# The Dynamics of Child Poverty and Awakening Cortisol in Adolescence

Extended Abstract

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## Background

Poverty constrains opportunity and increases exposure to a wide constellation of social stressors and is extremely harmful to child well-being. In the U.S. approximately 4 million babies are born each year. Of these births an astonishing 800,000 will live in families living below the official poverty threshold with another 900,000 in families struggling to make ends meet (Knitzer and Perry 2009). Perhaps even more astonishing, among the roughly 74 million children in the U.S. over 31 million live in low income households with nearly 10 million of these being adolescents (Douglas-Hall, Chau, and Koball 2006)[1]. Living in poverty long-term is thought to alter neurobiological functioning which in turn is associated with: poor mental and physical health, diminished cognitive and memory function, and even diminished life chances including socioeconomic attainment (Evans and Schamberg 2009; Evans and Kim 2007; Massey 2004). These detrimental effects coupled with such high child poverty rates present a pressing need to understand how poverty alters HPA axis functioning.

There is compelling body of evidence suggesting that the conditions associated with socioeconomic status can alter HPA axis functioning through exposure to stress, although the nature in which SES alters HPA is still debated (e.g. Cohen et al. 2006). Repeated activation of the HPA axis can have several direct biological and indirect social ramifications. For instance, chronic stress via glucocorticoid production can decrease functioning of the hippocampus (vital for memory); decrease functioning of the prefrontal cortex (important for cognition); and increase functioning of the amagdyla (important for emotions and fear) (Gunnar and Quevedo 2007). Repeated HPA activation can lead to brain alterations outside the HPA axis such as decreased amount of neurotransmitters (i.e. NE, serotonin, dopamine), rate of synthesis of neurotransmitters, and the efficacy of neurotransmitter receptors (Sapolsky 2004). These alterations can result in decreased cognitive and emotional functioning which in turn could lead to decreased life chances (Gunnar and Barr 1998). Poverty in early-life is associated with higher risk exposure including physical risk, such as substandard housing, low neighborhood quality, crowding, and noise pollution, as well as social risk, such as family conflict, parental insensitivity, harsh parenting, and family and residential instability (Evans 2004). Moreover, many of these risk factors have been found to be associated with increased HPA activation (Repetti et al. 2002). Few studies, however, have tested the relationship between early poverty and HPA axis functioning using prospective data and none to our knowledge have tested this relationship with data spanning from infancy to adolescence.

This study asks how poverty in early life influences awakening cortisol (a measure of HPA functioning). The answer to this question has important theoretical implications for how social disparities in physical and mental health arise. Two core theme help frame this study; (1) poverty is a dynamic experience that must be viewed in terms of exposure and timing; (2) the stress of living in poverty can have long-term influences HPA axis functioning. The goals of this project are to investigate; (1) how poverty exposure and timing throughout life are related to waking cortisol in adolescence; and (2) how the relationship between poverty and awakening cortisol is shaped by maternal sensitivity.

## Data

The NICHD Study of Early Child Care and Youth Development (SECCYD) is a longitudinal study that followed one cohort from birth through high school. In 1991 data collection began after recruiting families living close to a hospital in ten cities: Little Rock, Arkansas; Irvine, California; Lawrence, Kansas; Boston, Massachusetts; Philadelphia, Pennsylvania; Charlottesville, Virginia; Morganton, North Caroline; Seattle, Washington; and Madison, Wisconsin. Because the study followed the participants for 15 years, the current study can accurately capture the dynamics of poverty over an extended period of time. In addition, measures of cortisol, maternal sensitivity, and useful covariates (e.g. family structure,

[1] Defined as household income below 200% of the federal poverty level.

maternal employment) are available in the SECCYD making it especially suited to investigate the topics outlined in this study.

**Preliminary Results**

We are currently in the initial stage of data analysis and hence will only present some very preliminary results that categorize each individual into one of four class trajectories (i.e. poverty class, working class, middle class, upper class) based on a latent class growth analysis using the income-to-needs ratio at eight points in time. Future analysis will test for the effects of the timing of poverty. All analyses are split by gender.

Table 1 shows that being in persistent poverty is associated with lower awakening cortisol compared to those in the middle class among females. Among males, poverty is unrelated to cortisol. Maternal sensitivity at ages 0-3 is unrelated to waking cortisol among women but is positively associated with awakening cortisol among men. Maternal sensitivity among those in persistent poverty is positively associated with cortisol among women but not men. This relationship is depicted in Figure 1 which shows that among the poverty and working class maternal sensitivity is positively related to awakening cortisol. The slopes for the middle and upper class are not statistically significant from zero.

**Conclusion**

This project is in its initial stages but the preliminary results suggest the relationship between early poverty and awakening cortisol in adolescence is a complex one that requires further study. The preliminary findings suggest that chronic poverty is associated with lower awakening cortisol (a sign of hypocortisolism and HPA dysregulation) among women but not men. Moreover, the maternal sensitivity at ages 0-3 appeared to buffer the deleterious effects of poverty for women but not men. For men, high levels of maternal sensitivity were positively associated with cortisol for individuals from all classes.

## References


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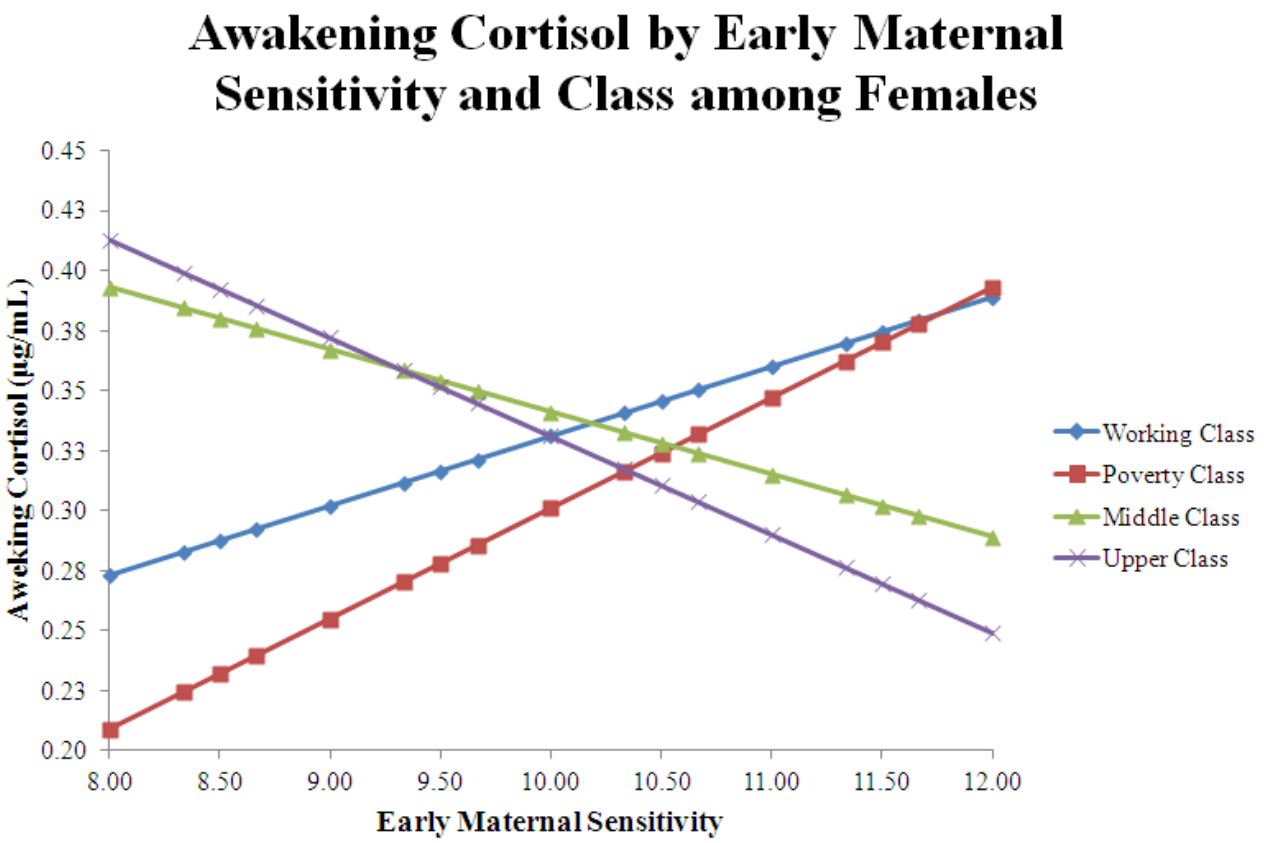
**Table 1 Regression Models Predicting Awakening Cortisol at Age 15**

| | Women (N=407) | | | Men (N=397) | | |
|---|---|---|---|---|---|---|
| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
| Working Class[a] | -0.029 | -0.026 | -0.561 ** | -0.003 | -0.000 | 0.224 |
| Poverty Class | -0.087 * | -0.080 * | -0.755 *** | -0.025 | -0.013 | 0.056 |
| Upper Class | -0.008 | -0.009 | 0.146 | 0.012 | 0.007 | 0.128 |
| Average Wake | -0.000 | -0.000 | -0.000 | -0.000* | 0.000 ** | 0.000 ** |
| High School | 0.020 | 0.018 | 0.000 | 0.035 | 0.029 | 0.028 |
| Some College | 0.020 | 0.010 | -0.012 | 0.053 | 0.040 | 0.044 |
| College | -0.015 | -0.027 | -0.041 | 0.112 ** | 0.092 * | 0.093 * |
| College Plus | 0.020 | 0.006 | -0.000 | 0.034 | 0.012 | 0.011 |
| Married | -0.019 | -0.022 | -0.026 | -0.018 | -0.019 | -0.015 |
| Black[b] | -0.082 * | -0.072 * | -0.059 † | -0.005 | 0.007 | 0.005 |
| Other Race | -0.016 | -0.011 | -0.008 | 0.004 | 0.017 | 0.016 |
| Mother Age @ 1 month | -0.004 † | -0.004 † | -0.004 * | -0.002 | -0.002 | -0.002 |
| Mother Depressive Symptoms @ 1 months | 0.002 † | 0.002 † | 0.002 * | -0.001 | -0.000 | -0.001 |
| Sleep Problems | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 |
| Birthweight (grams) | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 |
| Maternal Sensitivity | | 0.013 | -0.026 | | 0.017 * | 0.029 * |
| Maternal Sensitivity X Working Class | | | 0.055 * | | | -0.023 |
| Maternal Sensitivity X Poverty Class | | | 0.072 ** | | | -0.006 |
| Maternal Sensitivity X Upper Class | | | -0.015 | | | -0.012 |
| Constant | 0.538 *** | 0.429 ** | 0.851 *** | 0.477 ** | 0.341 ** | 0.223 |
| R-squared | 0.062 | 0.067 | 0.102 | 0.067 | 0.081 | 0.086 |

[a] Middle class is the reference group.

[b] Whites are the reference group.

*** p<0.001, ** p<0.01, * p<0.05, + p<0.10.


Awakening Cortisol by Early Maternal Sensitivity and Class among Females
Aweking Cortisol (µg/mL)
0.45
0.43
0.40
0.38
0.35
0.33
0.30
0.28
0.25
0.23
0.20
8.00
8.50
9.00
9.50
10.00
10.50
11.00
11.50
12.00
Early Maternal Sensitivity
Working Class
Poverty Class
Middle Class
Upper Class