarkets that can be matched to plan participants and conduct a longitudinal analysis. This may provide a better understanding of how prices affect food purchases.

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Table 1

Descriptive statistics of the health risk assessment survey participants

Variable	Attribute	Mean (SD)
Dietary intake		
Daily servings of fruits and vegetables	Count	3.48 (1.81)
Having ≧ 3 servings of wholegrain foods daily	Dichotomous	0.25 (0.41)
Often having foods high in sugar	Dichotomous	0.12 (0.31)
Having foods high in salt regularly	Dichotomous	0.06 (0.23)
Having fried foods regularly	Dichotomous	0.29 (0.43)
Having processed meats regularly	Dichotomous	0.22 (0.40)
Having fast-food regularly	Dichotomous	0.28 (0.43)
Weight status		
Body mass index (BMI)	Continuous	26.33 (5.08)
Overweight (BMI ≥25)	Dichotomous	0.55 (0.48)
Obesity (BMI ≥30)	Dichotomous	0.20 (0.39)
Gender		
Male	Dichotomous	0.48 (0.50)
Age		
Age in years	Continuous	37.18 (10.67)
Medical history		
Number of chronic conditions a survey respondent ever had	Count	0.78 (1.02)

Table 2

Estimated effects on dietary behaviors and weight status of a 10% or 25% discount on healthy food purchases

Dependent variable	Attribute	Model	Dichotomous variable for having 10% discount on healthy food purchases at time of survey	Dichotomous variable for having 25% discount on healthy food purchases at time of survey
Dietary Behavior				
Daily servings of fruits and vegetables	Count	RE Linear	0.382 (0.006) ***	0.636 (0.006) ***
Having ≧ 3 servings of wholegrain foods daily	Dichotomous	RE Logit	2.048 (0.040) ***	2.958 (0.059) ***
Often having foods high in sugar	Dichotomous	RE Logit	0.725 (0.016) ***	0.352 (0.008) ***
Having foods high in salt regularly	Dichotomous	RE Logit	0.582 (0.018) ***	0.264 (0.009) ***
Having fried foods regularly	Dichotomous	RE Logit	0.526 (0.012) ***	0.257 (0.006) ***
Having processed meats regularly	Dichotomous	RE Logit	0.706 (0.016) ***	0.327 (0.008) ***
Having fast-food regularly	Dichotomous	RE Logit	0.536 (0.013) ***	0.278 (0.007) ***
Weight status				
Body mass index (BMI)	Continuous	RE Linear	0.007 (0.011)	0.008 (0.010)
Overweight (BMI ≥ 25)	Dichotomous	RE Logit	0.994 (0.022)	1.006 (0.015)
Obesity (BMI ≥ 30)	Dichotomous	RE Logit	0.971 (0.026)	0.856 (0.025) ***

Note: (1) "RE Linear" denotes linear regression with individual random effects, and "RE Logit" denotes random-effects logistic regression. (2) Odds ratio is reported for logistic regressions. (3) Eicker-Huber-White sandwich estimator is used to calculate standard errors reported in parenthesis. (4)

* P < 0.05,

** P < 0.01,

*** P < 0.0001