

# **Subjective Social Status and Physiological Dysregulation in Young Adulthood: More Evidence for the Social Gradient in Health**

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## **Background/motivating theory:**

A person's place within the social stratification hierarchy matters a great deal for a variety of outcomes, including health (Adler and Rehkopf 2008; Braveman et al 2010). Researchers have used a number of criteria for determining location in the social structure, including a variety of objective measures of socioeconomic status such as income, occupation, education and wealth (Braveman et al 2005). It is fairly well established that objective social status (OSS) matters a great deal for mortality and morbidity, but how and why different OSS indicators matter is contentious (Braveman et al 2005; Link and Phelan 1995; Winkleby et al 1992). Part of the problem may be that despite the intercorrelation and predictive properties of OSS markers, no individual measure can completely capture the multidimensionality and life course-spanning nature of social status.

On the other hand, subjective social status (SSS) has long intrigued sociologists, public health researchers and psychologists, both as a theoretical construct and a tool in survey design (Jackman and Jackman 1973; Kluegel et al 1977; Operario et al 2004). There is emerging evidence that suggests SSS is more strongly related to morbidity and mortality than OSS (Adler et al 2000; Singh-Manoux et al 2005; Ostrove et al 2000; Demakakos et al 2008). While OSS may relate to material resources that perpetuate health disparities (Link and Phelan 1995), SSS may get under the skin through exposure to and ability to cope with stress, as theorized by reserve capacity models of stress (Matthews et al 2010). Those who perceive their status to be low (as measured by SSS) may feel more stress and experience more stressors while simultaneously being less equipped to deal with this stress (Marmot 2004).

With the widespread availability and growing collection of objective biomarkers of physiological regulation in data sets, attention has turned to examining how SES is related to markers of immune, cardiovascular and metabolic function (Wolfe et al 2012). Yet no one has examined the relationship between SSS and these biomarkers in a nationally representative sample of young adults. This paper will examine the associations between SSS and biomarkers, and compare these to the associations between more traditional OSS measures of SES and the biomarkers. I hypothesize that SSS will be more strongly related to these objective health measures, an indication that subjective status "gets under the skin" early in the life course even before disease emerges.

## **This paper's contribution:**

This paper provides additional evidence of a health gradient along socioeconomic lines, while further elucidating the process of how exactly low SES "gets under the skin" to worsen health. Fundamental causes theory suggests that OSS is directly related to access to resources, material and non-material (Link and Phelan 1996). Others have theorized that the stress of low status is internalized and eventually increases physiological dysregulation (Marmot 2004). While OSS markers can serve as proxies for low status, there is no better way to measure how one perceives their own status than by using SSS. Comparing the relative strength of OSS markers across the life course and SSS in young adulthood in relation to physical health will engage and clarify the debate between relative social standing (SSS) and absolute material resources (OSS).

And, while a provisional relationship between low SSS and high morbidity and mortality has been established, the relationship between subjective social status and objective biomarkers has yet to be thoroughly examined with a diverse, nationally representative data set. In addition, most studies have focused on later adulthood, once disease has manifested. By utilizing a nationally representative sample of young adults, I plan to demonstrate that SSS disparities in health begin early in the life course, even before typical diseases emerge. Thus, limiting focusing policy interventions to later life once morbidity and mortality differentials are high may not be as useful as intervening in early life stages, including adolescence and young adulthood.

### **Data:**

This paper will use the National Longitudinal Study of Adolescent Health (Add Health), a nationally representative data set that originally sampled 20,754 students ages 12 - 18 from 132 middle- and high-schools across the country during the 1994-1995. The first wave of data collection includes an in-school survey, a more detailed in-home interview, a parent questionnaire and Census data based on the respondent's home address. Three additional waves of data were collected in in-home interviews to follow the original cohort as they aged: Wave II (1995 – 1996), Wave III (2001 – 2002), and Wave IV (2008 – 2009). Biomarker collection was part of Wave IV, and nearly every respondent has these objective measures of physical health available to analyze.

I will draw on data from two waves of Add Health, Waves I and IV, which reflect two life course stages of interest: adolescence and young adulthood, respectively. Both waves have data on OSS markers that are specific to the life course stage. Thus, because of the wide variety of socioeconomic variables measured across waves, I select appropriate measures of OSS as the life course stage requires, making this study a true life course and intergenerational investigation, improving upon previous studies limited by cross-sectional data.

### **Measures:**

#### *Dependent variables:*

C-reactive protein: CRP measures immune function and inflammation. To adjust for skewing, I create a linear variable of the logged value of the original CRP measure (logCRP). In addition, I utilize a clinically relevant categorical measure of inflammation: Low (CRP < 1), Average (CRP between 1- 3), High (CRP between 3- 10) and Very High (CRP >10)

Blood pressure: Add Health reported both systolic and diastolic linear blood pressure, measures of cardiovascular function. For this paper, I use a linear measure of systolic blood pressure (SBP) and a clinically relevant binary indicator of hypertension to capture both diagnosed and undiagnosed hypertension, including those who had high measured blood pressure (SBP $\geq$ 130 and/or DBP $\geq$ 90), self-reported a hypertension diagnosis or were taking hypertension medication at the time of the Wave IV survey.

#### *Independent variable:*

Subjective social status: I use the variable at Wave IV that asked respondents to place themselves on a ladder compared to the rest of the US population, with the lowest rung (1) being those least well-off and the top rung (10) being those the most well-off.

#### *Control variables:*

Adolescent/parental OSS: Parental household income status is a categorical variable taken from the parental questionnaire from Wave I, where a parent or parent figure (most often the respondent's mother)

reported their 1994 annual household income in thousands. Because of the large amount of missing data, I create a categorical variable that includes poor (HH income below \$15,000, approximately the federal poverty line of 1994: \$14,800), near poor (\$16,000 – \$30,000: twice the federal poverty line in 1994), not poor (\$31,000 or more) or missing. Parental education is reported by the adolescent respondent for their residential mother and/or father, and the highest education reported is used to create a categorical variable: less than high school, high school graduate, some college, or at least a college degree (college+). Respondent OSS: Construction of the respondents household income categories mirror that of the parental household income categories, using the 2008 poverty line (\$21,000). Respondent education mirrors the parental education categories.

Socio-demographic: I also control for age at Wave I, sex, race/ethnicity (White, Black, Asian, Native American/Other and Hispanic), family structure (living with both biological parents; two-parents, step; single mother; single father; or other), ever being married by Wave IV and immigrant status (native born, second- or first- generation).

Health behaviors: I also introduce body mass index (measured at Wave IV), a dichotomous variable indicating daily smoking, and a dichotomous variable indicating lack of physical activity.

### **Preliminary findings:**

Table 1 presents the adjusted multivariate results on the relationships between subjective and objective socioeconomic measures and log C-reactive protein. Model 1 is the adjusted univariate relationship between SSS and CRP. Every unit increase in the ladder variable is associated with a 0.0656 reduction in logCRP. Model 2 presents the relationship between parental OSS and own OSS and logCRP. Neither parental nor own income is associated with logCRP. Having a parent with some college is associated with a reduction in logCRP of 0.101 and a parent with at least a college degree is associated with a slightly greater reduction in logCRP of 0.126. Respondents with a college degree or more educational attainment have lower logCRP (beta = 0.216). Model 3, which mutually adjusts for own and parental OSS and SSS, shows that both own and parental education remain significantly associated to logCRP, as does SSS. Finally, model 4 adjusts for health behaviors in addition to the Model 3 variables. Interestingly, these additional covariates mediate the relationship between own education and parental college degree+ and logCRP, but a significant association between SSS and logCRP remains.

### **Further research/conclusion:**

These preliminary results show that SSS is related to objective biomarkers of inflammation in a nationally-representative sample of young adults in the US. These relationships remain significant even with the introduction of OSS markers across the life course. However, health behaviors mediate almost all OSS relationships with the biomarkers, while SSS associations remain. This lends support to both the fundamental causes and internalized stress of low status models. While related, both SSS and objective education levels are negatively associated with logCRP levels, SBP and the binary indicators of inflammation and hypertension (results not presented in this abstract). In addition, adjusting for health behaviors mediates almost all OSS associations with logCRP, but while the SSS coefficient weakens, it remains significant. This suggests that while OSS may be related to health behaviors and health resources, the SSS relationship with health may due to an entirely different process, like the internalized stress of low status Marmot (2004) suggests.

Further analyses for this paper will continue to examine how OSS and SSS are independently related to objective biomarkers in young adulthood. I plan to investigate additional OSS measures across

the life course, including wealth, welfare receipt, home ownership, neighborhood disadvantage and occupation. In addition, I will explore other possible mediating mechanisms that can explain the association between SSS and health, including perceived stress, sleep quality, mastery and self-esteem. Thus, this paper aims not only to examine the relative importance of OSS and SSS for biomarkers disparities that emerge in young adulthood, but also to investigate the different mechanisms that connect objective and subjective status to health.

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Table 1: Adjusted objective and subjective socioeconomic status and C-reactive protein models  
(N=11,737)

	Log CRP			
	1	2	3	4
<b>SSS Ladder</b>	-0.0656*** (0.00942)		-0.0422*** (0.0101)	-0.0243** (0.00820)
<b>Parental Education (HS = ref)</b>				
Less than HS		-0.0342 (0.0545)	-0.0315 (0.0540)	-0.0561 (0.0465)
Some College		-0.101* (0.0449)	-0.0995* (0.0452)	-0.0811* (0.0410)
College +		-0.126** (0.0433)	-0.116** (0.0433)	-0.0296 (0.0361)
<b>Parental Income (Not poor = ref)</b>				
Poor		0.108 (0.0599)	0.106 (0.0600)	0.0726 (0.0492)
Near Poor		0.0856 (0.0499)	0.0821 (0.0503)	0.0524 (0.0442)
Missing		0.0293 (0.0439)	0.0287 (0.0437)	0.0190 (0.0367)
<b>Own Education (HS = ref)</b>				
Less than HS		0.0774 (0.0895)	0.0651 (0.0900)	0.112 (0.0810)
Some College		-0.0131 (0.0429)	-0.00590 (0.0427)	-0.0299 (0.0402)
College +		-0.216*** (0.0515)	-0.170** (0.0524)	-0.0410 (0.0492)
<b>Own Income (Not poor = ref)</b>				
Poor		0.0221 (0.0571)	-0.0171 (0.0567)	-0.0102 (0.0491)
Near Poor		0.00805 (0.0470)	-0.0166 (0.0467)	-0.0135 (0.0407)
Missing		0.104 (0.0754)	0.0836 (0.0757)	0.103 (0.0677)
<b>BMI Wave IV</b>				0.0808*** (0.00211)
<b>Smoker Wave IV</b>				0.0813* (0.0364)
<b>Inactive Wave IV</b>				0.154*** (0.0403)
Constant	0.426* (0.163)	0.229 (0.158)	0.407* (0.168)	-1.879*** (0.159)
R-squared	0.061	0.067	0.069	0.264

- a. Models adjusted for age, sex, race/ethnicity, family structure and immigrant status at baseline and marital status at Wave IV
- b. \* p<.05, \*\* p<0.01, \*\*\* p <0.001