**Online Supplemental Information**

**Effects of a Multipronged Beverage Intervention on Young Children’s Beverage Intake and Weight: A Cluster-Randomized Pilot Study**

Anna H. Grummon, Michael D. Cabana, Amelie A. Hecht, Abbey Alkon, Charles E. McCulloch, Claire D. Brindis, and Anisha I. Patel

**Contents**

**Supplemental Table 1.** Recommended beverages for children ages 2-5 years.

**Supplemental Table 2.** Beverage categories assessed in survey of children’s beverage consumption.

**Supplemental Table 3.** Intraclass correlation coefficients by outcome variable.

**Supplemental Table 4.** Estimated intervention impact on calories and added sugar from beverages.

**References**

**Supplemental Table 1.** Recommended beverages for children ages 2-5 years.

|  |  |  |
| --- | --- | --- |
| **Beverage** | **American Academy of Pediatrics & National Academies** | **Robert Wood Johnson Foundation Healthy Eating Research Expert Panel**(1) |
| Water | * Water should be promoted as an alternative to sugar-sweetened beverages, though milk is seen as the primary beverage to encourage children to consume(2)
 | * Water should be available and promoted in all settings where beverages are offered
 |
| Milk | * Milk should be low-fat (1%) or fat-free (skim)
* Sweetened milk can be part of a healthy diet(2)
 | * Milk should be low-fat (1%) or fat-free (skim) and served in no more than 8-ounce portions
* Discourage sweetened milk
 |
| Fruit juice | * Encourage whole fruit consumption over fruit juice(3)
* Limit fruit juice consumption to 100% juice (not fruit-flavored drinks) and to 6 ounces or less per day(3)
 | * Encourage consumption of whole fruit over fruit juice
* No more than one 0- to 4-ounce portion of 100% fruit or vegetable juice or fruit juice combined with water per day
 |
| Sugar-sweetened beverages | * Limit consumption of sugar-sweetened beverages(2)
* Sports drinks, soft drinks, and energy drinks are not appropriate beverages for young children(2)
 | * Reduce or eliminate consumption of sugar-sweetened beverages
* Sugar-sweetened beverages are not recommended for children of any age
 |

**Supplemental Table 2.** Beverage categories assessed in survey of children’s beverage consumption.

|  |  |
| --- | --- |
| **Beverage category** | **Examples Provided (if any)** |
| Plain whole milk |  |
| Plain 2% or reduced-fat milk |  |
| Plain 1% or low-fat milk |  |
| Plain skim or fat-free milk |  |
| Flavored milk  | Chocolate or strawberry |
| Plain rice or soy milk |  |
| Flavored rice or soy milk | Chocolate, vanilla, or strawberry |
| Horchata |  |
| Smoothies or licuados with added sugar |  |
| Smoothies or licuados without added sugar |  |
| 100% fruit juice |  |
| Fruit drinksa  | Capri Sun, Sunny D, or Hi-C |
| Kool-Aida |  |
| Sports drinks | Gatorade, Powerade, Propel, Vitamin Water |
| Regular (non-diet) soda | Coca-Cola, Fanta, Sprite, Jarritos |
| Diet drinks | Crystal Light, diet sodas |
| Coffee or tea with added sugarb |  |
| Coffee or tea without added sugar |  |
| Tap water | Water from the sink, faucet, refrigerator door, or water fountain |
| Plain (non-flavored) bottled water | Dasani, Aquafina, Arrowhead Alhambra  |
| Flavored bottled waterc | Crystal Geyser Lemon, Strawberry Dasani, Blackberry Hint |
| Aguas frescas |  |
| Anything else? Specify.  | (Answers were coded by research team into above categories as applicable).  |

aKool-Aid consumption was assessed separately from other fruit drinks based on feedback received during survey pilot testing. Kool-Aid was considered an SSB in analyses of total SSB consumption.

bOnly one parent reported that their child consumed coffee or tea without added sugar at baseline, and only two parents reported that their children consumed these beverages at follow-up. We excluded consumption of these beverages from analyses because: (i) consumption was very uncommon and (ii) these beverages cannot clearly be categorized as healthy or unhealthy for young children because the survey did not query caffeine content of the beverages.

cExcluded from estimates of total water consumption in the event that parents inadvertently counted caloric water in this category. Average consumption of this category was low (about 0.10 oz/day in both the intervention and control group). Including flavored water in estimates of total water consumption had no impact on the pattern of results.

**Supplemental Table 3.** Intraclass correlation coefficients (ICC) by outcome variable.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Child-level** | **Classroom-level** | **Center-level** |
|  | **Unadjusted** | **Adjusted** | **Unadjusted** | **Adjusted** | **Unadjusted** | **Adjusted** |
| **Beverage consumption (ounces/day)** |  |  |  |  |  |  |
| All less-healthy beverages | 0.25 | 0.27 | <0.01 | <0.01 | <0.01 | <0.01 |
| All healthier beverages | 0.22 | 0.12 | 0.03 | 0.03 | <0.01 | <0.01 |
| 100% juice | 0.31 | 0.40 | <0.01 | <0.01 | 0.01 | <0.01 |
| Total SSBs excluding sweetened milk | 0.18 | 0.15 | <0.01 | <0.01 | <0.01 | <0.01 |
| Unsweetened high-fat (2% or whole) milk | 0.33 | 0.39 | 0.01 | 0.01 | <0.01 | <0.01 |
| Sweetened milk | 0.25 | 0.26 | <0.01 | <0.01 | <0.01 | <0.01 |
| Total water | 0.14 | 0.07 | 0.05 | 0.07 | 0.02 | <0.01 |
| Tap water | 0.21 | 0.12 | 0.01 | <0.01 | <0.01 | <0.01 |
| Bottled water | 0.28 | 0.25 | 0.01 | <0.01 | 0.01 | <0.01 |
| Unsweetened, low- or non-fat milk | 0.50 | 0.43 | <0.01 | <0.01 | <0.01 | <0.01 |
| **Weight status & body mass index (BMI)**   |  |  |   |   |
| Overweight/obese statusa | - | - | <0.01 | <0.01 | <0.01 | <0.01 |
| BMI percentile | 0.93 | 0.92 | <0.01 | <0.01 | <0.01 | <0.01 |
| Absolute BMI (kg/m2) | 0.94 | 0.95 | <0.01 | <0.01 | <0.01 | <0.01 |

Abbreviations: BMI, body mass index; SSBs, sugar-sweetened beverages.

*Note.* ICCs were calculated using Stata’s *mixed* command for continuous variables and the *melogit* command for binary variables. Adjusted ICCs adjust for study group, time period (baseline vs. follow-up), the interaction between study group and time period, children’s characteristics (age and sex; excluded in models for overweight/obese status and BMI percentile) and parent/household characteristics (Hispanic ethnicity, educational attainment, marital status, income, and household size).

aICCs for overweight/obese status were calculated using baseline data only (not repeated measures) due to model convergence issues. Thus, child-level ICCs for this outcome are not reported.

**Supplemental Table 4.** Estimated intervention impact on calories and added sugar from beverages.

|  |  |  |
| --- | --- | --- |
| **Intervention Impact on Volume of Beverages Consumed, Survey Dataa** | **Calorie and Added Sugar Content of Beverage Categories,** **Supertracker Data(4)** | **Estimates of Intervention Impact on Beverage Calories and Added Sugar, Combining Survey and Supertracker Data** |
|  |  |  |  |  |  |  |
| **Beverage Category** | **Intervention Impact (oz/day)** | **Beverage Category** | **Calories per Fluid Ounce** | **Grams of Added Sugarb per Fluid Ounce** | **Beverage Caloriesc (kcal/day)** | **Added Sugar from Beverages (g/day)d** |
| **Promoted Beverages** |  |  |  |  |  |  |
| Total water | +2.59 | Water | 0 | 0 | 0.00 | 0.00 |
| Unsweetened, low-fat or skim milk | +0.92 | Milk, low-fat (1%) | 13 | 0 | 11.96 | 0.00 |
| **Discouraged Beverages** |  |  |  |  | -29.76 | 0.00 |
| 100% juice | -1.86 | Juice blend, 100% juice | 16 | 0 | -30.94 | -5.90 |
| Total sugar-sweetened beverages (sum of soda, fruit drinks, Kool-Aid, sports drinks, sweetened smoothies, sweetened coffee/tea, horchata, aguas frescas, and flavored waters) | -2.38 | Soft drink, cola | 11 | 3 | -30.94 | -5.90 |
| Fruit flavored drink (Snapple, lemonade, Kool-Aid Bursts, Little Hugs) | 20 | 5 |
| Fruit-flavored thirst-quencher beverage (sports drink) | 8 | 2 |
| Odwala smoothiee | 17 | 3 |
| Coffee, regular, with sugar | 5 | 1 |
| Tea, sweetened with sugar | 9 | 2 |
| Horchata, with reduced fat milk | 28 | 3 |
| Generic agua fresca – Piñaf | 6 | 1 |
| **Average across SSB categories** | **13.00** | **2.48** |
| Unsweetened, high-fat (2% or whole) milk | -0.99 | 2% milk | 15 | 0 | -14.85 | 0.00 |
| Sweetened milk | +0.06 | Milk, chocolate-flavored, fat-free | 17 | 1 | 1.02 | 0.06 |
| **Net impactg** |  |  |  |  | **-62.57 calories/day** | **-5.84 g/day** |

*Notes*. Some of the beverage categories we assessed via survey could be matched to more than one beverage category on Supertracker. For example, our survey asked about consumption of unsweetened low-fat and skim milk combined, while Supertracker provides estimates of calories/ounce for unsweetened low-fat (1%) milk and unsweetened skim (fat-free) milk separately. When more than one beverage category on Supertracker could be applied, we used the category that would provide the more conservative estimate of net caloric impact from the intervention (i.e., the higher estimate when the intervention increased intake of the beverage, and the lower estimate when the intervention decreased intake of the beverage).

aEstimated as the difference in changes in consumption from baseline to follow-up comparing the intervention to the control group. Estimated using generalized linear regressions controlling for ethnicity (Hispanic vs. non-Hispanic), parental educational attainment (high school degree/GED or less vs. more than high school/GED), number of household members, marital status (married or living with a partner vs. not), and child’s age and sex. Models accounted for clustering within classroom by including an indicator for classroom and within children by clustering standard errors at the child-level.

bExcludes intrinsic sugar in milk and 100% juice.

cCalculated as change in volume consumed (oz/day; column 2) \* calories/oz (column 4).

dCalculated as change in volume consumed (oz/day; column 2) \* grams/oz (column 5).

eData from myfitnesspal.com because this beverage was not listed in the SuperTracker database. Source: [https://www.myfitnesspal.com/food/calories/80306526#](https://www.myfitnesspal.com/food/calories/80306526). Odwala brand smoothies were selected to represent a popular brand.

fData from myfitnesspal.com because this beverage was not listed in the SuperTracker database. Source: <https://www.myfitnesspal.com/food/calories/238265627>.

gNet impact of the intervention on calories/day from beverages and grams of added sugar/day from beverages, calculated by summing intervention impact on these outcomes across all beverage categories.

**References**

1. Story M (2013) *Recommendations for Healthier Beverages*. Robert Wood Johnson Foundation.

2. National Academies of Sciences, Engineering, and Medicine (2017) *Strategies to Limit Sugar-Sweetened Beverage Consumption in Young Children: Proceedings of a Workshop*. National Academies Press.

3. Heyman MB & Abrams SA (2017) Fruit juice in infants, children, and adolescents: Current recommendations. *Pediatrics* **136**, e20170967.

4. United States Department of Agriculture (2018) Food-A-Pedia. *Supertracker*. https://www.supertracker.usda.gov/foodapedia.aspx?CatgoryID=-1&FoodDescription=soda (accessed June 2018).