

# Student Acceptance of Plain Milk Increases Significantly 2 Years after Flavored Milk Is Removed from School Cafeterias: An Observational Study



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## ARTICLE INFORMATION

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## ABSTRACT

**Background** Previous studies document decreases in lunchtime milk consumption immediately after flavored milk is removed. Less is known about longer-term effects.

**Objective** Plain milk selection and consumption were measured the first year flavored milk was removed in a school district (2010 to 2011 [Time 1]) and 2 years later (2012 to 2013 [Time 2]). Four behavioral economic interventions to promote milk were tested in one school at Time 2.

**Design** This was a longitudinal, observational study.

**Participants/Setting** Participants were kindergarten through grade 8 students in two schools in an urban district. Primary data were collected 10 times per school year at Time 1 and Time 2, yielding 40 days of data and 13,883 student observations. The milk promotion interventions were tested on 6 additional days.

**Main outcome measures** Outcomes were the percentage of students selecting milk at lunch, the ounces of milk consumed per carton, and the ounces of milk consumed school-wide per student.

**Statistical analyses** Logistic regressions were used to assess how sex, grade, time, availability of 100% juice, and behavioral interventions affected milk selection and consumption.

**Results** At Time One, 51.5% of students selected milk and drank 4 oz (standard deviation=3.2 oz) per carton, indicating school-wide per-student consumption of 2.1 oz (standard deviation=3.0 oz). At Time Two, 72% of students selected milk and consumed 3.4 oz per carton (standard deviation=3.2 oz), significantly increasing the school-wide per-student consumption to 2.5 oz (standard deviation=3.1 oz). Older students and boys consumed significantly more milk. Availability of 100% fruit juice was associated with a 16–percentage point decrease in milk selection. None of the behavioral economic interventions significantly influenced selection.

**Conclusions** These data suggest that after flavored milk is removed from school cafeterias, school-wide per-student consumption of plain milk increases over time. In addition, the presence of 100% juice is associated with lower milk selection.

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**L**IMITING ADDED SUGARS IN CHILDREN'S DIETS IS AN important public health target. The 2015 US Department of Agriculture Dietary Guidelines recommend that added sugars make up no more than 10% of daily calories<sup>1</sup> and the American Heart Association recently released a scientific statement recommending children and adolescents consume <25 g/day of added sugars.<sup>2</sup> Reducing intake to these low levels is an extremely ambitious goal, as youth consume an average of 80 g/day of added sugars.<sup>2</sup> Encouragingly, the nutritional quality of all foods and beverages sold in schools has improved significantly in recent years, which has the potential to help improve children's diets overall and decrease added sugars to some extent. National meal and snack standards have been updated;

sugary drinks such as soda and fruit drinks have been removed; new calorie maximums for meals and snacks have been set; and flavored milks are restricted to nonfat varieties.<sup>3</sup> It is in the context of school nutrition changes and the call to focus on added sugars that flavored milk has come under scrutiny.<sup>4,5</sup>

Flavored milk has been a staple of the National School Lunch Program (NSLP). It was available in 99% of schools in 2003 to 2004,<sup>6</sup> and 2005 data suggest that 47% of elementary school students and 30% of middle school students consumed flavored milk at school on a typical day.<sup>7</sup> In addition, the majority of flavored milk consumed by children overall is consumed at school.<sup>8</sup> It has been suggested that flavored milk falls into a special category of nutrient-dense foods that can

be made more palatable through the judicious use of added sugars.<sup>2,4,9</sup> Research has found that school-aged children who consume any type of milk at lunch are more likely to meet recommended levels of calcium intake than children who consume nonmilk beverages,<sup>10</sup> and flavored milk in schools increases milk selection and promotes dietary quality.<sup>11,12</sup> In addition, correlational studies have found that flavored milk consumption is not associated with higher body mass index.<sup>13</sup>

An alternative point of view is that flavored milk should not be served in schools for a variety of reasons.<sup>5</sup> Even one serving of flavored milk that meets the Institute of Medicine's recommended limit of 10 g added sugars<sup>14</sup> represents 40% of a child's daily allowance.<sup>2</sup> A second criticism of flavored milk is that many formulations also contain added sodium, artificial colors, flavors, and sweeteners, which are ingredients that concern many parents.<sup>15</sup> Finally, research suggests that children learn how sweet a food is supposed to taste during childhood, and early exposure to sweetened water predicts a preference for sweetened water later in life.<sup>16</sup> Therefore, an additional argument against introducing flavored milk in kindergarten and serving it daily in school is that it may reinforce children's preferences for sweet beverages as a category, and interfere with creating a social norm of drinking water and plain milk.

One important empirical question is: How will students respond if schools offer only plain milk? One hypothesis is that students will not switch to plain milk, and consequently will experience deficiencies in calcium, vitamin D, and potassium. Supporting this point, some research has found a reduction in both milk selection and/or consumption as measured by food waste immediately after flavored milk was removed. For example, Cohen and colleagues<sup>17</sup> found that the first year after flavored milk was removed, milk selection dropped from 80% to 55% and consumption of each 1-cup serving dropped from 64% to 54%. Another study by the same research group, however, found that milk selection and consumption were not significantly different between schools where flavored milk was available daily vs twice a week.<sup>18</sup> Specifically, this study found that in the school that served flavored milk only twice a week, overall milk consumption was not significantly different between flavored milk and plain-milk-only days, suggesting that students were just as likely to drink plain milk when it was the only option.<sup>18</sup> In another study, Hanks and colleagues<sup>19</sup> assessed milk selection in a school district for 1 year when flavored milk was available and again the following year after it had been removed. They observed a decrease in overall milk selection from 78% to 71%. Viewed another way, 90% of the decrease in chocolate milk sales was made up by an increase in sales of plain milk, suggesting that most students are willing to accept plain milk as a substitute.<sup>19</sup>

Understanding how the passage of time impacts milk selection is an important consideration when weighing the short and long-term costs and benefits of a policy to remove flavored milk. To date, little is known about student plain milk consumption over time after flavored milk is removed. One relevant variable may be the availability of alternative drinks in school. Historically, if a school elected to remove flavored milk, plain milk was potentially competing with other sugary drinks in the school building, such as sport drinks or soft drinks. But today, the only competitive

beverages permitted for sale in elementary and middle school buildings are plain water (with or without carbonation), and 100% fruit juice (full strength or diluted; with or without carbonation; and with no added sweeteners).<sup>20</sup> In addition, an emerging body of research suggests that behavioral economic strategies may increase selection and consumption of healthier foods in school cafeterias, but limited work has tested these with plain milk in schools where flavored milk has been removed.<sup>21</sup>

The aim of the present study was to assess plain milk selection and consumption in two kindergarten through grade 8 schools in a school district where flavored milk was removed in the 2010 to 2011 school year.

## METHODS

Selection and consumption of milk were assessed immediately after the policy change (Time 1: 2010 to 2011) and 2 years later (Time 2: 2012 to 2013). Selection and consumption were compared on days during which fruit juice was offered and not offered. In one of the schools, during 6 days in the spring of the 2012 to 2013 school year, four behavioral economic strategies were tested: marketing, multiple locations, rewards, and automatic placement.

## Setting

At the start of the 2010 to 2011 school year, a small urban district in New England elected to remove flavored milk and offer only 1% plain and nonfat milk. More than 80% of the students in this district qualify for free/reduced-price lunch, and universal free breakfast and lunch are served in all schools. This district has a history of strong wellness policies and had already removed many sources of added sugars from school buildings during the previous decade (ie, soda and sport drinks, all competitive foods). The district had also significantly changed its foodservice program to incorporate more "from scratch" cooking and fresh ingredients. District leadership believed that in the context of this commitment to student nutrition and health, flavored milk no longer fit into their vision for the lunch program.

## Participants

Two kindergarten through grade 8 public schools were invited by the district foodservice director to participate in the study. Student characteristics at each school are presented in [Table 1](#). The first cohort of kindergarten through grade 8 students was assessed at Time 1 (2010 to 2011) and the second cohort was assessed at Time 2 (2012 to 2013). There was partial overlap between the two cohorts because the students in kindergarten at Time 1 were in second grade at Time 2, students in first grade at Time 1 were in third grade at Time 2, and so on. On data-collection days, the mean number of students who were in the lunch line (and therefore participated in the study) was 369 (79% of total enrollment) from school A and 391 (71% of total enrollment) in school B. No personally identifying information was collected from the students; therefore, the behavior of individual students over time was not assessed.

## Procedure

The Yale University Institutional Review Board approved all procedures. Letters were sent home with all students

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