Obesity Rates of Cohorts in Middle Age: Increasing Burden, Increasing Educational Inequalities

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We have no commercial relationships to disclose.
Motivation

Importance of investigating obesity as risk factor of adverse health, functional limitations and chronic conditions

Inequalities in BMI and obesity are well established

- SES-BMI gradients stronger in women, vary across racial/ethnicity groups 1970s-2008 (Grabner 2012)
- Stronger increases in obesity rates in women 2005-2014 (Flegal et al. 2016), some levelling off cautiously noted (Rokholm et al. 2012)

Cohort inequalities?

- Strong cohort component suspected but evidence is scarce
- Available age-period-cohort analyses have problematic assumptions (Bell & Jones 2014)
- Characteristics of cohorts entering older ages necessary for social and healthcare planning

Data and Method

- National Health Interview Surveys (cross-sectional, annual data collection)

Age-Period-Cohort analysis

- 5-year periods 1976-2014 and five-year age groups 20-60
- Age-Period-Cohort Trended Lag Analysis (Chauvel & Schröder 2014; Bar-Haim, Chauvel, Hartung 2018) to detect fluctuations of prevalence of obesity across years
- Age-Period-Cohort Gap-Oaxaca Analysis to estimate the gradient related to education across age, period, cohort
Method Intro

The Lexis diagram to plot age against period to detect cohort change

*Figure: Simulated (against empirical) data on suicide rates per 100,000 population taken from Chauvel, Leist & Ponomarenko (2016)*

Method

0. Age-Period-Cohort model
   • Unidentifiable w/o further constraints

1. Age-Period-Cohort Detrended
   • Detects deviations from the linear trend of age, period and cohort
   • Cannot identify actual linear trends
   • Detects lucky/protected and unlucky/disadvantaged cohorts

1 Chauvel & Schröder 2014; Chauvel, Leist, Ponomarenko 2016; Stata: ssc install apcd
Method

2. Age-Period-Cohort Trended Lag
   • Constraints to identify social change via cohort vector
   • Age linear trend constrained to average within-cohort age effect; sum of age and period vectors zero; period linear trend zero

3. Age-Period-Cohort Gap/Oaxaca model
   • Blinder-Oaxaca decomposition in each cell of the Lexis table to derive differences between groups: Mean BMI of lower-educated minus mean BMI of higher-educated group
   • APCT-lag to detect the intensity of the cohort gap (constant), its evolution over time and non-linear accelerations of decelerations in the cohort trend

1 Bar-Haim, Chauvel, Hartung, 2018; Bar-Haim et al. 2018; Stata: ssc install apcgo

Descriptives

• Total of 4,071,692 observations 1976-2014, age 20-60
• 2,054,190 observations do not have information on BMI
• 17,080 observations without information on education
• 2,000,422 observations with information on BMI and education
• Age-Period-Cohort analysis requires the omission of first and last five-year age group:

• Final sample: 1,257,802 observations
• Higher education = BA holders or higher, 299,986 observations (23.84 %)
Descriptives

<table>
<thead>
<tr>
<th></th>
<th>M (Std)</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full sample</td>
<td>25.37 (4.87)</td>
<td>1,257,802 (100)</td>
</tr>
<tr>
<td>Obese (BMI&gt;=30)</td>
<td>34.00 (4.02)</td>
<td>211,249 (16.8)</td>
</tr>
<tr>
<td>Overweight (BMI&gt;=25)</td>
<td>27.01 (1.42)</td>
<td>421,385 (33.5)</td>
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<tr>
<td>Underweight (BMI&lt;=18)</td>
<td>17.21 (0.86)</td>
<td>20,029 (1.59)</td>
</tr>
</tbody>
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Strategy of Data Analysis

- Social trends with APC Trended Lag
- Educational gaps with APC Gap Oaxaca
- Stratified by gender (1)
- Stratified by gender; education; race/ethnicity (non-Hispanic White: non-Hispanic Black; Hispanic) (2)
1a. Obesity Trends in Women (apctlag)

- Social change in obesity rates in women across the window of observation (1976-2014)
- Slope increases in steepness for cohorts born 1960+

1b. Educational Gaps in Obesity Rates between Low- and High-educated Women (apcgo)

- BA holders versus non-BA holders
- Increasing inequalities = sharp change in steepness of the gradient for those cohorts born 1960+
1c. Obesity Trends in Men (apctlag)

- Social change in obesity rates in men across the window of observation (1976-2014)
- Less steep increases for men

1d. Educational Gaps in Obesity Rates between Low- and High-educated Men (apcgo)

- BA holders versus non-BA holders
- Increasing inequalities for those cohorts born before and after 1960 in men
Are there Race or Ethnicity Differences?

- Information on self-reported main racial background and Hispanic ethnicity

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>BMI mean (std)</th>
<th>Obesity rate in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Hispanic White</td>
<td>912,544</td>
<td>25.32 (4.75)</td>
<td>14.8</td>
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<tr>
<td>Non-Hispanic Black</td>
<td>155,045</td>
<td>27.22 (5.59)</td>
<td>26.2</td>
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<tr>
<td>Hispanic</td>
<td>135,692</td>
<td>26.8 (4.92)</td>
<td>22.2</td>
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</tbody>
</table>

2a. Trends in Women (apctlag)
2b. Trends in Men (apctlag)

- Strong gaps for cohorts born 1925-1940
- Gradients smaller for cohorts 1945-1960, before widening again for cohorts born 1960+
- Situation for Black low-educated women will be worse than for White counterparts

2c. Gaps b/w White and Black Women for Low Educated (apcgo)
Discussion

• Women of cohorts born 1960s and later entering old age in the next decade will present sharply increased obesity rates with associated challenges for social and healthcare systems
• In general similar patterns in increases of obesity rates for Black and White non-Hispanic men and women, and Hispanic men and women but different gap trajectories
• Possible explanations
  • Obesogenic environment; HFCS; sweetened beverages
  • Living conditions…

Annex Slides
Annex 1: BMI Trends in women (apctlag)

- Trends in BMI linear, capturing the increasing BMI across the weight/height distribution in the window of observation.

Annex 2: Educational Gaps in BMI in Women (apcgo)

- Gap analysis for BMI more pronounced than for obesity for cohorts born after 1960.
Annex 3: BMI Trends in Men (apctlag)

- Linear increase

Annex 4: Educational Gaps in BMI in Men (apcgo)

- No clear cohort trend
Annex 5. Trends in Hispanics (apctlag)

- Gaps between Hispanic and non-Hispanic women with low education are closing across the window of observation and are zero for cohorts born 1965+

Annex 6. Gaps in Obesity Rates between Low-educated Hispanic and non-Hispanic Women (apcgo)

- Gaps between Hispanic and non-Hispanic women with low education are closing across the window of observation and are zero for cohorts born 1965+
Annex 7. Educational Gaps in Obesity Rates between Hispanic and non-Hispanic Men (apcgo)

- BA holders versus non-BA holders
- Stable inequalities for those cohorts born before and after 1960 in men

Annex 8. Gaps b/w White and Black Men for Low-educated (apcgo)

- Smaller gaps in obesity rates
- Wide confidence intervals
- Gap closed for cohort born 1940 but widening again for cohorts 1960+
Annex 9. Gaps b/w White and Black Men for High-educated (apcgo)

- Wide confidence intervals
- Smaller gaps in obesity rates
- Cohorts born 1925 to 1940 close gap b/w White and Black men
- Cohorts born 1960+ widening again but w/wide CIs