**Family Income and Childhood Obesity**

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**Introduction**
In this paper, I estimate the causal impact of family income on childhood obesity.

- **Direction of causality**
  1. Increase children’s weight: more income is associated with frequent restaurant meals which are often associated with higher caloric intake.
  2. Decrease children’s weight: income constrained families may choose healthier foods given higher income and more income reduces stress and thus reduces children’s weight.

- **Heterogeneous effect**
  1. Young vs. Old: Younger children’s weights are more affected by income since their dietary intake is more heavily influenced by parents.
  3. Socioeconomic status: Previous studies show that children from more disadvantaged families are more affected by changes in income.

- **Method**
  Data

- **Methodology**
  Instrumental Variable (IV) method, using structural changes to the EITC program as an instrument for family income.

- **Empirical Framework**
  **OLS Model**
  \[
y_{it} = \beta_{0} + \beta_{1}X_{it} + \epsilon_{it} \tag{1}
\]
  \(y_{it}\) = obesity status or BMI
  \(X_{it}\) = total family income net of taxes but including EITC amount
  \(\epsilon_{it}\) = vector of individual characteristics that changes with time
  \(w_{i}\) = observable time invariant (permanent) characteristics
  \(\mu_{i}\) = unobservable time invariant characteristics
  - If \(X_{it}\) is correlated with \(\mu_{i}\), \(\alpha\) would be biased.
  - To remove \(\mu_{i}\), use a first differenced (FE) model.

  **Differenced Model**
  \[
  \Delta y_{it} = \Delta \beta_{0} + \Delta \beta_{1}X_{it} + w_{i} + \delta_{it} \tag{2}
  \]
  - Differenced model removes \(\mu_{i}\) but there’s still a concern that \(\Delta \beta_{0}\) is still correlated with \(\Delta \epsilon_{it}\).
  - For example, family income could change due to a shock to parental health, which would also influence children’s weight.

  **Instrumental Variable Model**
  \[
  \Delta \epsilon^{IV}(P_{t-1}) = \epsilon_{t} - \bar{E}(P_{t-1} | \epsilon_{t-1}) - \epsilon_{t-1} - (P_{t-1}) - \bar{E}(P_{t-1} | \epsilon_{t-1}) \tag{3}
  \]
  \[
  \Delta \epsilon^{IV}(P_{t-1}) = \Delta \beta_{0} + \Delta \beta_{1}X_{it} + w_{i} + f(P_{t-1}) + \Delta \epsilon_{it}
  \]
  - \(\Delta \beta_{0}\) is instrumented by \(\Delta \epsilon^{IV}(P_{t-1})\)
  - Since \(\Delta \epsilon^{IV}(P_{t-1})\) is still a function of lagged income, it could be correlated with \(\Delta \beta_{0}\) due to serial correlation of income
  - So following Dahl and Lochner (2012), a fifth order polynomial function of t-1 income is included in the model.

**Results**

- **Least squares and Differenced estimates**

<table>
<thead>
<tr>
<th></th>
<th>OLS</th>
<th>OLS</th>
<th>OLS</th>
<th>FE</th>
<th>FE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income(10k)</td>
<td></td>
<td>(0.002)</td>
<td>(0.003)</td>
<td>(0.002)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>Male x income</td>
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<tr>
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<tr>
<td>Hispanic x income</td>
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<tr>
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</tbody>
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An increase in family income by $10,000 is associated with a 0.5% decrease in probability of being obese or 0.5% decrease in probability of being overweight or obese.

- **Instrumental variable (IV) estimates**

<table>
<thead>
<tr>
<th></th>
<th>IV1</th>
<th>IV1</th>
<th>IV2</th>
<th>IV2</th>
<th>IV3</th>
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</thead>
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<td>(0.044)</td>
<td>(0.026)</td>
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<tr>
<td>Child controls</td>
<td>x</td>
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<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Lag stage</td>
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<td>130</td>
<td>119</td>
<td>120</td>
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</tr>
</tbody>
</table>

If family income increase by $10,000, probability of obesity increases by 2.6%.

- **Hypothesis for the difference in estimates**
  1. OLS estimates are biased and IV estimates show the true relationship between income and childhood obesity.
  2. IV results are due to special characteristics of the EITC.
  - EITC is received in lump sum. People may spend their lump sum income differently from incremental income.
  - A number of studies show that the expansion of EITC program generated a labor supply increase. If parents are working more because they receive larger EITC benefits, this could have a separate impact on children’s weight.
  3. Nature of the instrument used for IV.
  - The relationship between family income and children’s weight is non-linear.
  - Changes in EITC only affect low-income individuals, hence the positive IV estimates could be capturing income effect on only low-income children.

**Conclusions**

- OLS estimates confirm previously accepted belief that income and children’s weight are negatively correlated.
- IV estimates show that income may be harmful for children’s weight, especially for younger and more disadvantaged children.
- Future research efforts can be directed at understanding why family income has an adverse effect on children’s weight.

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**Notes:**
Table w: OLS and FE estimates of the impact of family income on children’s weight: BMI and

**Table 1:**
Family income and childhood obesity

**Table 2:**
Family income and childhood obesity

**Table 3:**
Family income and childhood obesity

**Table 4:**
Family income and childhood obesity

**Table 5:**
Family income and childhood obesity

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