

Consumption of 100% Fruit Juice is Associated with Better Nutrient Intake and Diet Quality but not with Weight Status in Children: NHANES 2007-2010

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Abstract: *Objective:* This study examined the impact of various levels of 100% fruit juice (FJ) consumption on intake of nutrients, diet quality, and weight in children using the more recent national data.

Methods: This was a cross-sectional study examining the data from children 2-18 years of age (n=6,090). Intake of nutrients and diet quality were assessed using the 24-hr dietary recall and Healthy Eating Index-2010, respectively. Various consumption levels of 100% FJ were determined. Covariate adjusted linear regression means, and standard errors were determined (p<0.01).

Results: Average per capita consumption of 100% FJ consumed was 3.6 fl oz (50 kilocalories; 2.9% energy intake); 30% of children 2-6 years exceeded the recommendation for 100% FJ. Among 100% FJ consumers, the mean amount of 100% FJ consumed was 10.6 fl oz (147 kilocalories; 8.4% energy intake). Intakes of vitamin C, magnesium, and potassium and overall diet quality were higher with more 100% FJ consumed; no difference was found in total fiber intake. No trends were seen in weight with increased amounts of 100% FJ consumed.

Conclusions: Consumption of 100% FJ should be recommended as a component of a healthy diet.

Keywords: Fruit juice, whole fruit, dietary intake, NHANES, children.

INTRODUCTION

Consumption of fruit has been associated with a variety of health benefits including an improved profile of cardiovascular risk factors (CVRF) [1-5], a reduced risk of hypertension [3], and some types of cancer [1, 6]. The majority of the studies conducted with children have examined the association between 100% fruit juice (FJ) and weight. Although some studies have shown an association between 100% FJ consumption and overweight/obesity [7-10], the majority have not supported this relationship [11-18]. A 2008 systematic review showed no consistent association between consumption of 100% FJ and overweight/obesity in children and adolescents [19]. In addition to the ongoing debate over the tenuous relationship between 100% FJ and weight, there is a concern that 100% FJ are sugary drinks that should just be eliminated from the diets of children [20]. This concern over the tenuous adverse relationship with weight and the total sugar content of 100% FJ has overshadowed the contribution of 100% FJ to nutrient intake and diet

quality. The authors of a 2015 systematic review concluded that the "preponderance of evidence supports the position that 100% fruit juice delivers essential nutrients and phytonutrients, provides year-round access to a variety of fruits, and is a cost-effective way to help people meet fruit recommendations" [21].

Few children consume the recommended amounts of fruit per day based on gender, age and activity levels [22]. A substantial part of the total fruit intakes of children is comprised of 100% FJ and it is a contributor to their total nutrient intake and overall diet quality [12, 13, 18, 23, 24]. Compared with non-consumers, the overall nutritional profile of those consuming 100% juice had significantly higher intakes of energy, and energy adjusted intakes of vitamins C and B₆, potassium, riboflavin, magnesium, iron, and folate and significantly lower intakes of saturated fatty acids, discretionary fat, and added sugars [12, 13, 18, 23, 24]. Consumption of 100% FJ also contributed to improved diet quality, and was specifically associated with higher intake of whole fruit [12, 18, 23]. Data from the National Health and Nutrition Examination Survey (NHANES) showed that the percentage of children 2-18 years of age (yrs) consuming 100% FJ has decreased from

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55% (2003-2006 NHANES) [24] to 34% (2007-2010 NHANES) reported in this study.

Mean daily juice consumption among children 2-11 yrs was 4.1 fluid ounces (fl oz) (0.5 cup eq) which contributed a mean intake of 58 kilocalories (kcal) (3.3% of total energy intake) [12]. On average, children consumed less than the maximum amounts of 100% FJ recommended by the American Academy of Pediatrics (AAP) [25] which is 4 to 6 fl oz per day for children 1-6 yrs and 8 to 12 fl oz per day for children 7-18 yrs.

The 2010 Dietary Guidelines Advisory Committee (DGAC) recognized dietary fiber, calcium, vitamin D, and potassium as nutrients of public health concern. Vitamins A, C, D, and magnesium were also identified as nutrients that were under-consumed by certain segments of the population [26]. In previous research [12, 18, 23, 24], consumption of 100% FJ was associated with higher intakes of many of these shortfall nutrients.

To date, majority of the studies looking at the contribution of 100% FJ to nutrient intake, diet quality, and weight in children used older NHANES data from 1999-2006 and focused on consumer versus non-consumers of FJ. The goal of this study was to examine the impact of various levels of 100% FJ consumption on intake of nutrients, diet quality, and weight in children 2-18 yrs using the 2007-2010 NHANES consumption and weight data.

MATERIALS AND METHODS

Data Collection

The NHANES is now conducted on a continual basis by the National Center for Health Statistics of the Centers for Disease Control and Prevention. One major objective of NHANES is to examine the relationship between diet, nutrition, and health [27]. Details regarding the survey design, content, operations and procedures are available online [27-29].

Study Population and Dietary Intake

Participants were children 2-18 yrs (N=6,090) from the 2007-2010 NHANES. Dietary data were obtained from two 24-hour dietary recalls administered using an automated multiple-pass method [30, 31]. The first dietary recall was obtained *via* an in-person interview (Day 1) in the Mobile Examination Center (MEC) and the second (Day 2) was obtained 3-7 days later *via*

telephone. Parents/guardians provided the 24-hour dietary recalls of children 2-5 yrs; children 6-11 yrs were assisted by an adult; all others provided their own recalls. The following were excluded from the analyses: those with unreliable recall data as assessed by the United States Department of Agriculture (USDA) Food Surveys Research Group (n=83) and those consuming breast milk (n=5). Detailed descriptions of the dietary interview methods are provided in the NHANES MEC In-Person Dietary Interviewers Procedures Manual [32] and in the Phone Follow-up Dietary Interviewer Procedures Manual [33], which includes pictures of the Computer-Assisted Dietary Interview system screens, measurement guides, and charts used to collect dietary information. The NHANES has stringent protocols and procedures that ensure confidentiality and protect individual participants from identification using federal laws [34]. This study was a secondary data analysis which lacked personal identifiers; therefore, this study did not require Institutional Review Board review.

Determination of Intake of 100% Fruit Juice (FJ), Nutrients and Food Groups

In this study, 100% FJ was defined according to USDA food codes that specifically indicated 100% FJ (food codes beginning with 612, 641, 6720 and 6721) while juice cocktails, juice punches, juice drinks, or juice beverages were not considered as fruit juice in this study, although they contain some juice [35]. The USDA Food and Nutrient Database for Dietary Studies (FNDDS) v. 4.1 [36] was used to determine the nutrient content of foods in 2007-2008 NHANES survey foods, and the FNDDS v. 5.0 [37] was used to determine the nutrient content of foods contained in 2009-2010 NHANES survey foods. The Food Patterns Equivalent Databases (for 2007-2008 and 2009-2010) were used to assess food group intakes [38, 39]. Using the first dietary recall, children aged 2-18 yrs were identified and separated into four 100% FJ consumption groups (>0 ≤ 4 fl oz, >4 ≤ 8 fl oz, >8 ≤ 12 fl oz, and > 12 fl oz) or non-consumers.

Diet Quality as Determined by the Healthy Eating Index (HEI-2010)

The HEI-2010 (HEI) was used to determine diet quality [40]. The SAS code used to calculate HEI-2010 scores using data from the first dietary recall was downloaded from the Center for Nutrition Policy and Promotion website [41]. Briefly, HEI-2010 was designed to evaluate all of the major food groups and major subgroups and nutrients to manage in the diet.

The twelve HEI-2010 components were summed for a maximum score of 100 points. Components 10 (sodium), 11 (refined grains), and 12 (empty calories) are reverse scored, so that lower intake leads to a higher score, and thus a greater contribution to diet quality.

Anthropometric Measures

Height and weight were obtained according to NHANES Anthropometry Procedures Manual [42]. The manual provides information about equipment, calibration, methods, quality control, and survey procedures. Body mass index (BMI) was calculated as body weight (in kilograms) divided by height (in meters) squared [43]. The Centers for Disease Control and Prevention's growth chart programs were used to determine BMI z-score; children with a BMI z-score greater than or equal to the 85th and less than 95th, and greater than or equal to the 95th percentile were considered overweight or obese, respectively [44]. Waist circumference (WC) was obtained using NHANES protocol [42].

Statistical Analyses

Demographics of consumers and non-consumers were determined and compared using t-tests. Regression analyses were used to generate least-square means of nutrient intakes, HEI-2010 total score and subcomponents, food group intakes, and anthropometric measures for each 100% FJ intake group. Logistic regression was utilized to assess the odds ratios of being overweight, obese or overweight/obese for each 100% FJ intake group. Covariates for these regression analyses were age, gender, race/ethnicity, poverty income ratio grouped into three categories (< 1.25, 1.25-3.49, and >3.49) [45], physical activity (sedentary, moderate and vigorous) [46], current smoking status, alcohol consumption (which was obtained from the 24-hour dietary recall) and total energy intake (the latter was not included in the analysis of energy intake, the HEI-2010 scores, and body weight related parameters). For all regression analyses a p-for-trend-analysis was conducted across levels of 100% FJ consumption. The National Cancer Institute (NCI) Method was used to estimate usual intake (UI) of 100% FJ [47]. The two days of intake, using first day sampling weights, were used to obtain necessary variance estimates. The NCI SAS (SAS Institute, Inc., Cary, NC) macros Mixtran v.1.1 and Distrib v.1.1 were used to generate parameter estimates after covariate adjustment and to estimate the distribution of UI *via* the Monte Carlo

method [48], respectively. The two part correlated model was used for the UI estimations. Covariates used in the NCI UI estimations were day of the week of the 24-hour recall (coded as weekend [Friday-Sunday] or weekday [Monday-Thursday]) and sequence of dietary recall (first or second). The percentage of children with UI of 100% FJ exceeding the AAP recommendations for children ages 2-6 yrs and 7-18 yrs was assessed [25]. For all analyses study-specific four-year sample weights [49] were used to adjust the variance for the complex sample design of NHANES using the statistical package SUDAAN (version 9.0.3, 2007, Research Triangle Institute, Research Triangle Park, NC). Significance was set at $p < 0.01$.

RESULTS

Description of Sample

There was a significantly lower percentage of whites ($p < 0.01$) and older children in the 100% FJ consumer group; whereas, a smaller percentage of 100% FJ consumers reported smoking (Table 1). Of the sample ($n = 6,090$) of 2-18 yrs, 66% did not consume 100% FJ on the day of the recall (Table 2). For the entire population, the mean amount of 100% FJ consumed daily was 3.6 fl oz, contributing a mean intake of 50 kcals or 2.9% of total energy intake. Among 100% FJ consumers only, the mean amount of 100% FJ consumed daily was 10.6 fl oz, which contributed a mean of 147 kcals or 8.4 % of total energy intake. The mean amount of 100% FJ consumed was 9.9 fl oz for ages 2-8 yrs and 11.2 fl oz for 9-18 yrs.

Average Nutrient Intake by 100% FJ Consumption

Compared to children who did not consume 100% FJ, there was a significant ($p < 0.0001$) positive trend with increased amount of 100% FJ consumed for adjusted total energy intake (+18.0 kcal/fl oz FJ), carbohydrates (+1.4 g/fl oz FJ), total sugars (+1.5 g/fl oz FJ), vitamin C (+7.6 mg/fl oz FJ), magnesium (+1.3 mg/fl oz FJ), and potassium (+30.5 mg/fl oz FJ) (Table 3). In contrast, there was a significant ($p < 0.001$) inverse trend for total fat (-0.5 g/fl oz FJ), saturated fatty acids (-0.2 g/fl oz FJ), and sodium (-14.8 mg/fl oz FJ) with increased amount of 100% FJ consumed (Table 3).

Diet Quality and 100 % FJ Consumption

Compared to non-consumers, diet quality significantly ($p < 0.0001$) increased with increased

Table 1: Demographics of Children 2-18 Years (n=6,090) Participating in 2007-2010 National Health and Nutrition Examination Survey

Variable	100% Fruit Juice		
	Consumers (n=2,337)	Non-Consumers (n=3,753)	P Value
	LSM ± SE	LSM ± SE	
Gender (%)			
Female	48.0 ± 0.01	51.0 ± 0.01	0.1690
Ethnicity (%)			
White	49.8 ± 3.4	63.4 ± 2.4	0.0012
African-American	17.4 ± 1.9	12.2 ± 1.0	0.0151
Hispanic-American	25.7 ± 2.7	18.1 ± 2.2	0.0282
Age (y)	8.2 ± 0.1	11.0 ± 0.1	<0.0001
Poverty Income Ratio (PIR)	2.4 ± 0.1	2.6 ± 0.1	0.1634
Physical Activity (%)			
Sedentary	11.0 ± 1.0	9.7 ± 0.8	0.2897
Moderate	20.2 ± 1.7	22.7 ± 0.9	0.1812
Active	68.8 ± 2.1	67.6 ± 1.0	0.6140
Smoker, current (%)	3.4 ± 0.6	7.5 ± 0.7	<0.0001
Alcohol (%)	1.9 ± 0.4	3.4 ± 0.6	0.0406

Table 2: 100% Fruit Juice Consumption Children by Age Group

	Age Group (yrs)		Total (yrs)
	2-8 x̄ ± SE	9-18 x̄ ± SE	2-18 x̄ ± SE
Total Population (n)	2838	3252	6090
Mean Amount Consumed (fluid ounces)	4.7 ± 0.2	2.8 ± 0.1	3.6 ± 0.1
Total Calories from Juice	65.8 ± 2.5	38.3 ± 2.1	49.5 ± 1.8
% of Daily Calories from Juice	4.1 ± 0.1	2.0 ± 0.1	2.9 ± 0.1
Non-Juice Consumers (%)	52.4 ± 1.9	75.6 ± 1.2	66.1 ± 1.4
Juice Consumers (%)	47.6 ± 1.9	24.4 ± 1.2	34.0 ± 1.4
100% Fruit Juice Consumers Only			
Mean Amount Consumed (fluid ounces)	9.9 ± 0.2	11.2 ± 0.4	10.6 ± 0.2
Total Calories from Juice	138.4 ± 3.3	156.5 ± 5.6	147.1 ± 3.0
% of Daily Calories from Juice	8.6 ± 0.2	8.1 ± 0.3	8.4 ± 0.2

amounts of 100% FJ consumed (0.4 HEI-2010 points/fl oz FJ) (Figure 1). There was a significant ($p < 0.0001$) decrease in intake of solid fat (-0.4 g/fl oz FJ) and added sugars (-0.3 tsp/fl oz FJ) with increased amounts of 100% FJ consumed; 100% FJ did not appear to displace milk consumption (Figure 2). However, 100% FJ consumers consumed significantly

($p < 0.01$) more whole fruit than non-consumers (0.76 ± 0.04 vs. 0.65 ± 0.04 cup equivalents) (data not shown).

Percentage of Children Exceeding the AAP Recommendations for 100% FJ Consumption

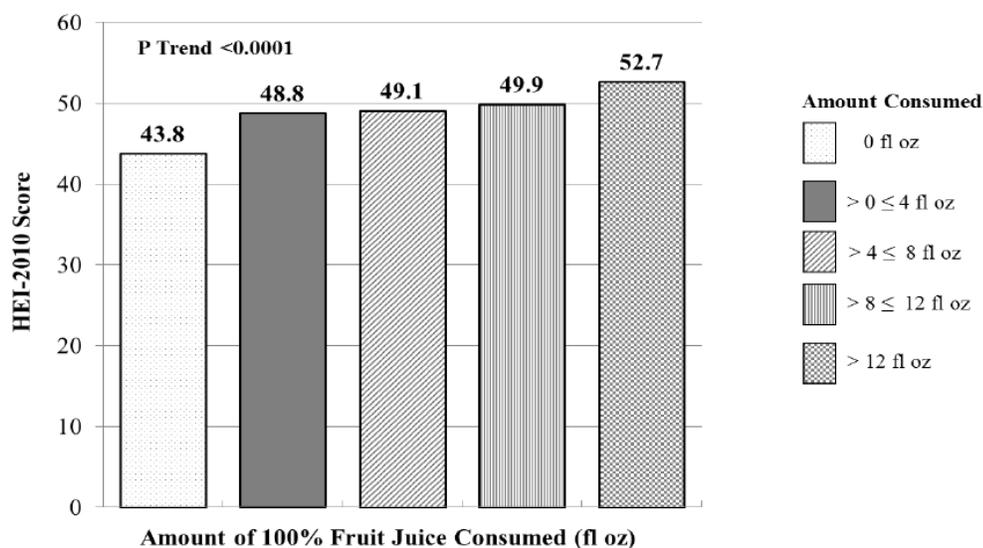
Thirty-two percent of children ages 2-6 yrs consumed more than 6 fl oz of 100% FJ, being higher

Table 3: Adjusted Nutrient Intake by 100% Fruit Juice Consumption Groups

Nutrients Per Day ¹	100% Fruit Juice Consumption Groups (fl oz/Day)					Beta	P Trend
	LSM ± SE						
	0 fl oz	>0 ≤ 4 fl oz	>4 ≤ 8 fl oz	>8 ≤ 12 fl oz	> than 12 fl oz		
Energy (kcal) ²	1860.8 ± 19.6	1813.0 ± 69.1	1881.3 ± 29.1	1952.9 ± 51.2	2269.8 ± 45.1	18.21	<0.0001
Carbohydrates (g)	252.6 ± 1.4	246.9 ± 7.6	255.7 ± 2.6	266.4 ± 2.4	277.0 ± 3.1	1.43	<0.0001
Total Sugar (g)	124.0 ± 1.5	116.3 ± 8.0	128.3 ± 2.8	133.0 ± 2.0	151.2 ± 3.4	1.48	<0.0001
Total Fiber (g)	12.9 ± 0.2	13.6 ± 0.6	13.2 ± 0.3	13.8 ± 0.4	13.6 ± 0.4	0.03	0.0629
Total Fat (g)	71.1 ± 0.6	71.6 ± 2.2	69.7 ± 1.0	66.7 ± 0.9	62.7 ± 1.1	-0.49	<0.0001
Saturated Fatty Acids (g)	25.1 ± 0.2	24.8 ± 1.5	24.3 ± 0.5	23.5 ± 0.5	21.5 ± 0.4	-0.21	<0.0001
Vitamin C (mg)	56.1 ± 1.7	75.5 ± 5.3	95.6 ± 3.6	119.3 ± 2.6	209.1 ± 5.8	7.59	<0.0001
Vitamin B ₆ (mg)	1.7 ± 0.0	1.7 ± 0.1	1.7 ± 0.0	1.7 ± 0.1	1.8 ± 0.1	0.01	0.0027
Vitamin A, RAE (mcg)	589.3 ± 10.6	585.2 ± 43.7	597.5 ± 14.5	601.5 ± 25.7	561.6 ± 23.5	-0.5	0.9735
Total Folate (mcg)	502.1 ± 11.9	530.1 ± 22.0	522.0 ± 16.6	514.5 ± 14.9	500.1 ± 11.4	0.99	0.2329
Magnesium (mg)	225.9 ± 2.2	229.0 ± 6.9	232.0 ± 3.1	235.3 ± 4.4	251.3 ± 4.5	1.28	<0.0001
Calcium (mg)	994.0 ± 12.3	1025.3 ± 68.3	1059.5 ± 23.6	1069.3 ± 22.2	1142.6 ± 37.4	10.10	0.0170
Iron (mg)	13.6 ± 0.2	14.6 ± 0.6	13.5 ± 0.2	13.7 ± 0.4	13.5 ± 0.4	0.00	0.9755
Sodium (mg)	3091.8 ± 30.2	3135.3 ± 100.4	3036.1 ± 49.3	2955.4 ± 40.4	2814.4 ± 54.1	-14.76	0.0003
Potassium (mg)	2067.0 ± 25.2	2139.8 ± 67.0	2239.6 ± 25.6	2306.7 ± 30.0	2677.3 ± 60.6	30.49	<0.0001

¹Adjusted for gender, race/ethnicity, age, and energy intake.

²Adjusted for gender, race/ethnicity, and age.

**Figure 1: Diet quality by 100% fruit juice consumption.**

among males (35%) than females (29%). Only 2% of children 7-18 yrs consumed more than 12 fl oz of 100% FJ (Figure 3).

Mean Levels of Adiposity Measured by 100% FJ Consumption

No significant trends were found in BMI, BMI Z-scores, and WC with increased amount of 100% FJ

consumed (Table 4). There were no differences in the likelihood of being overweight or obese among the 100% FJ consumption groups compared to non-consumers (Figure 4).

DISCUSSION

On average, the entire population of children 2-18 yrs consumed only 3.6 fl oz of 100% FJ; in consumers

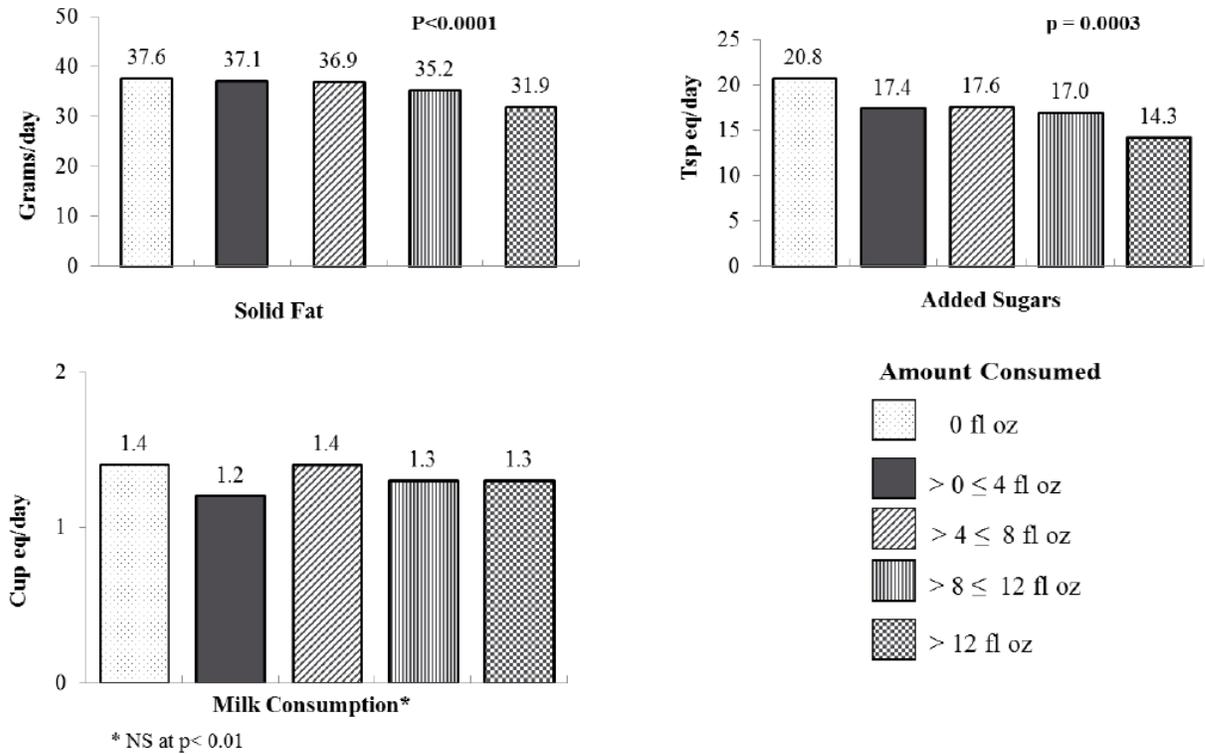


Figure 2: Intakes of solid fat, added sugars, and milk by 100% fruit juice consumption.

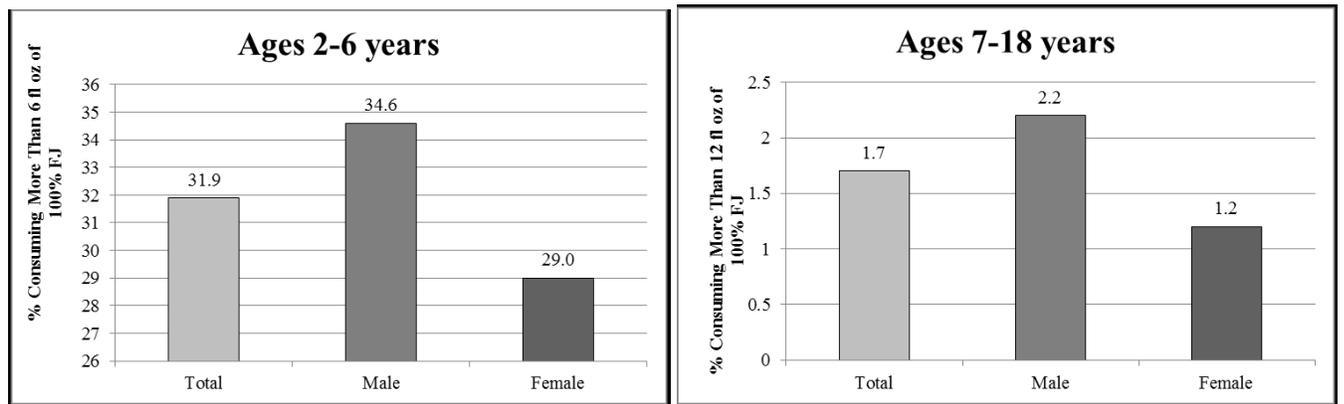


Figure 3: Percentage of children exceeding the American academy of pediatrics recommendations for 100% fruit juice consumption.

Table 4: Adjusted Obesity Measures for 100% Fruit Juice Consumers

Adiposity Measures	100% Fruit Juice Consumption Groups ¹ (LSM ± SE)					P Trend
	0 fl oz/d	> 0 ≤ 4 fl oz/d	> 4 ≤ 8 fl oz/d	> 8 ≤ 12 fl oz/d	> than 12 fl oz/d	
Body Mass Index, kg/m ²	20.1 ± 0.13	19.7 ± 0.25	19.8 ± 0.25	19.7 ± 0.26	20.3 ± 0.23	0.6364
Waist Circumference, cm ^{2,3}	68.8 ± 0.33	67.4 ± 0.80	68.0 ± 0.63	67.5 ± 0.77	68.9 ± 0.57	0.5894
BMI z-Score	0.49 ± 0.04	0.26 ± 0.08	0.42 ± 0.07	0.39 ± 0.07	0.49 ± 0.06	0.6126

¹Consumers vs. Non-Consumers: BMI, WC, and BMI z-score were not significantly different.

²Adjusted for gender, race/ethnicity, age, and energy intake.

³Calculated as weight in kilograms divided by height in meters squared.

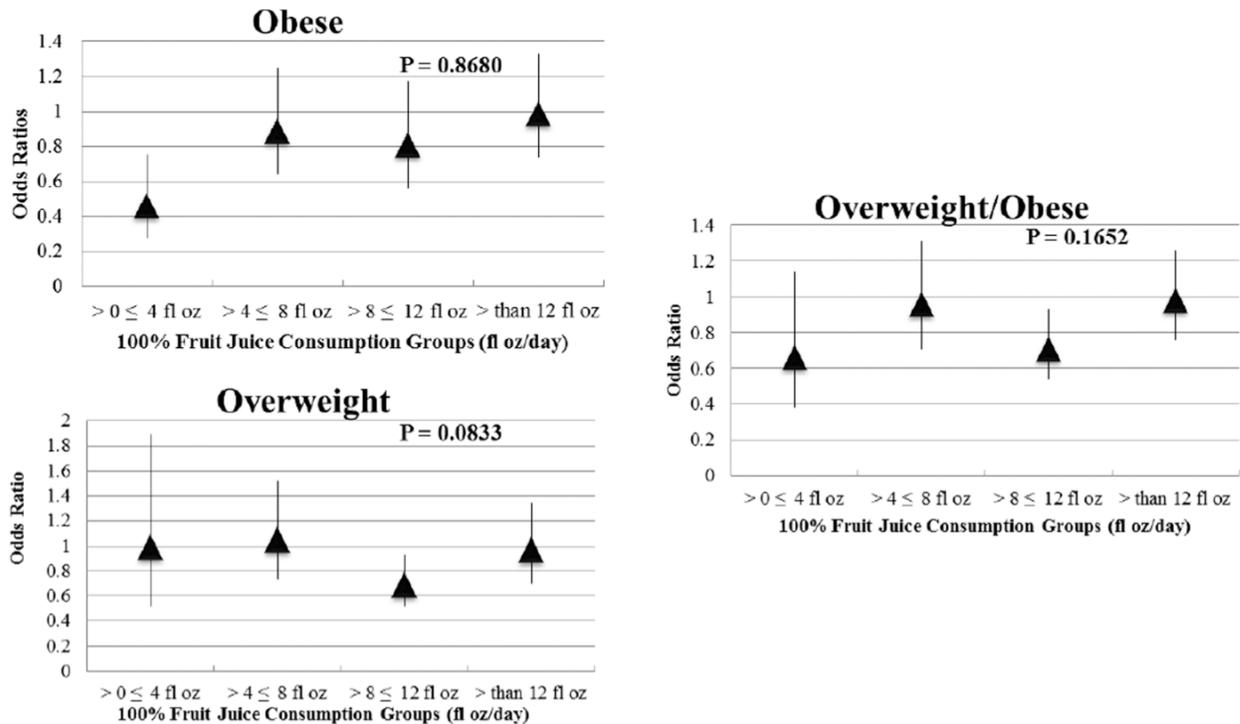


Figure 4: Likelihood of being overweight and/or obese by 100% fruit juice consumption.

Consumers only: the odds of being overweight and/or obese was not significant at $p < 0.01$.

FJ consumption was 10.6 fl oz/d. The 2010 DGA [50] did not make a specific recommendation for 100% FJ consumption with the exception that the majority of fruit consumed should be whole fruit. Among those children drinking 100% FJ, mean intake was higher in the younger age group. Approximately one-third of children 2-6 yrs exceeded the AAP recommendations of 4-6 fl oz per day. Thus, intakes above recommendations should be monitored by practitioners to ensure that intakes are not excessive for calories recommended.

The percentage of 100% FJ consumption was age dependent; younger children had a significantly higher percentage of consumers than older children. This is consistent with other findings [12, 23, 24]. Despite the age difference in the prevalence of 100% FJ consumption, mean intakes did not exceed AAP recommendations [25]. Overall, the mean energy intake of children consuming the highest amounts of 100% FJ was higher than children consuming no 100% FJ. This is consistent with one study that found that with increased intake of any type of beverage [14], including 100% FJ, total energy intake increased, though BMI did not increase. Although higher intakes of 100% FJ were not associated with increased weight, more longitudinal studies are needed to understand the effect of increased energy intake associated with increased 100% FJ consumption on weight.

Children consuming 100% FJ had better nutrient intake, especially potassium—a nutrient of public health concern, and diet quality compared to non-consumers. Mean intakes of vitamin C, magnesium, and potassium increased with increased amounts of 100% FJ consumed. There was no difference in total fiber intake between 100% FJ consumers and non-consumers and there was no significant impact on fiber intake as FJ increased. Moreover, mean intake of total fat, saturated fatty acid, and sodium decreased with increased amounts of 100% FJ consumed.

There is a concern that 100% FJ are “sugary drinks” that should be eliminated from the diet [45]. This concern was ignited with the comparison of the total sugar content of 100% FJ with sugar sweetened beverages. Twelve fl oz of a typical sugar-sweetened beverage contains 8 tsp eq (~40 g) sugar and 152 kcals compared to 6 tsp eq (~31 g) sugar and 167 kcals in 12 fl oz of orange juice [51]. Data from this study showed that mean intake of total sugars increased with increased amounts of 100% FJ consumed. However, the total sugar content in a typical sugar-sweetened beverage is added sugars and 100% FJ by definition contains no added sugars. This explains, at least in part, why consumers of 100% FJ, in this study, had lower intakes of added sugars despite the increased intakes of total sugars.

In addition to better nutrient intake, consumers of 100% FJ also had better diet quality than non-consumers; lower intakes of solid fats and added sugars and higher intakes of whole fruit [12, 23]. Thus, the concern over the total sugar content of 100% FJ has overshadowed the contribution of 100% FJ to nutrient intake and diet quality. Another concern about consumption of 100% FJ is that it may displace fluids like milk in the diet. Data from this study and another study [12] showed that 100% FJ did not replace milk in the diets of children. And finally, consumers of 100% FJ had improved intake of whole fruit. Thus, consumption of 100% FJ may be one way to increase fruit intake and should be encouraged as part of a healthy diet when consumed in age appropriate amounts [25].

The rationale for the AAP recommendations for 100% FJ consumption in children is not completely clear; however it is, in part, based on one study that showed an association of 100% FJ consumption and overweight in pre-school aged children [7]. Since that study was published, the association between overweight/obesity in children and consumption of 100% FJ appear unfounded [19]. Data from this study demonstrates that 100% FJ consumption was not associated with weight status of children. The verdict is not established until causality can be shown in studies with a more rigorous research design.

LIMITATIONS

This study had a number of limitations. NHANES is a cross-sectional study, thus cause and effect relationships cannot be determined. Another noteworthy limitation is the use of dietary recalls to assess intake in NHANES. Participants relied on memory to self-report dietary intakes; therefore, data were subject to non-sampling errors, including under- or over-reporting of energy. Parents reported or assisted their children 2-11 yrs with the 24-hour recalls; parents often report accurately what children eat in the home [52] but may not know what their children consume outside the home [53], which could also result in reporting errors [54]. Specific to 100% FJ consumption data, parents and children may not know whether the FJ consumed was 100% FJ or a blended juice beverage; therefore, data were subject to additional reporting errors. It is important to recognize that the results from this study do not reflect the effect of 100% FJ consumption specifically, but rather the consumption of 100% FJ within the context of the total diet. The results could reflect other foods consumed

throughout the day among 100% FJ consumers compared to non-consumers. Practitioners need to monitor 100% FJ consumption, particularly among younger children, to ensure that intakes are not excessive for calories recommended.

CONCLUSION

Consumption of 100% FJ was associated with better nutrient intake and diet quality and was not associated with body weight/adiposity in a nationally representative sample of children. Thus, consumption of 100% FJ should be recommended as a component of a healthy diet. In conclusion, 100% FJ is not just another sugary drink that may contribute to adiposity among some children.

CONFLICTS OF INTEREST

None of the authors have any conflict of interests to report.

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