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Economic evaluation of price discounts and skill-building strategies on purchase and consumption of healthy food and beverages: The SHELf randomized controlled trial☆

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ABSTRACT

Objective: Pricing strategies are a promising approach for promoting healthier dietary choices. However, robust evidence of the cost-effectiveness of pricing manipulations on dietary behaviour is limited. We aimed to assess the cost-effectiveness of a 20% price reduction on fruits and vegetables and a combined skills-based behaviour change and price reduction intervention.

Design and methods: Cost-effectiveness analysis from a societal perspective was undertaken for the randomized controlled trial Supermarket Healthy Eating for Life (SHELf). Female shoppers in Melbourne, Australia were randomized to: (1) skill-building (n = 160); (2) price reductions (n = 161); (3) combined skill-building and price reduction (n = 161); or (4) control group (n = 161). The intervention was implemented for three months followed by a six month follow-up. Costs were measured in 2012 Australian dollars. Fruit and vegetable purchasing and consumption were measured in grams/week.

Results: At three months, compared to control participants, price reduction participants increased vegetable purchases by 233 g/week (95% CI 4 to 462, p = 0.046) and fruit purchases by 364 g/week (95% CI 95 to 633, p = 0.008). Participants in the combined group purchased 280 g/week more fruits (95% CI 27 to 533, p = 0.03) than participants in the control group. Increases were not maintained six-month post intervention. No effect was noticed in the skill-building group. Compared to the control group, the price reduction intervention cost an additional A$2.3 per increased serving of vegetables purchased per week or an additional A$3 per increased serving of fruit purchased per week. The combined intervention cost an additional A$12 per increased serving of fruit purchased per week compared to the control group.

Conclusions: A 20% discount on fruits and vegetables was effective in promoting overall fruit and vegetable purchases during the period the discount was active and may be cost-effective. The price discount program gave better value for money than the combined price reduction and skill-building intervention.

The SHELf trial is registered with Current Controlled Trials Registration ISRCTN39432901.

1. Introduction

Evidence supports the role of fruits and vegetables in the prevention of chronic diseases such as stroke, cardiovascular diseases, obesity and cancers (He et al., 2004; Lock et al., 2005; Steinmetz, 1996; Van Duyn, 2000). However, large proportions of the population across many countries do not consume sufficient fruits and vegetables (Ball et al., 2015). In Australia, 94% of the population eats

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less than the recommended seven servings of fruits and vegetables per day (ABS, 2009), and the proportion of Australian adults consuming fruits and vegetables has declined since 1983 (Department of Community Services and Health, (1992). Additionally, high intake of sugar-sweetened soft drinks is a key risk factor contributing to high energy diets and risk for obesity and associated adverse health outcomes (Olsen NJ, 2009). Therefore, strategies to promote healthy eating are needed in Australia and worldwide. Nutrition education, which is often used in attempts to improve dietary behaviours of individuals, generally shows positive effects on self-reported outcomes (e.g., fruit and vegetable intakes or saturated fat consumption) (Ammerman et al., 2002) but modest effects on objectively-assessed food purchases (Ball et al., 2015; Mhurchu et al., 2010).

Price is perceived to be a key barrier to healthy food choice especially for consumers of low socio-economic status (SES) (Russell, 1999; Sullivan, 2004). Experiments in controlled settings have found that price reductions are effective in changing food purchases (French, 2003), and taxes and subsidies on food may be effective strategies in stimulating healthy eating behaviours (Caraher, 2005; Kuchler, 2005; Leicester, 2004; Powell, 2009). Positive effects of relative price reductions in healthy food on healthy food choices have also been found across a variety community settings and targeted food types (Wall et al., 2006). Wall et al. (2006) conducted a review of four randomized controlled trials (RCTs) in which they found a positive effect of incentives on healthy eating or weight loss. For example, the Changing Individuals' Purchase of Snacks (CHIPS) study (French et al., 2001) reported that price reductions of 50%, 25% and 10% were associated with increases in low-fat snack sales of 93%, 39% and 9% respectively. However, evidence from randomized controlled trials of the effects of pricing strategies on food purchasing and consumption in real-world settings such as supermarkets is limited (Eyles et al., 2012). Supermarkets are a major controller of food access, pricing and affordability (Australian Government Department of Agriculture Fisheries and Forestery (2014). Supermarkets and grocery stores accounted for 62% ($87.7 billion) of the total food retail in Australia in 2012–3 (Australian Government Department of Agriculture Fisheries and Forestery, 2014).

To our knowledge, very few RCTs have examined the effect of price reduction and nutrition education behaviour change on food purchases in a large real-life setting. A Dutch Supermarket study found that a 50% price discount on fruits and vegetables over six months increased fruit and vegetable purchases by 5.3 kg per 2 weeks, but nutrition education alone had no impact (Waterlander et al., 2013). The Supermarket Healthy Options Project (SHOP) study conducted in New Zealand, found that price discounts had a significant effect on healthier food purchases (mean difference between price discount versus control groups: 0.79 kg/week) but not on nutrients (Ni Mhurchu et al., 2009). However, none of these studies included a formal full economic evaluation or economic costing of the programs.

Economic evaluation of interventions is important to determine which interventions offer good value for money. This information would allow decision-makers to consider appropriate duplication, replication or upscaling costs against potential benefits when comparing effective interventions for implementation of policy and allocation of resources, particularly when resources are scarce and budgets constrained. Although the need for economic evaluation of nutrition programs has been noted for years (Brun, 1987), only a few peer-reviewed studies have reported the economic impacts of community-based nutrition education (Dollahite et al., 2008). It was strongly recommended in the review of Wall et al. that future RCTs should explicitly assess the cost-effectiveness of incentive-based interventions (Wall et al., 2006). We aim to assess the costs and cost-effectiveness of a price discount and combined price reduction and skill-building strategies on purchase and consumption of healthy food and beverages in the randomized controlled trial Supermarket Healthy Eating for Life (SHELf).

2. Methods

2.1. Study design

The SHELf trial protocol is described in full elsewhere (Ball et al., 2011). In brief, SHELf was a parallel four-arm trial including a three-month 20% price reduction (feasible to implement and unlikely to lead to the unintended consequence of promoting additional snack food items that a larger price reduction might encourage (French, 2005)), a combined price reduction and skill-building, a skill-building only and a control arm. The trial, which took place between May 2011 and November 2012, was approved by the Faculty of Health Human Ethics Advisory Group (approval HEAG-H 12/10).

Economic evaluation of the SHELf interventions was cost-effectiveness analysis, comparing the incremental costs and incremental outcomes of each intervention to the control condition, from a societal perspective. No discount factor was applied for this three-month intervention. Incremental cost-effectiveness ratios (ICER) were only calculated for outcomes with reported effects.

2.2. Participants and setting

Female regular shoppers who shopped at least once every two weeks at either the target Coles supermarkets (the second largest grocery chain in Australia) in Melbourne, Victoria, Australia or any other Coles stores within a 5 km radius of these stores were randomly chosen from the Coles store loyalty database and invited to participate in the trial. Women were targeted for this intervention because of their role as key nutrition gatekeepers (Australian Bureau of Statistics, 2009; Smith et al., 2013). Shoppers from two supermarkets were selected, to represent one disadvantaged and one advantaged neighbourhood (defined by the Socioeconomic Economic Index for Areas (SEIFA) indicator) that were serviced by a Coles store within 25 km of the main research site for logistical reasons. Additional eligibilities were that women were: aged between 18 and 60 years, the main household shoppers, able to communicate in English, willing to have their Coles sales data collected and analysed and the only person in the household taking part in the study. The power of the study was calculated based upon data from a large community-based dietary study of women (Ball et al., 2006) to detect an increase in vegetable consumption of $\geq$0.5 servings/d, with the assumption of an SD of 1.1 servings. The sample size required was 76 per group, totalling 408 for 90% power. In order to adjust for attrition and loss to follow-up (conservatively estimated at 10% at each of 3 time points) and account for potential design effects on the basis of sampling within catchment areas (about 10%), our total minimum sample size was: $408 \div 0.70 \times 1.1 = 641$.

Details of recruitment and randomisation are reported in full elsewhere (Ball et al., 2011, 2015). In brief, a mailing of 3000 recruitment invitations resulted in 700 registrations of interest. A total of 642 eligible women subsequently completed the baseline survey and were randomly assigned to one of 4 conditions: price reduction ($n = 160$); skill-building ($n = 160$); combined price reduction and skill-building ($n = 160$); control ($n = 161$) using a computer-generated block randomisation sequence.

2.3. Intervention

Details of the intervention are described in full elsewhere (Ball