

# Childhood socio-economic status and obesity in later life among older Chinese men and women in Singapore

Rahul Malhotra<sup>1</sup>

Angelique Chan<sup>1,2</sup>

Chetna Malhotra<sup>1</sup>

Truls Østbye<sup>1,3</sup>

1. Health Services and Systems Research, Duke – National University of Singapore Graduate Medical School, Singapore
2. Sociology, NUS, Singapore
3. Community and Family Medicine, Duke University, Durham, NC, USA

**24<sup>th</sup> REVES Meeting, Taichung, Taiwan, May 25-27, 2012**

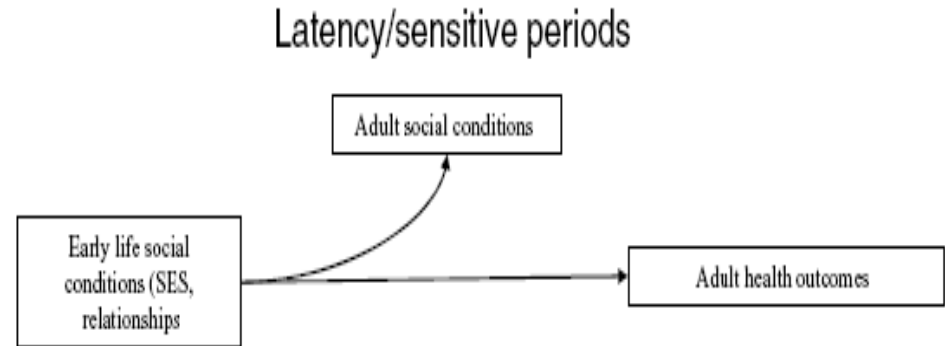
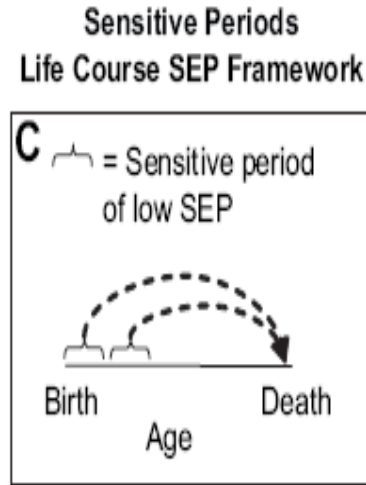
**“Inequalities in Health by Socio-economic Status: Is it a universal fact?”**

# Obesity and Socio-Economic Status

- **Obesity among older adults**
- **Socio-economic status (SES)**
  - Well known distal determinant of obesity
  - Most studies address adult SES / adult obesity
  - SES is not stable, but rather dynamic
  - Role of childhood SES?

# Childhood SES – Adult health outcomes

## 'Sensitive Periods' framework



Loucks EB, Pilote L, Lynch JW, Richard H, Almeida ND, Benjamin EJ, Murabito JM. Life course socioeconomic position is associated with inflammatory markers: the Framingham Offspring Study. *Soc Sci Med*. 2010 Jul;71(1):187-95.

Berkman LF. Social epidemiology: social determinants of health in the United States: are we losing ground? *Annu Rev Public Health*. 2009 Apr 29;30:27-41.

# Childhood SES and Obesity

- Recent studies, sensitive period framework
  - **Inverse association** (low childhood SES ~ higher prevalence or odds of adult obesity) - **Most studies**
  - **No association - Few studies**
- Limitations
  - **Most studies** pertain to **Caucasian** populations (US and Europe) and to **middle-aged** individuals
  - **Asian setting?** (Period and pace of economic development)
  - **Older adults?** (Childhood in an earlier period)

# SES and Obesity: Variation by setting and gender

- Variation by setting
  - **Developed economies: Inverse association** of adult SES and childhood SES with adult obesity
  - **Developing economies: Positive association** of adulthood SES and with adult obesity
- Variation by gender
  - **Stronger for women** than for men

# Singapore: Unique setting

- **Older adults** (aged 60+): **14.1%**
- **Obesity** (Body Mass Index [BMI]  $\geq 27.5$  kg/m<sup>2</sup> [Asian classification]): **18.6%**
- **Rapid economic transition**
  - Childhood: Developing economy
  - Adulthood: Rapidly developing / developed economy
- Does the **childhood SES ~ older adult obesity association** match with developing economies (**positive**) *or* developed economies (**inverse**)?
- Variation by gender?

# Objective

To assess the association of childhood SES and older adult obesity among older Singaporean Chinese men and women, using the SP framework

## Hypotheses:

- Low (vs. high) childhood SES  $\sim$  Lower prevalence and odds of older adult obesity (i.e. a positive association)
- Stronger for women, relative to men

# Methods: Setting and Dataset

- **Singapore**

- Multi-ethnic Asian country
- Population: 5.8 million
- High-rise high-density public

(Housing Development Board [HDB]) housing



<http://www.shantravels.com/Travels/Singapore/singapore.php>

- **Social Isolation, Health and Lifestyles Survey (SIHLS) 2009**

- 5000 community-dwelling elderly (60+) Singaporeans
- **3576 (71.5%) of Chinese ethnicity**



# Methods: Childhood (and Adult) SES

SES	Indicator	Low	High
<b>Childhood</b>	<b>Family financial status:</b> “Now think about your family when you were growing up, from birth to age 16. Would you say your family during that time was .....?”	Response: “Poor”	Response: “Average” or “Pretty well off”

# Methods: Childhood (and Adult) SES

- **Childhood SES**

- Missing for 311 (8.7%) participants
- Imputed using multiple imputation (MI) (monotone logistic regression model) ~ 10 times
  - age, gender, marital status and two adult SES indicators

- **Educational status**

- Missing for 10 (0.3%) participants
- Excluded from further analysis

# Methods: Outcome

- **BMI**

- Measured weight and height
- Missing for 449 (12.6%) participants
- Imputed using (MI) (Markov Chain Monte Carlo method) ~ 10 times
  - age, gender, marital status, self-reported disease status (cardiovascular disease, hypertension, diabetes and chronic back pain), smoking status, height and weight

- **Older adult Obesity:** BMI  $\geq 27.5$  kgm<sup>-2</sup> (Asian classification)

# Methods: Statistical analysis

- **1530 (42.9%) men and 2036 (57.1%) women**
- Prevalence of childhood and adult SES indicators, and of older adult obesity by SES indicators
- **Association between childhood SES and older adult obesity**
  - Unadjusted (without adjusting for adult SES or age) and adjusted logistic regression models

# Methods: Statistical analysis

- **MI ~ 10 'complete' datasets**
  - all estimates calculated separately for each dataset
  - combined into a single estimate with confidence intervals and/or p-values adjusted for missing data uncertainty
  - p-value < 0.05 : statistically significant
- **Sensitivity test**
  - Analysis limited to the 1,286 men and 1,687 women without missing data on BMI, childhood SES and adult SES (complete case analysis)
- SAS for Windows, Version 9.2.

# Methods: Ethical considerations

- De-identified dataset.
- Exemption from full IRB review from NUS and Duke IRBs

# Results: Participant characteristics

**Table 1: Weighted prevalence of age and obesity among older Singaporean Chinese men and women in the analysis sample**

<b>Characteristic</b>	<b>Men Weighted %<sup>a</sup> N = 1530</b>	<b>Women Weighted %<sup>a</sup> N = 2036</b>
<b>Age (in years)</b>		
60-69	61.5	54.3
70-79	28.9	29.9
80 or more	9.6	15.8
<b>Obesity</b>	13.0 (11.2-14.8) <sup>b</sup>	17.0 (15.3-18.7) <sup>b</sup>

<sup>a</sup> weighted by survey sample weights

<sup>b</sup> 95% confidence interval. It accounts for variation in estimates in each of the ten imputed datasets (which differed in imputed BMI values). The ten estimates were combined to arrive at the single estimate presented in the table

# Results: Childhood and adult SES, and obesity by SES

Table 2: Childhood and adult SES indicators, and older adult obesity by SES indicators

SES indicator	<i>Men</i>		<i>Women</i>	
	Weighted column % (95% CI) <sup>a</sup> <b>N = 1530</b>	Older adult obesity Weighted row % (95% CI)	Weighted column % (95% CI) <sup>a</sup> <b>N = 2036</b>	Older adult obesity Weighted row % (95% CI)
<b>Childhood SES</b>				
<b>Low</b>	55.6 (53.0, 58.1)	<b>11.1</b> (8.8, 13.5)	62.2 (60.1, 64.4)	<b>16.4</b> (14.3, 18.6)
<b>High</b>	44.4 (41.9, 47.0)	<b>15.3</b> (12.5, 18.1)	37.8 (35.6, 40.0)	<b>17.9</b> (15.1, 20.8)

<sup>a</sup> 95% confidence interval. It accounts for variation in estimates in each of the ten imputed datasets. The ten estimates were combined to arrive at the single estimate presented in the table



# Results: Childhood (and adult) SES association with obesity

**Table 3: Association of childhood (and adult) SES with older adult obesity: Unadjusted and adjusted OR estimates**

SES	<i>Men (N = 1530)</i> Odds ratio (95% CI) <sup>a</sup> for Obesity		<i>Women (N = 2036)</i> Odds ratio (95% CI) <sup>a</sup> for Obesity	
	<b>Unadjusted</b>	<b>Adjusted</b>	<b>Unadjusted</b>	<b>Adjusted</b>
<b><u>Childhood SES</u></b> Low versus high	<b>0.69*</b> <b>(0.51, 0.93)</b>	<b>0.67*</b> <b>(0.50, 0.92)</b>	0.90 (0.72, 1.13)	<b>0.78*</b> <b>(0.62, 1.00)</b>

\*  $p < 0.05$

<sup>a</sup> 95% confidence interval. It accounts for variation in estimates in each of the ten imputed datasets. The ten estimates were combined to arrive at the single estimate presented in the table

# Discussion

- **Low childhood SES ~ Lower odds of obesity**
  - In line with our hypothesis of a positive association
  - Previous studies: Inverse (most) or no (few) association
- **'Childhood' (0-16 yrs) setting and time period**
  - Born 1908 to 1949; Singapore or Malaysia
  - Childhood years (all or a considerable part):
    - Developing economy
    - Colonial rule (British [till 1962] and Japanese[1942-45])
    - Periods of economic and (food) insecurity
      - Depression in the West (early 1930s)
      - Japanese Occupation
      - Post WW II

# Discussion

- **Low childhood SES ~ Lower odds of obesity**
  - Poorer families / Low SES: disproportionately exposed to a nutritionally inadequate diet or to limited caloric intake
  - **Average lower limb length:**
    - **Men: low (81.02 cm) vs high (81.76 cm) childhood SES**
    - **Women: low (73.66 cm) vs high (73.88 cm) childhood SES**
    - Lower for low SES for both, significant for men (stronger effect?)
  - Continuing influence of childhood nutritional or caloric inadequacy

# Discussion

- **Low childhood SES ~ Lower odds of obesity**

- Alternative explanations:

- Financial hardship more sensitive?
- Residual confounding by adult SES
- 'Healthy' survivor bias

- **Low education ~ Higher odds of obesity for women**

- Previous studies: Similar findings.
- Lower levels of knowledge and of adoption of healthy lifestyles
- Greater consumption of cheaper but calorie dense foods
- Value of being thin

# Discussion

- **Limitations:**

- Retrospective recall of childhood SES
- Cross-sectional design

- **Strengths:**

- Large representative sample
- Among the few studies assessing the association of childhood SES with obesity in adulthood from Asia, and among older adults
- Results hold in sensitivity test (complete case analysis – not shown)

# Conclusion

- The inverse **association** of childhood SES with obesity in adulthood is not universal, rather is **context (age cohort and setting) specific**

# Acknowledgements / Funding

- **Social Isolation, Health and Lifestyles Survey 2009:**
  - Ministry of Community Development, Youth and Sports, Singapore
  - Nihon University Population Research Institute from the "Academic Frontier" Project for Private Universities: matching fund subsidy from MEXT (Ministry of Education, Culture, Sports, Science and Technology), 2006-2010
- **Analyses:**
  - Tsao Foundation Ageing Research Initiative, NUS
  - A\*STAR infrastructure grant to the Duke-NUS Program in Health Services and Systems Research
- **Travel support:**
  - National Medical Research Council through their Singapore Translational Research Investigator Award (STaR Award) to Prof. D.B. Matchar



transforming  
medicine,  
improving lives

**DUKE**  **NUS**  
GRADUATE MEDICAL SCHOOL SINGAPORE

**THANK  
YOU**

Partners in Academic Medicine



**DUKE**  **NUS**  
GRADUATE MEDICAL SCHOOL SINGAPORE

[www.duke-nus.edu.sg](http://www.duke-nus.edu.sg)





# Methods: SIHLS 2009

- Survey of **community-dwelling elderly Singaporeans**, aged 60 years and above
- Commissioned by the Ministry of Community Development, Youth and Sports (**MCYS**), Singapore
- Random sample of 8400 elderly
- 1195 (14.2%) addresses: Invalid
- **5000 elderly interviewed** at their residence after written informed consent (Response rate: 69.4%)
- Proxy interviews: 458 (9.2%) elderly