The Beneficial Role of 100% Fruit Juice in Diet Quality of Children
100% fruit juice plays an important role in helping American children meet the recommended fruit group daily servings.

100% fruit juice delivers significant nutrients in the diets of children.

Replacing 100% fruit juice with whole fruit results in lower intakes of important nutrients and insignificant fiber increases.

100% fruit juice consumption is associated with higher whole fruit intake.

Majority of studies report that intake of 100% fruit juice in appropriate amounts does not result in increased weight and adiposity in children and adolescents.
2010 Dietary Guidelines for Americans & MyPlate
Current Fruit Group Recommendations for Nutrient Adequacy

2010 Dietary Guidelines Fruit Group Recommendation

- 2 to 4 servings or 1 to 2 cups of fruits per day
- Recommendation depends on age and level of physical activity

What is 1 equivalent cup of fruit?

- ½ cup dried fruit
- 1 cup of 100% fruit juice

* Whole fruit recommended as majority of fruit intake
Current Fruit Consumption Patterns in United States

Typical Fruit to Juice Intake Ratio is 2:1

Consumption of whole fruit follows a socioeconomic gradient

Current fruit intakes still below recommendations
More than 70% of Americans Fall Short of the Recommended Daily Fruit Servings\(^2\)

The average American consumes only 1 cup, or 50%, of the recommended fruit servings each day, including 100% fruit juice\(^2\)

When 100% fruit juice is added to whole fruit intake, the proportion of children and adolescents meeting recommendations doubles, and triples for some age groups\(^2\)

The percent of children and adolescents meeting fruit recommendations, with implications toward nutrient recommendations, based on whole fruit alone, is low and decreases with age\(^2\)

Analyses conducted to “test the impact” of removing 100% fruit juice and replacing it with whole fruit found:

- Significant decreases in vitamin C (-27%), folate (-51%), and potassium (-17%)\(^1,4\)
- Inconsequential increases (0.5 grams) in fiber\(^1,4\)

8% of 5-9 year olds

4% of 15-19 year olds

100% Fruit Juice plays an Important Role in Helping American Children Meet the Recommended Fruit Consumption
100% Fruit Juice Plays a Critical Role in Providing Important Vitamins & Minerals

100% fruit juice is a top contributor to dietary intake of:

• Potassium
• Vitamin C*
• Folate
• Magnesium
• Calcium* and Vitamin D* 4,5

In some cases, drinking 100% fruit juice may provide more phytonutrients than the whole fruit

* May come from fortified juices
100% Juice is Cost-effective

Meeting fruit shortfalls with a combination of whole fruit and 100% fruit juice

- Cost-neutral
- Higher vitamin C
- Higher potassium

Preference of juice over fruit goes beyond economics

- Ease of Storage
- Convenience
- No waste or spoilage
- Widely available
According to the 2010 Dietary Guidelines Advisory Committee Report, estimated consumption for 2-18 year olds was about **100 calories per day from fruit juice**

Juice accounts for only 8% of total caloric intake in the diets of 2-18 year olds.\(^5\)
Fruit Juice and Diet Quality of Children

- More vitamins and minerals
- Lower intakes of fat, saturated fat, and added sugars\textsuperscript{10}
- More whole fruit
- Milk and 100% fruit juice are complementary and not competitive in children’s diets\textsuperscript{13}
- Source of Phytonutrients\textsuperscript{14,15}

Children consuming 100% fruit juice have better overall diet quality\textsuperscript{8}
# 100% Fruit Juice Delivers Significant Nutrients in the Diets of Children

<table>
<thead>
<tr>
<th></th>
<th>Oranges</th>
<th>Apples</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>½ cup sections</td>
<td>½ cup FJ</td>
</tr>
<tr>
<td><strong>Servings (weight)</strong></td>
<td>90 g</td>
<td>124.5 g</td>
</tr>
<tr>
<td><strong>Energy (kcal)</strong></td>
<td>42</td>
<td>61</td>
</tr>
<tr>
<td><strong>Carbohydrate (g)</strong></td>
<td>10.58</td>
<td>14.37</td>
</tr>
<tr>
<td><strong>Sugars, total (g)</strong></td>
<td>8.42</td>
<td>10.35</td>
</tr>
<tr>
<td><strong>Dietary Fiber, total (g)</strong></td>
<td>2.2</td>
<td>0.4</td>
</tr>
<tr>
<td><strong>Calcium (mg)</strong></td>
<td>36</td>
<td>14</td>
</tr>
<tr>
<td><strong>Magnesium (mg)</strong></td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td><strong>Potassium (mg)</strong></td>
<td>163</td>
<td>222</td>
</tr>
<tr>
<td><strong>Vitamin A, RAE (mcg)</strong></td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td><strong>Vitamin C (mg)</strong></td>
<td>47.9</td>
<td>41.8</td>
</tr>
<tr>
<td><strong>Folate, DFE (mcg)</strong></td>
<td>27</td>
<td>24</td>
</tr>
</tbody>
</table>

All fruits, and forms of fruit contribute to recommended fruit servings and nutrient adequacy.

On a per serving basis one small fruit, or ½ cup of whole fruit are consistent with ½ cup of 100% fruit juice.

- USDA NDB codes: Oranges, raw, 09200; Orange juice 100% fruit juice, 09209; Apples, raw, 09003, Apple juice 100% fruit juice with added ascorbic acid, 09400.
Drinking 100% Fruit Juice Does Not Negatively Affect Fiber Intake

Replacing 100% fruit juice with whole fruit results in lower intakes of vitamin C, folate, and potassium, with minor fiber increases

Gaps in intake of nutrients such as potassium, vitamin C and folate

Diets of 100% fruit juice consumers have higher intakes of total dietary fiber

Only 10% of dietary fiber comes from whole fruit
Top Sources of Dietary Fiber in Food Supply

Fruits are a less effective means of increasing fiber intake – especially compared to foods like whole grain ready to eat cereal, beans, and popcorn.19

Table 1: Major sources\(^1\) of dietary fiber in the U.S. food supply (>1% of total)

<table>
<thead>
<tr>
<th>Fiber sources and selected specific foods within group</th>
<th>Percent in food supply, 5-year intervals</th>
<th>1995</th>
<th>2000</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grain products</td>
<td></td>
<td>36.00</td>
<td>36.30</td>
<td>35.50</td>
</tr>
<tr>
<td>White flour</td>
<td></td>
<td>16.91</td>
<td>17.14</td>
<td>15.55</td>
</tr>
<tr>
<td>Ready-to-eat cereals</td>
<td></td>
<td>4.11</td>
<td>3.62</td>
<td>3.60</td>
</tr>
<tr>
<td>Whole wheat flours</td>
<td></td>
<td>1.42</td>
<td>1.26</td>
<td>1.20</td>
</tr>
<tr>
<td>Rice</td>
<td></td>
<td>1.20</td>
<td>1.25</td>
<td>1.36</td>
</tr>
<tr>
<td>Vegetables</td>
<td></td>
<td>27.50</td>
<td>25.90</td>
<td>24.70</td>
</tr>
<tr>
<td>White potatoes</td>
<td></td>
<td>8.57</td>
<td>8.57</td>
<td>8.57</td>
</tr>
<tr>
<td>Tomatoes</td>
<td></td>
<td>3.90</td>
<td>3.90</td>
<td>3.90</td>
</tr>
<tr>
<td>Deep-yellow vegetables</td>
<td></td>
<td>2.69</td>
<td>2.42</td>
<td>2.03</td>
</tr>
<tr>
<td>Dark-green vegetables</td>
<td></td>
<td>1.46</td>
<td>1.80</td>
<td>1.67</td>
</tr>
<tr>
<td>Legumes, nuts, and soy</td>
<td></td>
<td>14.10</td>
<td>14.00</td>
<td>12.90</td>
</tr>
<tr>
<td>Legumes</td>
<td></td>
<td>7.14</td>
<td>6.82</td>
<td>5.54</td>
</tr>
<tr>
<td>Nuts</td>
<td></td>
<td>3.69</td>
<td>4.03</td>
<td>4.22</td>
</tr>
<tr>
<td>Soy products</td>
<td></td>
<td>3.24</td>
<td>3.11</td>
<td>3.10</td>
</tr>
<tr>
<td>Fruits</td>
<td></td>
<td>11.10</td>
<td>11.20</td>
<td>10.00</td>
</tr>
<tr>
<td>Bananas, fresh</td>
<td></td>
<td>2.20</td>
<td>2.22</td>
<td>1.95</td>
</tr>
<tr>
<td>Citrus fruit</td>
<td></td>
<td>2.21</td>
<td>2.23</td>
<td>2.15</td>
</tr>
<tr>
<td>Apples, fresh</td>
<td></td>
<td>2.09</td>
<td>1.87</td>
<td>1.99</td>
</tr>
<tr>
<td>Miscellaneous foods(^2)</td>
<td></td>
<td>11.30</td>
<td>13.60</td>
<td>16.70</td>
</tr>
</tbody>
</table>

\(^1\)The order in which fiber food sources are listed is based on how much fiber is provided in the U.S. food supply and not as they are consumed.

\(^2\)Spices, cocoa, tea, and coffee.

Source: Nutrient Content of the U.S. Food Supply, 2005 and Interactive Food Supply. USDA Center for Nutrition Policy and Promotion.
Children, adolescents, and adults who consumed 100% fruit juice have higher intake of whole and total fruit than those who do not consume 100% fruit juice. Whole fruit consumption in children and adolescents has increased significantly, while 100% fruit juice consumption has remained relatively flat, suggesting that 100% fruit juice does not interfere with, or detract from whole fruit consumption in kids.

100% fruit juice serves a critical role in delivery of key nutrients and plays an important complementary and supportive role to whole fruit consumption.

Studies show that children’s intake of fruits (and vegetables) tracks into adolescence and adulthood; thus incorporating fruit, in any form, will likely have long-term benefits.

Whole fruit consumption in children and adolescents has increased significantly, while 100% fruit juice consumption has remained relatively flat, suggesting that 100% fruit juice does not interfere with, or detract from whole fruit consumption in kids.
Evidence Analysis

“What is the association between intake of 100% fruit juice and weight status or adiposity in children?”

The evidence reviewed does not support an association between 100% fruit juice consumption and weight status or adiposity in children ages 2 to 18 years of age. ²⁶

The Majority of Evidence Suggests that 100% Fruit Juice Does Not Impact Weight in Children or Adolescents

Comprehensive, systematic review of studies on 100% fruit juice and weight studies in children and adolescents, including an assessment of the quality of studies ²⁴-²⁶
Beverage Intake in Early Childhood and Change in Body Fat from Preschool to Adolescence

Longitudinal study from ages 3-5 y to 15-17 y

Significant inverse relationship between skin fold thickness (4 measurements) and waist circumference and highest tertile of 100% fruit juice consumption

Consumption in the highest tertile was 10oz/d, which is consistent with national data

Limitations: small numbers of study subjects in each tertile; white boys only; potential for measurement error; low mean intake of 100% fruit juice, even in the highest tertile (10 oz/d)
Where is the scientific weight of evidence for consumption of 100% fruit juice and weight in children?

**Positive Relationship**
- 3 longitudinal
- 3 Cross-sectional

**No / Inverse Relationship**
- 10 cross-sectional
- 10 longitudinal

Based on nationally representative data
# Sample of Recent Studies on Adults and Juice Consumption

<table>
<thead>
<tr>
<th>Beverage</th>
<th>Study Type</th>
<th>Sample Size</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>100% Fruit Juice</td>
<td>Longitudinal (CARDIA)</td>
<td>n=2,774</td>
<td>No association with high waist circumference</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100% Fruit Juice</td>
<td>Cross sectional (NHANES)</td>
<td>n=14,196</td>
<td>Lower mean BMI and (NHANES) waist circumference in consumers vs non-consumers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruit Juice</td>
<td>Cross sectional Canadian Community Health Survey</td>
<td>n=15,392</td>
<td>Inverse association with BMI</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruit Juice</td>
<td>Prospective cohort (Nurses’ Healthy Study I and II, Health Professional Follow-up Study)</td>
<td>n=120,877</td>
<td>Positive association with weight gain in each 4-year period</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruit Juice</td>
<td>Prospective cohort (Nurses’ Healthy Study I and II, Health Professional Follow-up Study)</td>
<td>n=124,988</td>
<td>Higher Intake associated with long term weight gain</td>
</tr>
</tbody>
</table>

---

**References:**
- Duffey, 2010
- Pereira and Fulgoni, 2010
- Aktar-Danesh, 2010
- Mozaffarian, 2011
- Pan, 2013
Ages 1 to 6 years: No more than 4 to 6 ounces per day

Ages 7 to 18 years: No more than 8 to 12 ounces per day

• Existing AAP guidelines remain consistent with most current body of scientific evidence
Key Takeaways

A naturally, nutrient-dense beverage

Moderate consumption is part of a healthy diet

Better Diet Quality

19 Juice Products ASSOCIATION
Questions?

Contact Me:

- Diane Welland, MS, RD
- dwelland@kellencompany.com
- 202.207.1111
- www.juicecentral.org

Thank You!
Become a member!

- **Benefits of membership**
  - Professional Member - $190/year
  - Associate Member - $95/year
  - Student Member - $60/year
- Subscription to the *Journal of Nutrition Education and Behavior*
- Free access to live and recorded webinars
- Deepest discount to attend the SNEB Annual Conference
- Membership in an SNEB division
- Connection to other professionals through SNEB listserv
- [www.sneb.org/join](http://www.sneb.org/join)

Already a member?

- Join SNEEZE listserv by emailing dpalmer@NJAES.rutgers.edu.
- Read JNEB online at [www.jneb.org](http://www.jneb.org) - the redesigned website launched Tuesday
- follow us on Twitter and Facebook with @snebonline
- Read the weekly policy update arriving every Monday
- Sign up for the Journal Club webinar series or watch a recorded session
- Have minutes or hours to spare – volunteer at [www.sneb.org/volunteer.html](http://www.sneb.org/volunteer.html)
References

7. Drewnowski, A. Unpublished data presented at the Experimental Biology meeting 29 April 2014, University of Washington Center for Obesity Research and University of Washington, Seattle, WA
References (con’t)

8. USDA. Diet quality of children age 2-17 years as measured by the healthy eating index-2010. Nutrition Insights. 2013
A comprehensive review of 21 studies, including qualitative review, concluded that there is no systematic association between consumption of 100% fruit juice and overweight in children or adolescents. Data do support consumption of 100% fruit juice in moderate amounts (O’Neil and Nicklas 2008).

Intake of OJ not significantly related to children’s BMI (Dennison et al. 1999)
BMI not significantly associated with consumption of citrus juice in children and adolescents (Forshee et al. 2003)
Weight status in children had no association with the amount of 100% fruit juice consumed (O’Connor et al. 2006)
Fruit juice not associated with BMI in adolescents (Vagstrand et al. 2009)
Adult consumers of 100% fruit juice, relative to nonconsumers, had lower mean BMI and lower waist circumference (Pereira & Fulgoni 2010)
Inverse association between fruit juice consumption and BMI in adults (Akhtar-Danesh et al. 2010)
No association between 100% fruit juice consumption and obesity in Mexican American children living in San Francisco (Beck et al. 2013)
No association between fruit juice+nectar consumption and BMI in a large European cohort of adults (EPIC) (The InterAct Consortium 2013)
Intake of 100% fruit juice was not associated with overweight or obesity in Greek school children and adolescents age 7-15 years (Papandreou et al. 2013)

Lower WC with OJ (children) (O’Neil et al. 2011)
Lower risk for overweight/obesity with OJ (adults) (O’Neil et al. 2012)
Lower BMI, WC, % body fat with OJ (adults) (Wang et al. 2012)

No statistically significant difference in child height, BMI or ponderal index related to juice consumption (Skinner et al. 1999)
Growth velocity, BMI, and height standard deviation score were not related to fruit juice consumption in young children (Alexy et al. 1999)
No relationship between longitudinal juice consumption and BMI or ponderal index in young children (Skinner and Carruth 2001)
Consumption of 100% fruit juice not predictive of change of BMI in children and adolescents (Field et al. 2003)
No relationship between 100% fruit juice consumption and weight gain in boys or girls (Berkey et al. 2004)
No relationship between fruit juice consumption and weight change or in consumption of ≥12 oz juice/day and overweight in preschool children (Newby et al. 2004)
No relationship between 100% fruit juice consumption and BMI z-score children from Nebraska (Blum et al. 2005)
100% fruit juice consumption was not associated with BMI in young girls (Striegel-Moore et al. 2006)
Fruit juice consumption at age 5 or 7 years did not predict weight or adiposity at age 9 years in children living in England (Johnson et al. 2007)
No association with OJ and change in BMI over 5 years in adolescents (Vanselow et al. 2009)
No association between 100% fruit juice consumption and high WC in young adults (Duffey et al. 2010)
No negative effect with OJ and BMI or WC (Cesar et al. 2010a), body weight and BMI (Basile et al. 2010), and BMI (Morand et al. 2011)
No body composition changes with OJ (Simpson et al. 2012 abstract)

Lower WC with OJ (Basile et al. 2010)
Studies Reporting POSITIVE ASSOCIATION Between 100% Fruit Juice & Overweight/Obesity

Cross-Sectional Studies
- Frequency of fruit juice consumption associated with obesity in Puerto Rican children (Tanasescu et al. 2000; case-control study)
- Juice intake was positively related to risk of overweight in Mexican-American preschool children (Melgar-Quinonez et al. 2004)
- Greater intakes of fruit juice/drinks associated with higher likelihood for overweight/obesity in children (Sanigorski et al. 2007)

Longitudinal Studies
- In children overweight at baseline, higher intakes of fruit juice were associated with higher risk for overweight (Welsh et al. 2005)
- Among children who were initially either at risk for overweight or overweight, increased fruit juice intake was associated with excess adiposity gain (Faith et al. 2006)
- Change in 100% fruit juice was positively associated with change in BMI in adolescent girls; no association with boys (Libuda et al. 2008)
- Consumption of 100% fruit juice was associated with statistically significant 4-year weight gain in men and women (Mozaffarian et al. 2011)
- Increasing intakes of 100% fruit juices were associated with long-term weight gain in three separate large prospective cohorts in US men and women. Replacement of fruit juice with water was associated with lower long-term weight gain (Pan et al. 2013)