Changes in Total Fruit and Fruit Juice Intakes of Individuals: WWEIA, NHANES 2005-2006 to 2017-2018

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Highlights

- Estimated mean intakes of total fruit, which includes intact fruit and fruit juice, did not change significantly among children, adolescents, and adults from 2005-2006 to 2017-2018.
- Mean intakes of fruit juice obtained from single- and multi-ingredient foods decreased among children, adolescents, and adults during this period.
- Proportion of fruit juice to total fruit consumed decreased from 40% in 2005-2006 to 25% in 2017-2018 for individuals 2 years and over.
- Percentage of individuals, 2 years and over, who reported consuming fruit juice decreased from 45% to 34% during this period.

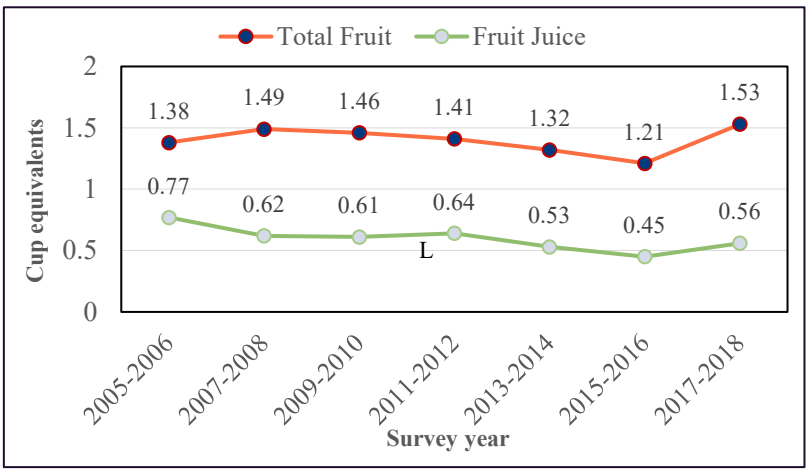
The Dietary Guidelines for Americans (DGA) [1] and the American Academy of Pediatrics [2] place limits on 100% fruit juice intake. The study identifies changes, if any, in the intakes of total fruit inclusive of 100% fruit juice consumed alone and that obtained from multi-ingredient foods such as fruit canned in juice, alcoholic beverage cocktails, fruit juice drinks (15% fruit juice assumed), and fruit nectars by individuals 2+ years, using Food Patterns equivalents data from the What We Eat in America, NHANES surveys from 2005-2006 to 2017-2018 [3]. The methodology, sample sizes, and definitions are on page 9.

Did the fruit intakes change among children 2-5 years?

The estimated mean intakes of total fruit and fruit juice in 2005-2006 and in 2017-2018 were not significantly different at p-value < 0.01.

Linear trends were not significant for total fruit. However, fruit juice had a significant decreasing linear trend during this period, although the means in 2005-2006 and 2017-2018 were not significant.

Figure 1. Estimated mean intakes of total fruit and fruit juice by children 2-5 years, from 2005-2006 to 2017-2018, WWEIA, NHANES



[L] significant linear trend at p-value < 0.01
Data: Food Patterns equivalents data from WWEIA, NHANES 2005-2006 to 2017-2018, day 1, children 2-5 years

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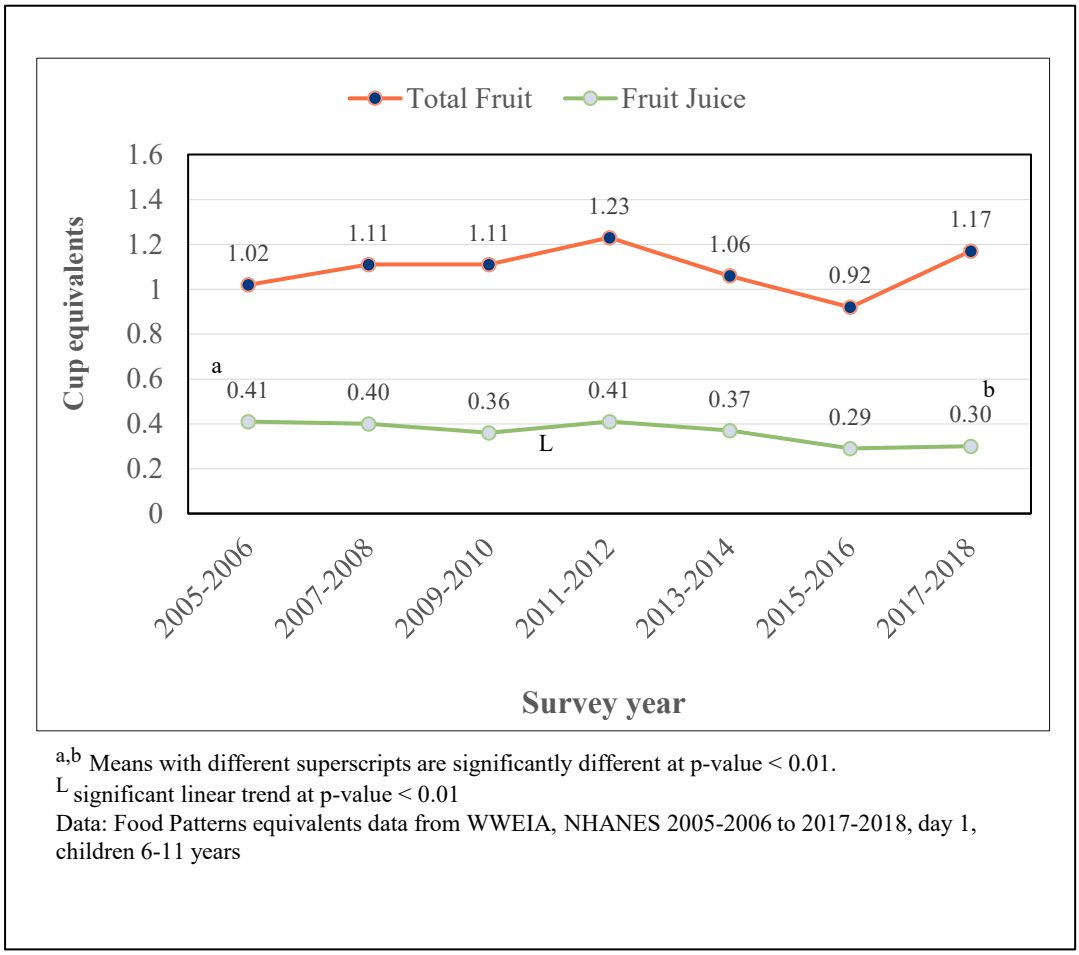
Did the fruit intakes change among children 6-11 years?

Figure 2 includes the estimated mean intakes of total fruit and fruit juice by children 6 to 11 years.

Comparison between 2005-2006 and 2017-2018:

- The total fruit intakes were not significantly different from each other.
- Fruit juice intakes were significantly different from each other.
- The linear trends for total fruit was not significant.
- Fruit juice had a significant, decreasing linear trend during this period.

Figure 2. Estimated mean intakes of total fruit and fruit juice by children 6-11 years, from 2005-2006 to 2017-2018, WWEIA, NHANES



[a,b] Means with different superscripts are significantly different at p-value < 0.01.
[L] significant linear trend at p-value < 0.01
Data: Food Patterns equivalents data from WWEIA, NHANES 2005-2006 to 2017-2018, day 1, children 6-11 years

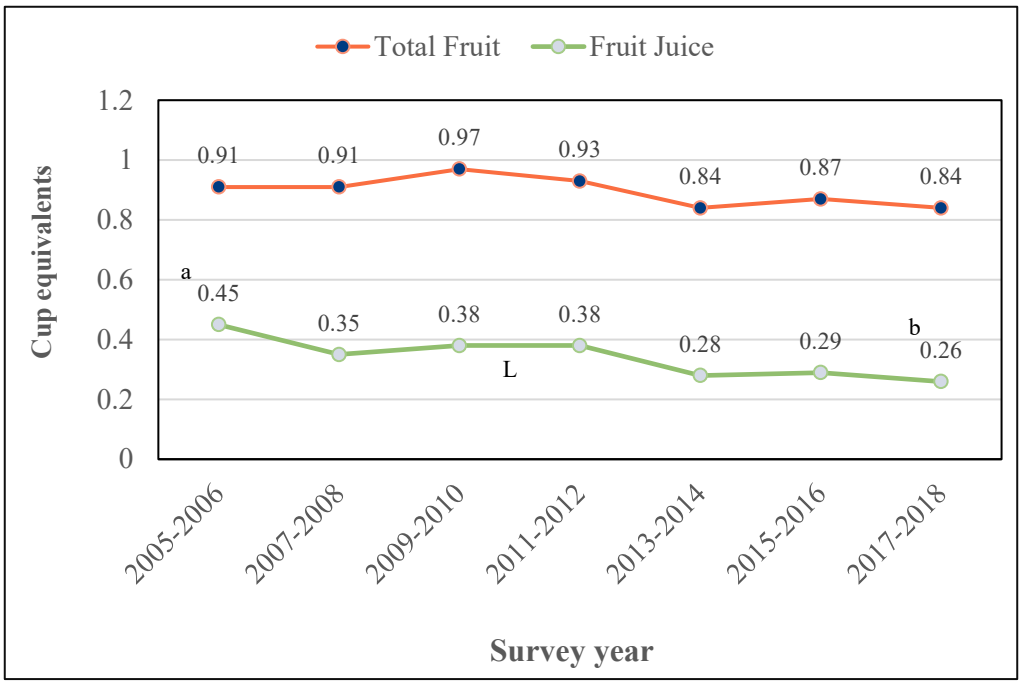
Did the fruit intakes change among adolescents 12-19 years?

Figure 3 includes the estimated mean intakes of total fruit and fruit juice by adolescents 12-19 years.

Comparison between 2005-2006 and 2017-2018:

- The total fruit intakes were not significantly different from each other.
- Fruit juice intakes were significantly different from each other.
- The linear trends for total fruit was not significant.
- Fruit juice had a significant, decreasing linear trend during this period.

Figure 3. Estimated mean intakes of total fruit and fruit juice by adolescents 12-19 years, from 2005-2006 to 2017-2018, WWEIA, NHANES



[a,b] Means with different superscripts are significantly different at p-value < 0.01.
[L] significant linear trend at p-value < 0.01
Data: Food Patterns equivalents data from WWEIA, NHANES 2005-2006 to 2017-2018, day 1, adolescents 12-19 years

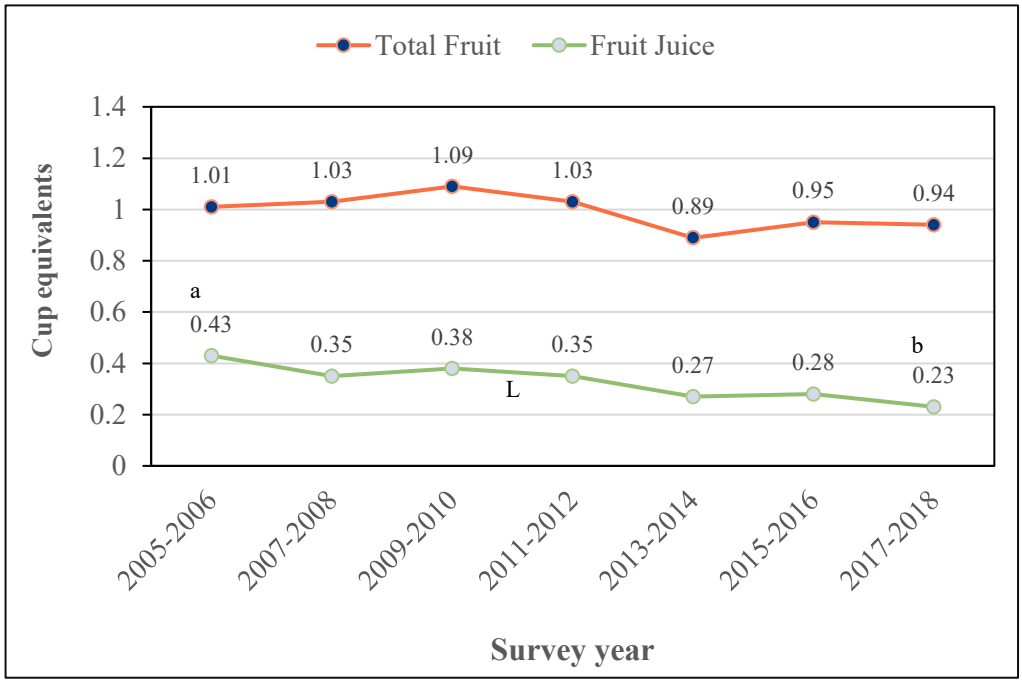
Did the fruit intakes change among males 20+ years?

Figure 4 includes estimated mean intakes of total fruit and fruit juice by males 20+ years.

Comparison between 2005-2006 and 2017-2018:

- The total fruit intakes were not significantly different from each other.
- Fruit juice intakes were significantly different from each other.
- The linear trends for total fruit was not significant.
- Fruit juice had a significant, decreasing linear trend during this period.

Figure 4. Estimated mean intakes of total fruit and fruit juice by males 20+ years, from 2005-2006 to 2017-2018, WWEIA, NHANES



a,b Means with different superscripts are significantly different at p-value < 0.01.

L significant linear trend at p-value < 0.01

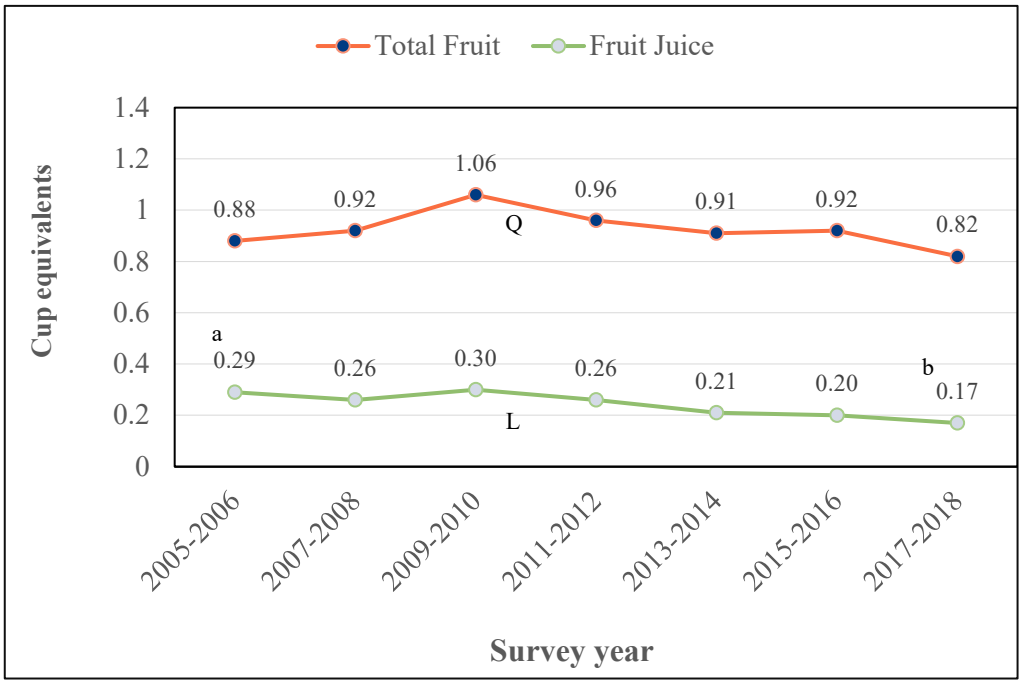
Data: Food Patterns equivalents data from WWEIA, NHANES 2005-2006 to 2017-2018, day 1, males 20+ years

Did the fruit intakes change among females 20+ years?

Figure 5 includes the estimated mean intakes of total fruit and fruit juice by females 20+ years. Comparison between 2005-2006 and 2017-2018:

- The total fruit intakes were not significantly different from each other.
- Fruit juice intakes were significantly different from each other.
- The linear trends for total fruit was not significant, but the quadratic trend was significant.
- Fruit juice had a significant, decreasing linear trend during this period.

Figure 5. Estimated mean intakes of total fruit and fruit juice by females 20+ years, from 2005-2006 to 2017-2018, WWEIA, NHANES



[a,b] Means with different superscripts are significantly different at p-value < 0.01.
[L] significant linear trend at p-value < 0.01
[Q] significant quadratic trend at p-value < 0.01
Data: Food Patterns equivalents data from WWEIA, NHANES 2005-2006 to 2017-2018, day 1, females 20+ years

What percentage of the total fruit intake was fruit juice?

Figure 6 includes the estimated mean percentage of total fruit consumed as fruit juice.

Comparisons between 2005-2006 and 2017-2018

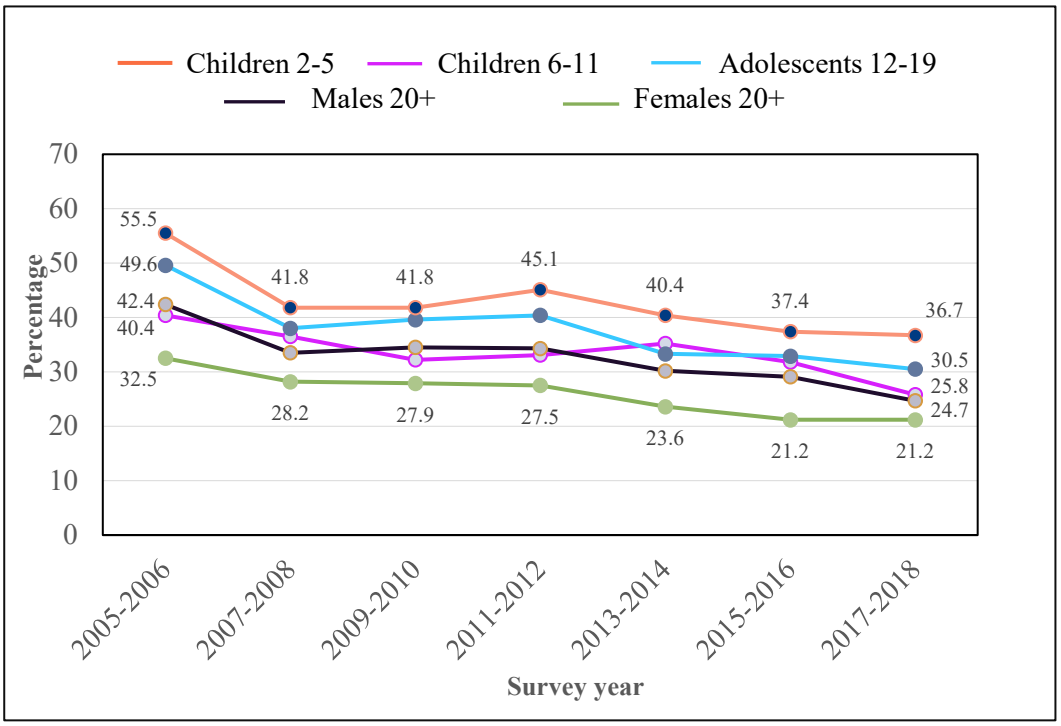
The respective mean percentages were significantly different for all demographic groups.

- Children 2-5: 55.5% and 36.7% - declined from about one-half to about one-third
- Children 6-11: 40.4% and 25.8% - declined from about 40% to about one-fourth
- Adolescents 12-19: 49.6% and 30.5% - declined from about one-half to about one-third
- Males 20+: 42.4% and 24.7% - declined from about 40% to about one-fourth
- Females 20+: 32.5% and 21.2% - declined from about one-third to one-fifth

On average, individuals 2 years and over consumed 40% of their total fruit intake as fruit juice in 2005-2006 and 25% as fruit juice in 2017-2018 (data not shown in Fig. 6.)

- The linear trends were significant for all demographic groups.
- The quadratic trends were not significant.

Figure 6. Estimated mean percentage of total fruit consumed as fruit juice from 2005-2006 to 2017-2018, WWEIA, NHANES



All percentages are shown in the graph except for those that overlap.
Estimated mean percentages in 2005-2006 were significantly different from that in 2017-2018 for all five demographic groups at p-value < 0.01.
Linear trends were significant for all five demographic groups at p-value < 0.01.
Data: Food Patterns equivalents data from WWEIA, NHANES 2005-2006 to 2017-2018, day 1, all individuals 2 years and over

What percentage of individuals report consuming fruit juice?

Figure 7 includes the estimated mean percentage of individuals who reported consuming fruit juice.

Comparison between 2005-2006 and 2017-2018

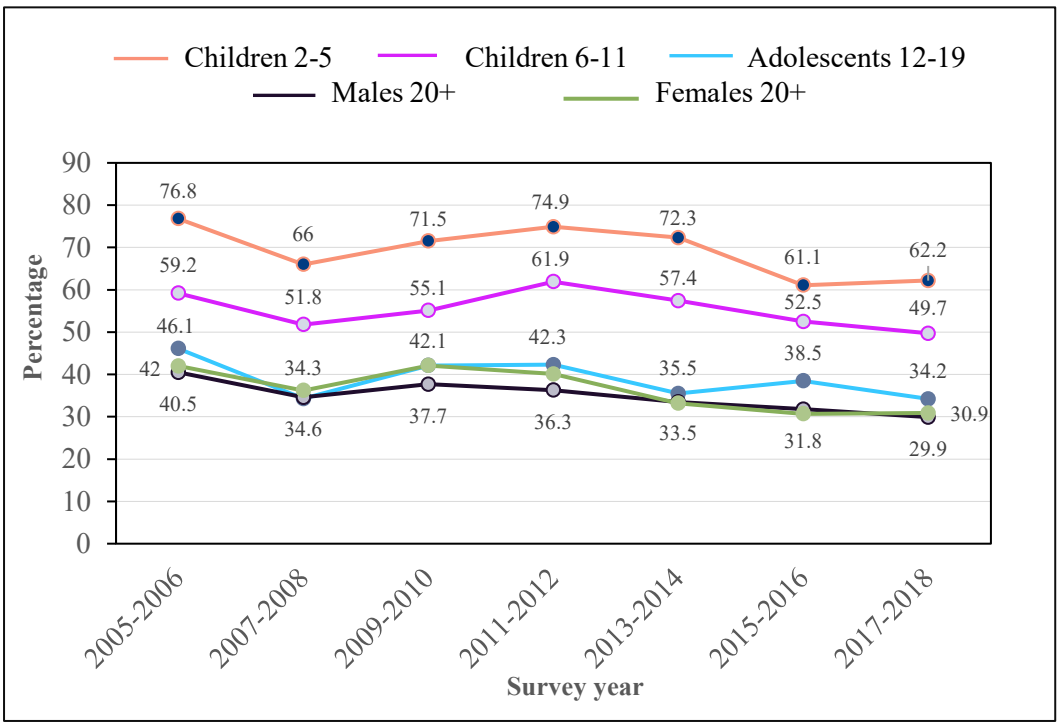
The respective mean percentages were significantly different for all five demographic groups.

- Children 2-5: declined from 76.8 to 62.2%, a difference of 14.6%
- Children 6-11: declined from 59.2% to 49.7%, a difference of 9.5%
- Adolescents 12-19: declined from 46.1% to 34.2%, a difference of 11.9%
- Males 20+: declined from 40.5% to 29.9%, a difference of 10.6%
- Females 20+: declined from 42.0% to 30.9%, a difference of 11.1%

The percentage of individuals, 2 years and over, who reported consuming fruit juice decreased from 45% to 34% during this period (data not shown in Fig.7.) This decline was significant at p-value < 0.01.

- The linear trends were significant for all demographic groups, except for children 6-11 years.
- The quadratic trends were not significant.

Figure 7. Estimated mean percentage of individuals reported consuming fruit juice from 2005-2006 to 2017-2018, WWEIA, NHANES



All percentages are shown in the graph except for those that overlap.
Estimated mean percentages in 2005-2006 were significantly different from that in 2017-2018 for all five demographic groups at p-value < 0.01.
Linear trends were significant for all the demographic groups, except for children 6-11 years at p-value < 0.01.
Data: WWEIA, NHANES 2005-2006 to 2017-2018, day 1, all individuals 2 years and over

What are the main findings of the study?

Between the two survey periods, 2005-2006 and 2017-2018:

- The estimated mean intakes of total fruit did not change significantly among children, adolescents, and adults. However, fruit juice intakes decreased significantly.
- Children, adolescents, and adults consumed significantly lower proportions of their total fruit as fruit juice.
- Percentage of individuals who reported consuming fruit juice declined significantly.

In summary, whereas the total fruit intake remained the same over the 7 survey periods, the proportion of 100% fruit juice to total fruit consumed declined. Moreover, fewer individuals reported consuming fruit juice over this period.

What are the implications of the study?

The DGA 2020-2025 and the earlier DGAs place limits on the amount of fruit juice to consume. The American Academy of Pediatrics also has limits on how much fruit juice children may consume. The decline in fruit juice intake could be due to the impact of these recommendations, although the NHANES do not collect data on the reason for the changes in fruit juice consumptions.

Methods

The study included individuals, 2 years and over, who had complete dietary intake data on day 1 on What We Eat in America (WWEIA), NHANES survey cycles from 2005-2006 to 2017-2018 [3]. Sample sizes are in Table 1.

Table 1. Sample sizes by age groups 2005-2006 to 2017-2018

Survey Year	2-5 years	6-11 years	12-19 years	Males 20+ years	Females 20+ years
2005-2006	902	1012	2115	2163	2357
2007-2008	832	1121	1156	2662	2758
2009-2010	861	1154	1265	2789	2973
2011-2012	834	1146	1152	2394	2407
2013-2014	676	1047	1296	2414	2633
2015-2016	665	1040	1196	2415	2602
2017-2018	540	795	1045	2307	2435

Two types of statistical analyses were conducted.

1. The first set of analysis compared mean intakes in 2005-2006 with that in 2017-2018.
2. The second set of analyses examined the overall linear and quadratic trends during the 7 survey periods from 2005-2006 to 2017-2018. Quadratic trends are reported in figures, only if they are significant.

A p-value < 0.01 was considered significantly different for all analyses.

Definitions

USDA Food Patterns include the five food groups, vegetables, fruit, grains, dairy, and protein foods; and components such as oils, solid fats, added sugars, and alcoholic drinks.

Total fruit consists of whole/cut/intact fruit and fruit juice. These may be obtained from single- or multi-ingredient foods.

Fruit juice consists of fresh, bottled, canned, and single strength 100% fruit juice diluted from frozen juice concentrates. This group also includes fruit juice from fruit canned in fruit juice, fruit juice from alcoholic beverage cocktails, fruit nectars (40% fruit juice assumed), and fruit juice drinks (15% juice assumed). Reference No. 4 includes definitions, what counts as one cup equivalent of fruit and fruit juice, and the foods assigned to the Food Pattern Fruit Group.

Data sources

Seven survey cycles of What We Eat in America, NHANES 2006-2018, day 1 Food Patterns equivalents dietary data were used to estimate total fruit and fruit juice intakes. Sample sizes are in Table 1 on page 9.

References

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