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Micro-marketing healthier choices: Effects of personalized ordering suggestions on restaurant purchases☆

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ABSTRACT

We study the effects of the Nutricate receipt, which makes personalized recommendations to switch from unhealthy to healthier items at a restaurant chain. We find that the receipts shifted the mix of items purchased toward the healthier alternatives. For example, the share of adult main dishes requesting "no sauce" increased by 6.8 percent, the share of kids' meals with apples (instead of fries) rose by 7.0 percent and the share of breakfast sandwiches without sausage increased by 3.8 percent. The results illustrate the potential of emerging information technologies, which allow retailers to tailor product marketing to individual consumers, to generate healthier choices.

1. Introduction

Over the past several decades, social scientists have studied the effects of policy tools designed to reduce the consumption of products that are harmful to health, such as cigarettes, drugs, and unprotected sex. Interventions that have been studied include outright prohibitions, taxes, publicity campaigns, commitment contracts, mandated disclosure of adverse consequences, and changes in the way choices are presented to consumers. More recently, prompted in part by the rise in obesity across the developed world, researchers have focused on reducing the consumption of sugary and fatty foods, using tools like labeling of packaged foods (Variyam and Cawley, 2006), mandatory calorie posting on menus (Bollinger et al., 2011), and added convenience of healthier choices (Wisdom et al., 2010). While some studies of these interventions report statistically significant effects, policy tools that induce sizable long-term improvements in nutritional choices remain an elusive goal.

A parallel development over the past couple of decades is the growth of information technologies that allow retailers not only to track their customers' purchasing behavior but also to design individualized marketing strategies based on that information. For example, commercial software packages like *Adobe Target* provide automated behavioral targeting algorithms that adaptively learn what individual consumers want, and test models of each consumer's preferences against alternatives. New information is continuously gathered from a variety of sources including detailed purchase histories. While systems like these are now widely used to increase firms' sales revenues, their potential to induce health-improving changes in consumer behavior remains largely unexplored.

To that end, this paper studies the effects of an intervention called the *Nutricate* receipt. Designed by *SmartReceipt* Corporation, the receipt technology was implemented at a trial store of *Burgerville*, a restaurant chain in the Pacific Northwest in June 2009. A novel feature of this intervention is the fact that – in addition to providing tabular information on the calories and fat contained in the items the customer just ordered – it delivers personalized purchase suggestions promoting healthier products that are close substitutes to an item the consumer just bought. While the *Nutricate* receipt is an early and simple example of the use of individual purchase history data to market healthier choices, it may provide some indication of this approach's potential.

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Using store-level weekly purchase data from all 39 restaurants operated by *Burgerville* over a 125-week period, we find that the *Nutricate* receipt did, in fact, shift the mix of items purchased in directions encouraged by the most common ordering suggestions. For example, the share of adult main course items requesting "no sauce" increased by 6.8 percent, the share of kids' meals with apples (instead of fries) rose by 7.0 percent, and the share of breakfast sandwiches without sausage increased by 3.8 percent. While the implications of these changes for overall calories and fat consumed at *Burgerville* stores are modest, the results suggest that the next generation of targeted, adaptive interventions might have additional potential. For example, the *Nutricate* system bases its recommendations on the consumer's most recent purchase only, and – because it is printed on the receipt – is not accessible electronically and can only be acted on at the consumer's next purchase. None of these are necessary features of adaptive micro-marketing systems.

Also of interest for the direction of future interventions are the mechanisms that appear to account for the effects of the *Nutricate* receipts in our data. While it is possible that customers are responding primarily to the tabular information on fat and calories printed on those receipts, in the paper we argue this is unlikely because – rather than being broadly based – consumers' item substitutions are quite focused on the items targeted by the receipts' ordering suggestions. Further, because most customers will not be able to act on these ordering suggestions until their next restaurant visit, it seems unlikely that the suggestions are mitigating problems of impulse control (Laibson, 1997; O'Donoghue and Rabin, 1999) or otherwise affecting the immediate decision environment at the time of purchase via framing effects or jogging a consumer's memory. Instead, we suggest that the *Nutricate* receipts work primarily because the individualized ordering suggestions provide new, possibly restaurant-specific information in a form that mitigates well known cognitive constraints associated with choices from lists (Rubinstein and Salant, 2006). Choice from lists characterizes many consumer decision problems; with lists becoming ever longer due to the expansion of internet commerce, mechanisms that improve the effectiveness of such choices may have significant social value.

2. Previous studies

While some other interventions designed to reduce caloric intake in restaurants have been considered, most of the research to date studies the effects of calorie posting on menus.[2] Since New York introduced mandatory calorie posting in 2008, a number of other jurisdictions including California, Seattle, and Philadelphia followed suit.[3] The best known of the calorie-posting studies are probably Bollinger et al. (2011) and Wisdom et al. (2010). Bollinger et al. (2011) use internal company data from Starbucks to study the reaction of Starbucks' customers to a mid-2008 law that required all chain restaurants in New York City to post calories on menus or menu boards. While average calories per transaction fell from 247 to 236, this effect was entirely driven by the small fraction of consumers purchasing food – there was no decline in purchased drink calories. The 11 calories decline is statistically significant, but constitutes less than half a percent of recommended daily calories.[4]

Wisdom et al. (2010) designed a pair of field experiments where a small number of Subway customers were randomly assigned to different types of menus. The context was one in which no restaurants operating in the market were required to post nutrition information. Pooling their two studies, Wisdom et al.'s results suggest that calorie information reduces calories by approximately 7 percent, although many of their point estimates are imprecise. Their results also suggest that a different intervention that made healthy choices more convenient (by making them a 'featured option') could reduce ordered calories, depending on the format.

Other survey and receipt collection studies come to similar conclusions. Elbel et al. (2009) collected receipts from guests outside of fast-food chain restaurants, before and after calorie posting in New York City, using Newark, NJ stores as controls. They could detect no change in calories purchased. Dumanovsky et al. (2011) conduct a similar study, but using data from New York restaurants only; they found modest reductions in calories purchased in some specifications, but interpretation of these differences as causal is problematic due to the absence of a control group. Bassett et al. (2008) show that Subway consumers who reported seeing posted calorie information purchased few calories than other Subway consumers; inferring causality is difficult here as well. Finally, in a study design similar to ours, Finkelstein et al. (2011) studied the effects of mandatory calorie posting in King County, WA using monthly sales data from 28 TacoTime restaurants. Seven of these restaurants were near but not inside King County, and served as controls. Their econometric approach does not appear to include store fixed effects, or to adjust standard errors and optimize the control group in the ways we do here. They find no effect of menu labeling on calories purchased.

To the best of our knowledge, ours is the only study to estimate the effect of using micro-marketing methods based on a customer's purchase history to encourage health-improving choices in any commercial context, including restaurants.

3. Data and descriptive statistics

Our data consist of weekly purchase information for all 39 restaurants operated by *Burgerville* for the 125-week period running from December 27, 2007 to May 19, 2010. Beginning on June 4, 2009, the receipts at a single store (henceforth the "treatment" store) were changed from a conventional sales receipt to the *Nutricate* receipt. Overall, we therefore have a difference-in-differences, or "comparative case study" design with pre- and post-treatment information on one treated store and 38 potential control stores.

While our confidentiality agreement with *Burgerville* limits the amount of information we can provide about *Burgerville*'s stores and customer base, Table 1 of the online Appendix provides some contextual information on Multnomah County. Multnomah County includes central Portland, more than one-quarter of *Burgerville*'s stores, and is by far the most populous county in Oregon. Two

[2] An earlier literature studies the effects of the 1990 *Nutrition Labeling and Education Act* (*NLEA*), which mandated nutritional labeling of packaged foods (see for example Variyam and Cawley, 2006). Most studies find small impacts. Other researchers have asked whether *access* to fast food has increased obesity, with decidedly mixed results; see for example Davis and Carpenter (2009), Currie et al. (2010) and Anderson and Matsa (2011).

[3] At the time of writing, the Federal Drug Administration was still reviewing national calorie posting regulations mandated by Section 4205 of the 2010 Patient Protection and Affordable Care Act. We discuss the significance of our findings in view of the ACA mandate in Section 8.

[4] Bollinger et al.'s regression tables do not indicate whether their standard errors are clustered or whether other adjustments were made for within-group error correlations. In footnote 27, they report that their results are robust when they account for serial correlation by aggregating all transaction data before calorie posting and all transaction data after calorie posting, then testing for a before-after difference in calories per transaction. Assuming the aggregation was done by store, these tests would then require the 316 store-level pre-post differences in their data to be statistically independent across stores. Most of our estimated standard errors do not rely on this assumption.