Socioeconomic Status and Biomarkers: The Example of Childhood Asthma

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Low SES Associated with Asthma Hospitalizations

(Pamuk et al, 1998)
Research Questions

1) What are the biological pathways through which low SES comes to affect childhood health?

2) What psychosocial processes connect SES to these biological markers?
Cytokine Production Differs by SES in Asthma Group

(Chen et al., J Allergy & Clin Immunol, 2006)
SES – Immune Relationship is Linear

\[ \beta = -0.39, \ p < 0.05 \]

(Chen et al., J Allergy & Clin Immunol, 2006)
Subgroup of low and high SES youth with asthma
Genome-wide transcriptional profiling done with microarrays on T cells
Robust multiarray averaging quantifies expression of ~14,500 genes
Identifies differentially expressed genes (≥ 1.3-fold expression disparity between groups)
Using TELiS, a bioinformatics software program, estimate the underlying transcription factor activity that drives differential gene expression
SES Associated with Differential Transcription Factor Activity

(NF-κB  
\[ p = 0.032 \]  
CREB  
\[ p = 0.031 \]  
NF-Y  
\[ p = 0.022 \]

(Chen et al., Thorax, 2009)
NF-κB could suggest alteration of signaling pathway shifting to >inflammatory phenotype
CREB/NFY could suggest diminished efficacy of beta agonist medications for asthma
Children lower in socioeconomic status show heightened inflammatory profiles in a direction consistent with their experience of greater clinical morbidity in asthma.

Effects of SES seen at multiple biological levels:
- inflammatory proteins
- gene expression
- transcription factor activity
Research Questions

1) What are the biological pathways through which low SES comes to affect childhood health?

2) What psychosocial processes connect SES to these biological markers?
Low SES children grow up in environments where negative events happen frequently.

Develop a tendency toward interpreting the world as a threatening place that requires heightened vigilance.

Low SES associated with greater perceptions of threat during ambiguous social situations.
Perceptions of Threat Differ by SES for Ambiguous Situations Only

A: \( t(28) = 2.99, p < .01 \)
N: \( t(28) = 0.25, ns \)

(Chen et al., Psychosomatic Medicine, 2003)
Perceptions of Threat as One Pathway Between SES and Cytokine Production

\[
\beta = -0.40^{**}
\]

\[
\beta = 0.28^+
\]

\[
Z = 1.17, p < 0.05
\]

Statistical Mediation: Sobel Test, \(Z > 0.97, p < 0.05\) using distributional properties recommended by MacKinnon. \(+p < 0.10, **p < 0.01\)

(Chen et al., J Allergy & Clin Immunol, 2006)
Controlling for Perceptions of Threat Reduces SES Differences in Transcription Factor Signaling Pathways

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<td>SES – NF-κB</td>
<td>2.18</td>
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(Chen et al., Thorax, 2009)
Children from lower SES backgrounds perceive their social world in more threatening ways, and this in turn has implications for asthma inflammatory responses.
Conclusions

- By focusing on disease-relevant biological markers, one can establish explanations for how the broader social environment can affect disease progression.

- Individual psychological appraisals serve as one bridge connecting the broader social environment to basic biological processes.
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