Social Science & Medicine 147 (2015) 80–88

Contents lists available at ScienceDirect

Social Science & Medicine

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

Nationwide expansion of a financial incentive program on fruit and vegetable purchases among Supplemental Nutrition Assistance Program participants: A cost-effectiveness analysis

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ARTICLE INFO

Article history:
Received 2 June 2015
Received in revised form
14 September 2015
Accepted 25 September 2015
Available online 30 September 2015

Keywords:
United States
Fruit
Vegetable
Diet
Financial incentive
Supplemental Nutrition Assistance Program
Cost-effectiveness analysis

ABSTRACT

High prices remain a formidable barrier for many people, especially those of low socioeconomic status, to adopt a healthier diet. The Food, Conservation, and Energy Act of 2008 mandated the U.S. Department of Agriculture (USDA) to conduct a pilot study to assess the impact of making fruits and vegetables more affordable for households in the Supplemental Nutrition Assistance Program (SNAP). Based on the USDA final report of the Healthy Incentives Pilot (HIP), a large-scale randomized trial in 2011–2012 that provided 30% rebate on targeted fruits and vegetables to 7500 study participants enrolled in the SNAP, we constructed a decision model to evaluate the cost-effectiveness of an expansion of the HIP to all SNAP households nationwide. The estimated life-time per capita costs of the HIP to the Federal government is $1323 in 2012 U.S. dollars, and the average gains in quality-adjusted life expectancy to a SNAP participant is 0.082 quality-adjusted life year (QALY), resulting in an incremental cost-effectiveness ratio (ICER) of $16,172 per QALY gained. Sensitivity analysis using Monte Carlo simulations indicates a 94.4% and 99.6% probability that the estimated ICER would be lower than the cost-effective threshold of $50,000 and $100,000 per QALY gained, respectively. Moreover, the estimated ICER of the HIP expansion tends to be competitive in comparison to other interventions that aimed at promoting fruit/vegetable intake among adult population. Findings from this study suggest that a nationwide expansion of the HIP is likely to nudge SNAP households towards purchasing and consuming more targeted fruits and vegetables. However, diet behavior modification is proportional to price change. When people's actual eating behaviors and what dietary guidelines recommend differ by several folds, even a 30% rebate closes just a small fraction of that gap and has limited beneficial impact on participants' weight management, disease prevention, and health-related quality of life.

1. Introduction

Adequate fruit and vegetable intake contributes to weight management and reduces the risk of various chronic illnesses including heart disease, stroke, hypertension, diabetes, and some types of cancers (American Institute for Cancer Research, 2007; Fung et al., 2008; He et al., 2006; Hu, 2003; Montonen et al., 2004; Rolls et al., 2004; Tohill et al., 2004). Since 1980, a major theme of the U.S. Federal dietary guidelines has been to increase consumption of nutrient-rich foods and reduce consumption of energy-dense foods, but without much success (U.S. Department of Agriculture [USDA] and U.S. Department of Health and Human Services [HHS], 2010; Fryar et al., 2014). A large majority of the U.S. population fails to meet these guidelines, with insufficient consumption of nutrient-rich foods and excessive discretionary calorie intake, especially from added sugars and solid fats (Krebs-Smith et al., 2010).

High prices remain a formidable barrier for many people, especially those of low socioeconomic status, to adopt a healthier diet (Darmon and Drewnowski, 2008). A survey of major supermarket chains in Seattle found foods in the bottom quintile of energy density cost on average $18.16 per 1000 kcal, compared with $1.76 per 1000 kcal for foods in the top quintile (Monsivais and Drewnowski, 2007). The large price differential between nutrient-rich, low-energy-dense foods such as fruits and vegetables and nutrient-poor, energy-dense foods might contribute to poor

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http://dx.doi.org/10.1016/j.socscimed.2015.09.032
0277-9536/

diet quality and growing health disparities (Drewnowski, 2010; Drewnowski and Darmon, 2005; Drewnowski and Specter, 2004).

People respond to prices. A meta-analysis of U.S.-based observational price elasticity studies found a 1% decrease in price to be associated with an increase in fruit purchases by 0.70% and vegetable purchases by 0.58% (Andreyeva et al., 2010). "Fat" or "soda" taxes are one possible tool to lower the consumption of nutritionally less desirable foods, but evidence remains limited on whether such taxes will increase the consumption of healthy foods such as fruits and vegetables as well through substitution and income effect (Sturm et al., 2013). Proposals on "fat" and "soda" taxes have raised much contention and so far been mostly unsuccessful in the U.S. (Kim and Kawachi, 2006). The opposite approach is to reduce the costs of healthy foods. A recent systematic review of healthy diet interventions that used financial incentives found that subsidies increased the purchase and consumption of promoted products. However, these interventions tended to be small in scale and short in durations (An, 2013). It is unclear whether and how those interventions would be scaled to serve large populations and sustain in the long term.

Administered by the USDA, the Supplemental Nutrition Assistance Program (SNAP), formerly known as the Food Stamps, is by far the largest federal aid nutrition program that provides food-purchasing assistance for low-income Americans nationwide. In 2014, SNAP benefits cost $70 billion and supplied over 46.5 million participants with an average of $125 per person per month in food assistance (USDA, 2015). Since its existence, the core goal of SNAP has been to alleviate hunger and malnutrition by increasing food-purchasing power among low-income households rather than promoting healthy diet (U.S. Senate and House of Representatives (2004)). As a result, SNAP households may use their benefits to purchase soft drinks, candy, cookies and cakes in addition to fruits and vegetables (Leung et al., 2012).

Challenged by the sweeping obesity epidemic over the past few decades partly resulted from poor diet quality, the Food, Conservation, and Energy Act of 2008 mandated the USDA to conduct a pilot study that aimed to assess the impact of making fruits and vegetables more affordable for SNAP households (U.S. Senate and House of Representatives, 2008). The Healthy Incentives Pilot (HIP) was implemented in Hampden County, Massachusetts from November 2011 to December 2012 (Bartlett et al., 2014). SNAP household heads in Hampden County were on average 43 years of age. Household monthly gross income averaged $806. A majority of SNAP households received some forms of unearned income from Supplemental Security Income, Social Security, Temporary Assistance to Needy Families, unemployment compensation, and others. The average monthly SNAP benefit was $258. The HIP adopted a randomized study design, in which 7500 out of the 55,095 SNAP households countywide were randomly assigned to participate in the HIP, while the remaining households continued to receive SNAP benefits as usual. The HIP participating households received on their SNAP Electronic Benefit Transfer (EBT) card an incentive of 30 cents for every dollar of SNAP benefits that they spent in participating retailers on targeted fruits and vegetables, including fresh, canned, frozen, and dried fruits and vegetables without added sugars, fats, oils or salt, but excluding white potatoes, mature legumes, and 100% fruit juice. The monthly incentive was capped at $60 per household mainly to prevent misuse. Few households ever reached this limit, as the average household monthly incentive earned was less than $4. A random subsample of approximately 5000 households, equally divided between the HIP participating and non-participating groups, was selected to participate in data collection. In September 2014, the USDA issued its final evaluation report that comprehensively documented findings from this pilot program, and projected the cost of expansion to all SNAP households across the nation (Bartlett et al., 2014). Program participation was found to significantly increase daily consumption of targeted fruits and vegetables among HIP incentive recipients. HIP participants generally had positive attitudes toward fruits and vegetables and did not report overwhelming barriers to their consumption. A majority of participating retailers, including supermarkets, superstores, grocery stores, convenience stores, and farmers markets, reported that they were somewhat or very satisfied with how HIP worked in their stores. Dependent upon evaluation outcomes, the pilot program may be integrated into SNAP and adopted nationwide.

The objective of this study is to assess the cost-effectiveness of a nationwide expansion of the financial incentive program piloted by the USDA. It aims to answer three questions: What are the life-time per capita costs of the program to the Federal government and average gains in quality-adjusted life expectancy to a SNAP participant? Do the gains justify the costs based on predetermined thresholds? How robust are the modeling results to changes in variable values and distributions? Findings of this study will be informative to policy makers in determining a nationwide adoption of the financial incentive program as part of the SNAP, and comparing its cost-effectiveness portfolio to other competing programs.

2. Methods

2.1. Data

2.1.1. Program effectiveness

The USDA final evaluation report documented program participation to increase daily consumption of targeted fruits and vegetables by 0.48 servings (95% confidence interval [CI] = 0.26, 0.69) among HIP incentive recipients 16 years of age and above (Bartlett et al., 2014).

2.1.2. Costs

The cost estimates of a nationwide expansion of the HIP came from the USDA final evaluation report, which consisted of two parts – a one-time (nonrecurring) implementation cost and an annual cost of incentive payments (Bartlett et al., 2014). Nationwide one-time implementation cost, totaling $89,776,395 or about $5 per SNAP household, was estimated based on pilot implementation expenses and input from industry experts, including managing the implementation of the HIP within a state, modifying EBT and other systems/terminals for HIP transactions, and training SNAP staff and retailers. HIP incentive payments to SNAP households will be an ongoing expense and by far the largest cost of a nationwide expansion of the HIP to the Federal government. The HIP final evaluation report determined $3.65 per SNAP household per month to be an adequate indicator of incentive payment for extrapolating to a nationwide expansion of the HIP. This payment amount captured the monthly average incentive earned per household in the pilot study from March to October 2012, but excluded the periods of phase-in and phase-out of incentives. In the decision model, we assumed a nationwide one-time implementation cost of $5 per SNAP household incurred within the first year and an annual cost of incentive payments of $44 ($3.65 per month by 12 months) per SNAP household starting from the first year. All costs were in 2012 U.S. dollars.

2.1.3. Mortality

Consistent evidence links increased fruit and vegetable consumption to reduced mortality rate. A recent meta-analysis of 16 prospective cohort studies, documenting a total of 56,423 deaths among 833,234 participants over follow-up periods ranging from