**OBJECTIVE**
To examine prospectively the association between beverage consumption (fruit juice, fruit drinks, milk, soda and diet soda), and changes in weight and body mass index (BMI) among low-income preschool children.

**STUDY DETAILS**
– Prospective cohort study
– 1345 children aged 2 to 5 years participating in the North Dakota Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) with two visits between 6 to 12 months apart
– Dietary intake during the previous month was assessed using a semiquantitative food frequency questionnaire (FFQ) that contained 84 foods and beverages
– Beverages recorded during this study:
  - Children excluded were those classified as underweight based on age and sex-specific 5th percentile BMI; who reported implausible daily energy intake (<800 kcal or >3500 kcal); with suspicious change in BMI (<-4 or >4 kg/m²); with only one clinic visit and with unreasonable measures of weight-for-height, weight-for-age or height-for-age

<table>
<thead>
<tr>
<th>Beverage</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Fruit juice</td>
<td>100% fruit juices (e.g., orange juice, apple juice)</td>
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<tr>
<td>Fruit drinks</td>
<td>Non-100% fruit drinks (e.g., lemonade, fruit punch)</td>
</tr>
<tr>
<td>Soda</td>
<td>Any non-diet soda</td>
</tr>
<tr>
<td>Diet soda</td>
<td>Any no- or low-calorie soda</td>
</tr>
<tr>
<td>Milk</td>
<td>All types of milk</td>
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</tbody>
</table>

**RESULTS**
– At the first clinic visit, 13% of girls and 15% of boys were at risk of overweight (BMI 85th to <95th percentile) and 5% of girls and 8% of boys were overweight (BMI ≥95th percentile)
– Almost 50% of children consumed 12 oz or more fruit juice per day
– One third of all children consumed 24 oz or more milk per day (this amount represents the highest recommended intake of milk for pre-school children by the American Academy of Pediatrics Committee on Nutrition)
– 81% of children were consuming 2% or whole milk
– All beverages were significantly correlated with total energy intake
– Children consuming fruit drinks were significantly more likely to consume soda ($r=0.23$, $p<0.001$)
– Children consuming milk were significantly less likely to consume soda ($r=-0.06$, $p<0.001$), or fruit drinks ($r=-0.09$, $p<0.001$)
– There was no association between change in weight or BMI with any of the beverages after adjustment for age, sex, energy intake, socio-demographic variables such as ethnicity, residence, level of poverty, maternal education and birthweight

**KEY FINDING**
No significant relationship was found between beverage consumption (fruit juice, fruit drinks, milk, soda and diet soda) and weight or BMI changes in this population of low-income preschool children in North Dakota.

Milk consumption was associated with the highest daily intake of energy from beverages, but this did not result in weight gain.
– The low intakes of soda, fruit drinks and diet soda seen in this study were possibly related to the fact that WIC program does not provide vouchers for these beverages
– There may have been a reluctance on the part of the mothers to report “unhealthy” beverage consumption, which coupled with the low intakes and limited variation of soda and fruit drinks limited the authors’ ability to see an association between these beverages and weight or BMI
– The study was unable to control for other major risk factors for obesity such as parental BMI, physical activity and television viewing. In terms of physical activity, perhaps children who are more active drink more beverages
– Lack of statistical power may have prevented the authors’ ability to detect a small, but clinically important association between beverages consumed and change in weight
– Beverage intake collected from FFQ provided information about the past month which may not be a good representation of intake over the entire follow-up period between the two visits
– Finally, this study looked at preschool children; this group has previously demonstrated a better ability to compensate for liquid energy intake compared with older children or adults