Impact of Socioeconomic Status and Upward Mobility on Rural Childhood Overweight and Obesity

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INTRODUCTION

Rural youth are now experiencing higher rates of overweight and obesity than their urban counterparts.[1] Rural communities have higher poverty levels, less access to healthy foods, and limited resources. These barriers compound communities ability to address obesity. While poverty experienced in early childhood has been found to affect BMI in adulthood,[2] little is known about whether there may be critical periods during gestation, childhood, or adolescence when exposures to poverty may have major and irreversible consequences. This study examines this relationship in a rural population.

RESEARCH QUESTION

- How are changes in SES from birth to adolescence (SES trajectories) associated with the odds of overweight at age 13?

METHOD

Population and Sample

This study employs an observational birth cohort (n=595) located in rural, central New York.

Data Collection

This study employs two sources of data collection.

1. **Prospective Birth Cohort**: The first source of data collection was from mothers enrolled in the Bassett Mothers Health Project 1 (BMHP1) who gave birth to a child from June 1995 to July 1997.

2. **Retrospective Medical Chart Audits**: The second source of data collection was a medical chart audit of each child born to a mother from the BMHP1.

Measures and Variables

Exposure Variable-- SES Trajectory: For each recorded medical visit a child is classified low-income if their insurance was listed as Medicaid or Child Health Plus, which requires families to be below 185% of the poverty line. Using PROC TRAJ in SAS 9.2 the longitudinal models classified children based on their family's movement in and out of low income through childhood.[3] **Figures 1 and 2** illustrate the grouping technique of PROC TRAJ and the final model used to categorize children into trajectories.

METHOD cont.

Outcome Variable: Body mass index (BMI) was calculated for children whose height and weight was measured at 3, 6, or 13 years (± 6 months). Overweight: BMI percentile ≥ 85th sex-specific percentile for age, based on the CDC growth reference for 2000. Obese: BMI percentile ≥ 95th sex-specific percentile for age.

Covariates: The following variables were included in the full models to test for possible confounding: maternal early pregnancy BMI category (under, normal, over, obese), maternal education (4 levels), excessive maternal gestational weight gain (yes/no), multiparious (yes/no), smoking during pregnancy (yes/no), and infant birth weight (in grams).

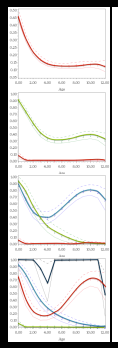

Figure 1. Modelling of SES Trajectories.

The first model has only one group defined and represents the population average. The second model reveals two "latent" groups within the population average, one never low-income and the other more low-income. This continues until the model with the best fit is found.

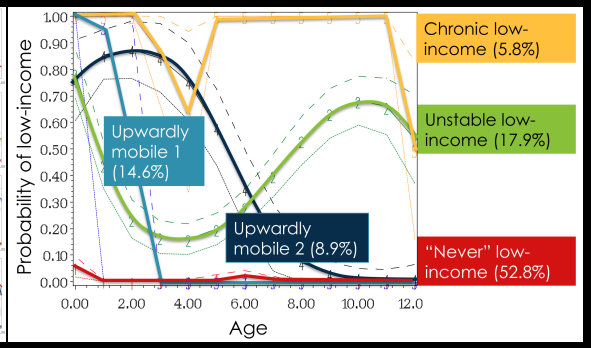

Figure 2. Five Group Model for SES Trajectories.

Model selection is based on the change in BIC between the simpler and more complex model.[3] Change in BIC approximates the evidence against the null hypothesis (that the simpler model is better) while penalizing more complex models.[3] For this study the five group model provided the best fit.

Statistical Analysis

Logistic regression models were developed for predicting overweight in children controlling for potentially confounding factors. Analyses were done with both overweight and obesity as outcomes and three ages 3, 6, and 13 years.

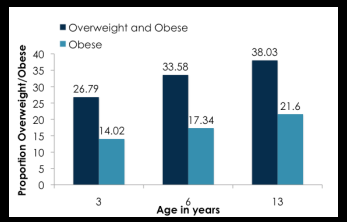

Figure 3. Proportion of children who were overweight at ages 3, 6, and 13 years.

RESULTS

Description of Sample

Figure 3 illustrates that overweight and obesity increased from 3 to 13 years. Additional analyses (not shown) revealed significant relationships between SES trajectory, maternal education, maternal early pregnancy BMI and risk of overweight and obesity at 3, 6, and 13 years. However, the most consistent trends were in overweight adolescents (age 13). The results from these analyses will be further discussed below. The 13-year analysis sample (n=213) has significantly reduced numbers of low-income at birth *(37.7% vs 46.8%, p=0.03)* and smoking during pregnancy *(15.5% vs. 22.3%, p=0.05)* compared to the population sample.

SES Trajectory and Overweight at 13 years of age

A full model was created with all the potentially confounding factors (R^2=20.78%). **Table 1** shows the results from the reduced model created using stepwise reverse regression until all covariates were significant. None of the significant variables changed in that process.

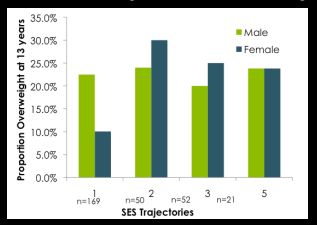

Figure 4. Proportion of adolescents (age 13) who were overweight within each sex and SES trajectory.

SES 1= Never Low Income
SES 2= Unstable Low Income
SES 3= Upwardly Mobile
SES 5= Chronic Low Income

RESULTS cont.

Interaction between SES Trajectory and Sex

Due to the small sample sizes created by the SES and sex interaction, SES trajectories 3 and 4 were combined to represent one group of "upwardly mobile."

Figure 4 illustrates the significant interaction shown in **Table 1** between SES trajectory and sex in predicting overweight risk in 13-year-old. Male 13-year-olds are twice as likely to be overweight in the "Never low-income group" (22.5% vs. 10.1%). Whereas, female 13-year-olds are more likely to be overweight in the "Unstable low-income" and "Upwardly Mobile" SES trajectories.

	OR	95% CI	p-value	
SESTraj x Sex				
Never low income (LI)	1	-	-	
Unstable LI and female	7.4	(1.8, 29.6)	0.005	*
Upwardly Mobile and female	7.3	(1.8, 28.9)	0.005	*
Chronic LI and female	0.62	0.063, 6.107	0.68	
Maternal Prepreg BMI				
Underweight	3.9	(0.7, 22.1)	0.116	
Normal	1	-	-	
Overweight	2.7	(1.4, 5.2)	0.003	*
Obese	4.1	(2.1, 7.9)	<0.0001	*

Table 1. Reduced Model with Odds of being overweight at age 13 (n-213).

Other variables included but not shown are: SES trajectories and sex. R^2=18.7

CONCLUSION

Previous studies that have examined the association between SES and overweight in children have been cross-sectional and have suggested a weak relationship.[4] By using SES trajectories, which simultaneously captures duration, sequence, and timing of low-income, this study brings a novel approach to examining the relationship between SES and overweight. This study adds a more complex understanding of the potential importance of timing and gender to the risk of overweight in adolescence.

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