Stress Neurobiology, Risk & Resilience

Intervening Early: Progress and Opportunities in Child Service Settings

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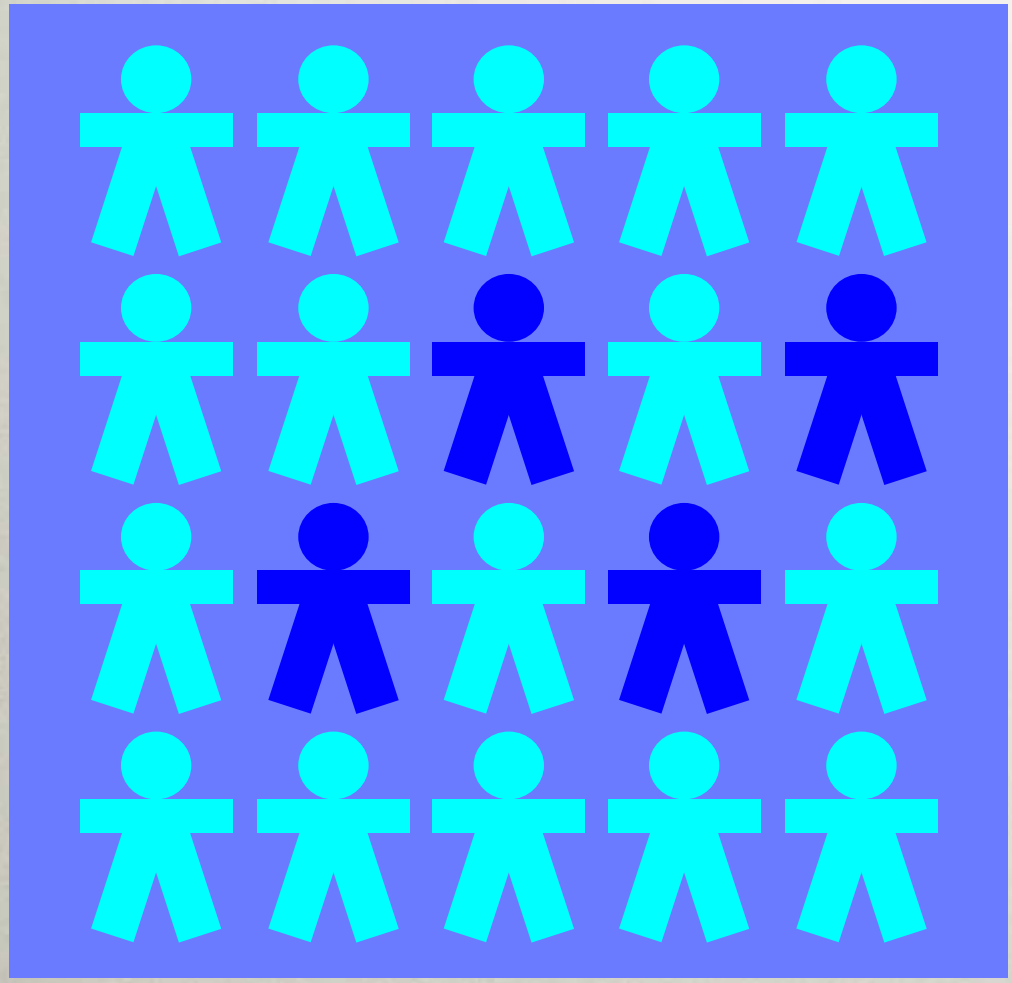
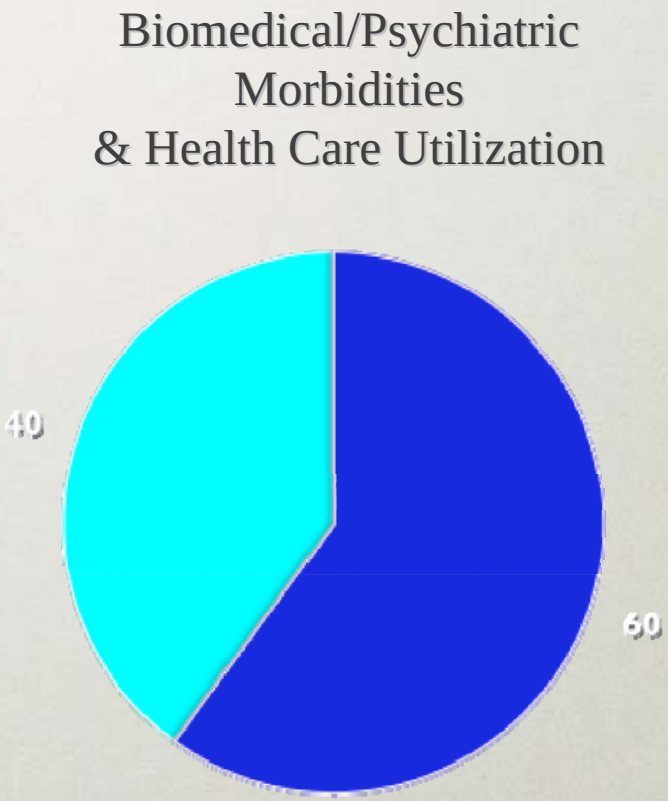
- Can early interventions further an understanding of biological development?
- What are the challenges and opportunities for studying basic research issues within child service settings?

- The non-random character of childhood morbidities
- Individual differences in neurobiological ‘susceptibility’ to early interventions
- Stress, biological sensitivity to social contexts and development

- Example of dental caries

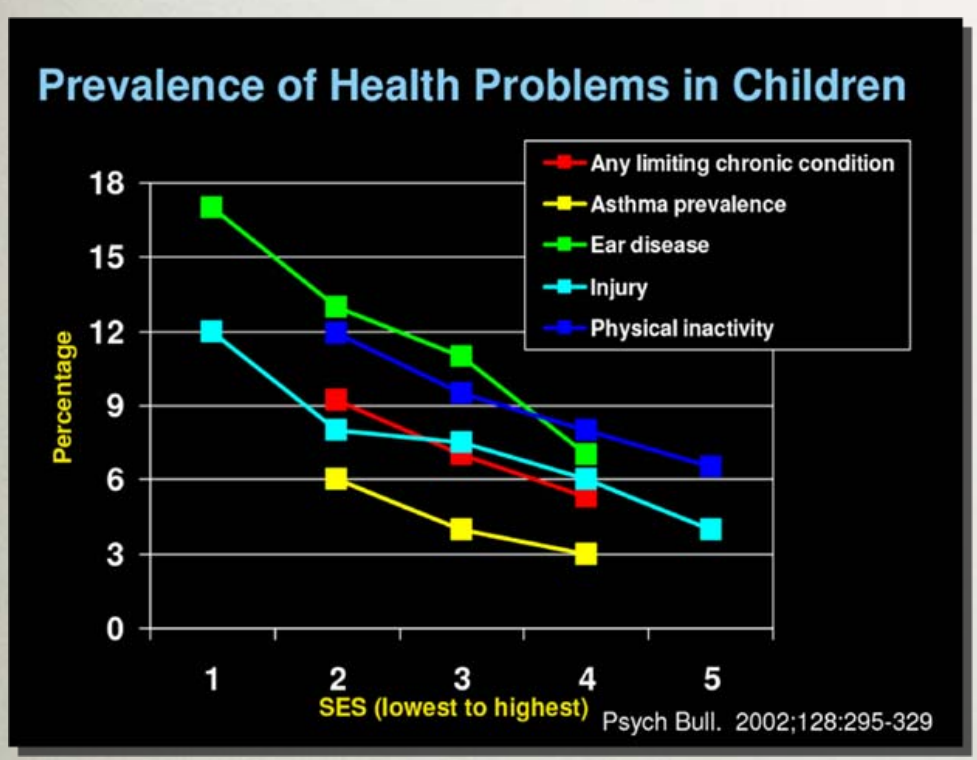
The Nonrandom Distribution of Childhood Morbidities

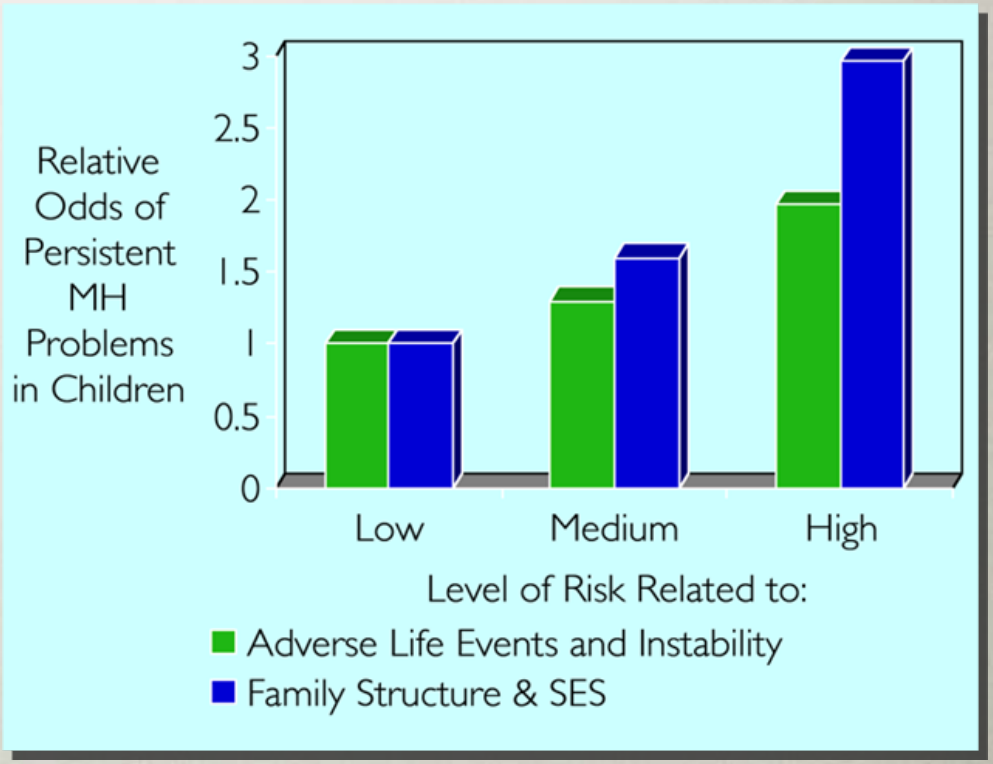




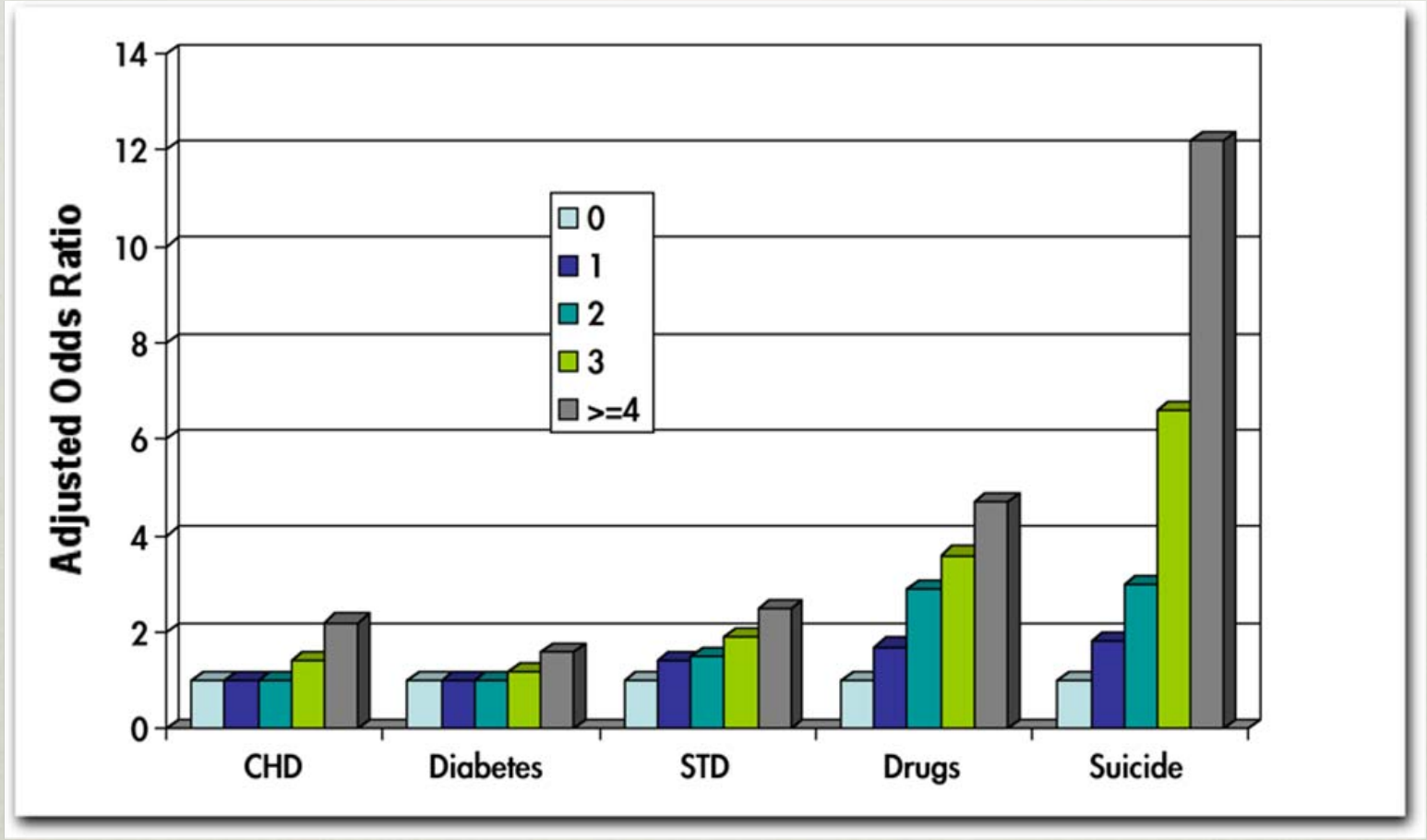
Social Partititioning of Physical and Mental Health

(Chen, Matthews & Boyce, Felitti)

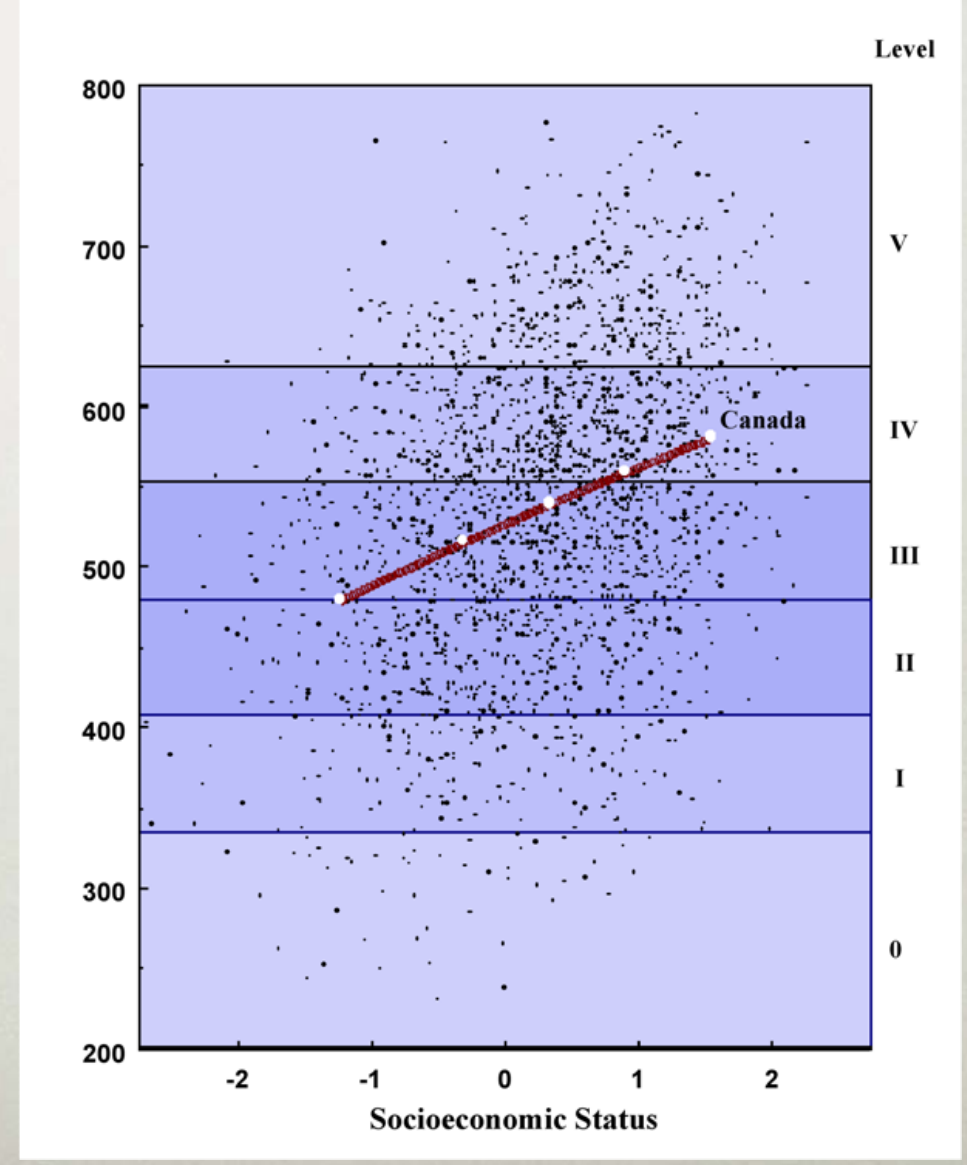




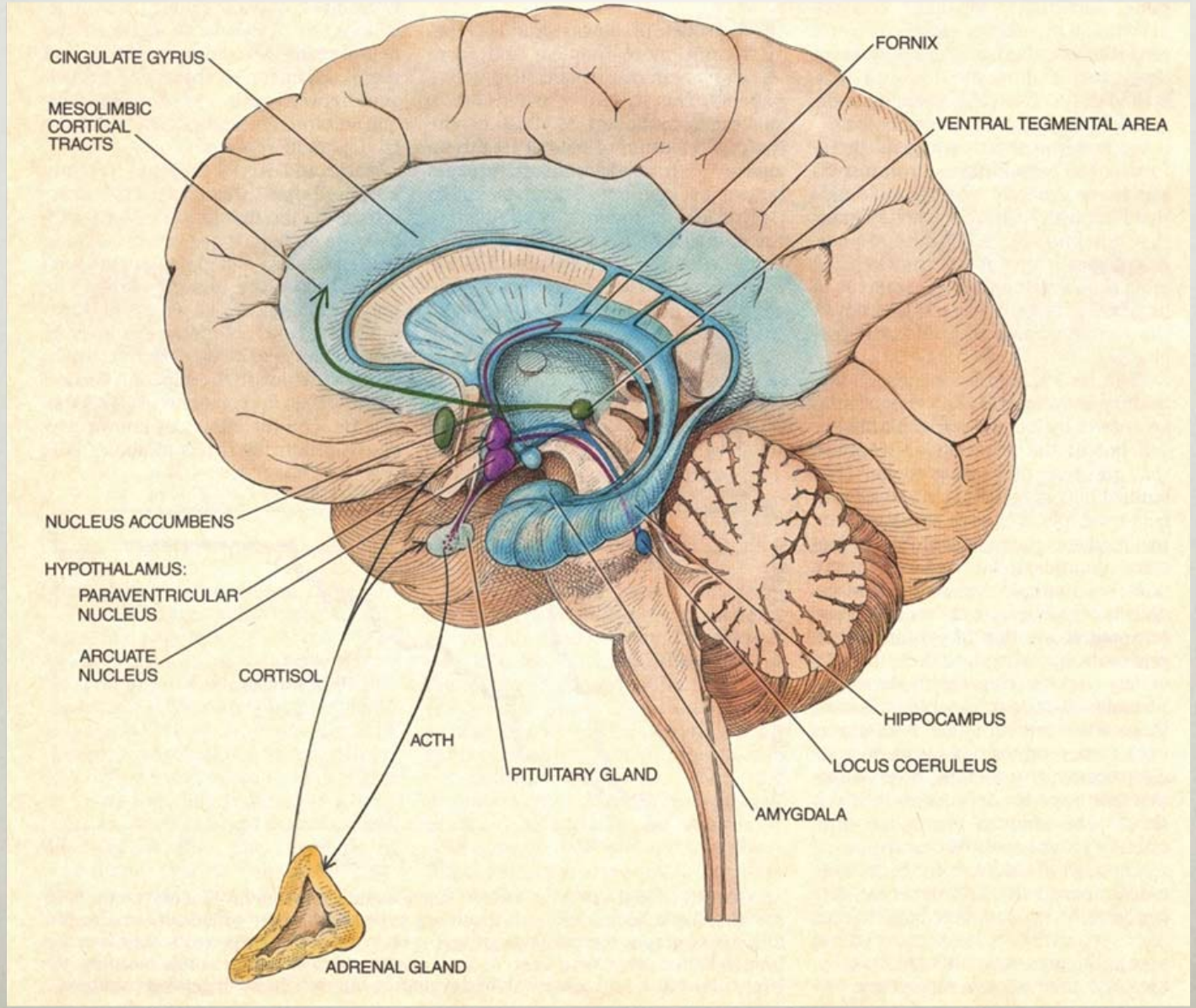
Childhood experiences of adversity/trauma predict leading causes of adult mortality (Felitti et al, 1998)

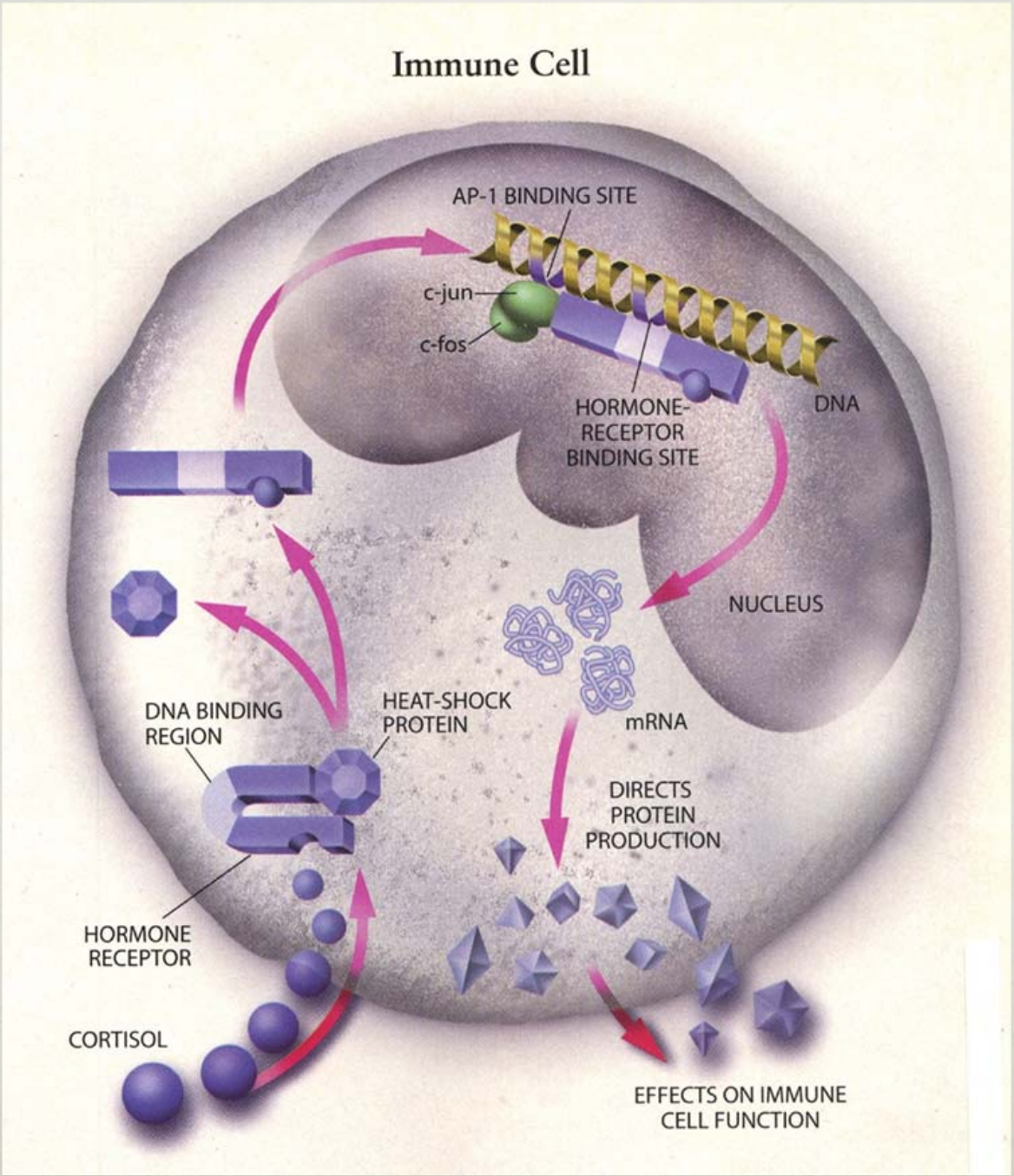


Variability in Child Literacy Levels by SES (Willms)



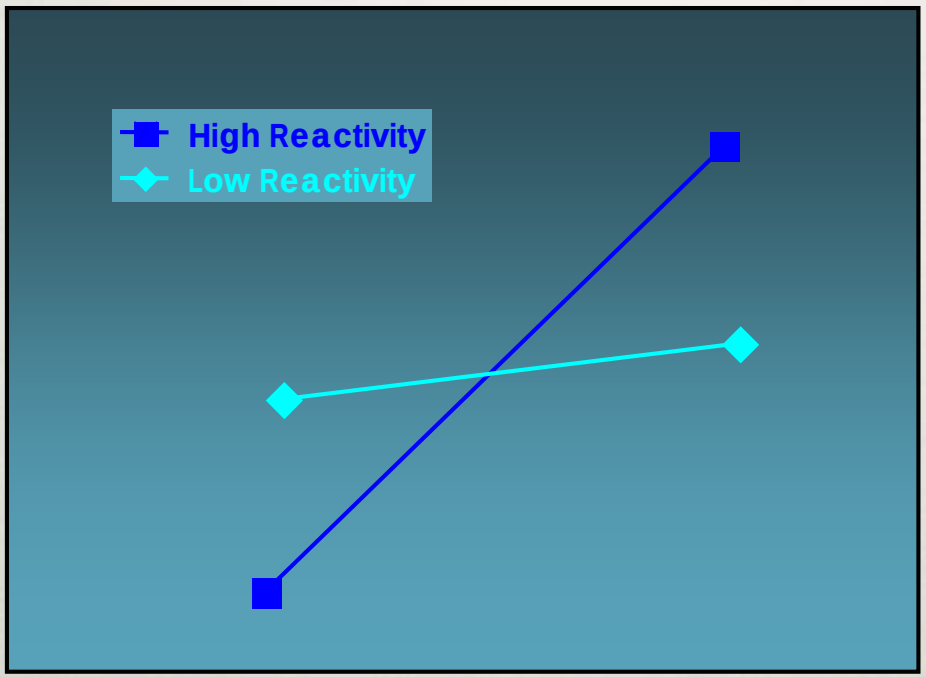
Two Principal Stress Responsive Neural Circuits: The CRH System and the locus coeruleus-NE System




Immune Cell
AP-1 BINDING SITE
c-jun
c-fos
HORMONE-
RECEPTOR
BINDING SITE
DNA
NUCLEUS
mRNA
DIRECTS
PROTEIN
PRODUCTION
DNA BINDING
REGION
HEAT-SHOCK
PROTEIN
HORMONE
RECEPTOR
CORTISOL
EFFECTS ON IMMUNE
CELL FUNCTION

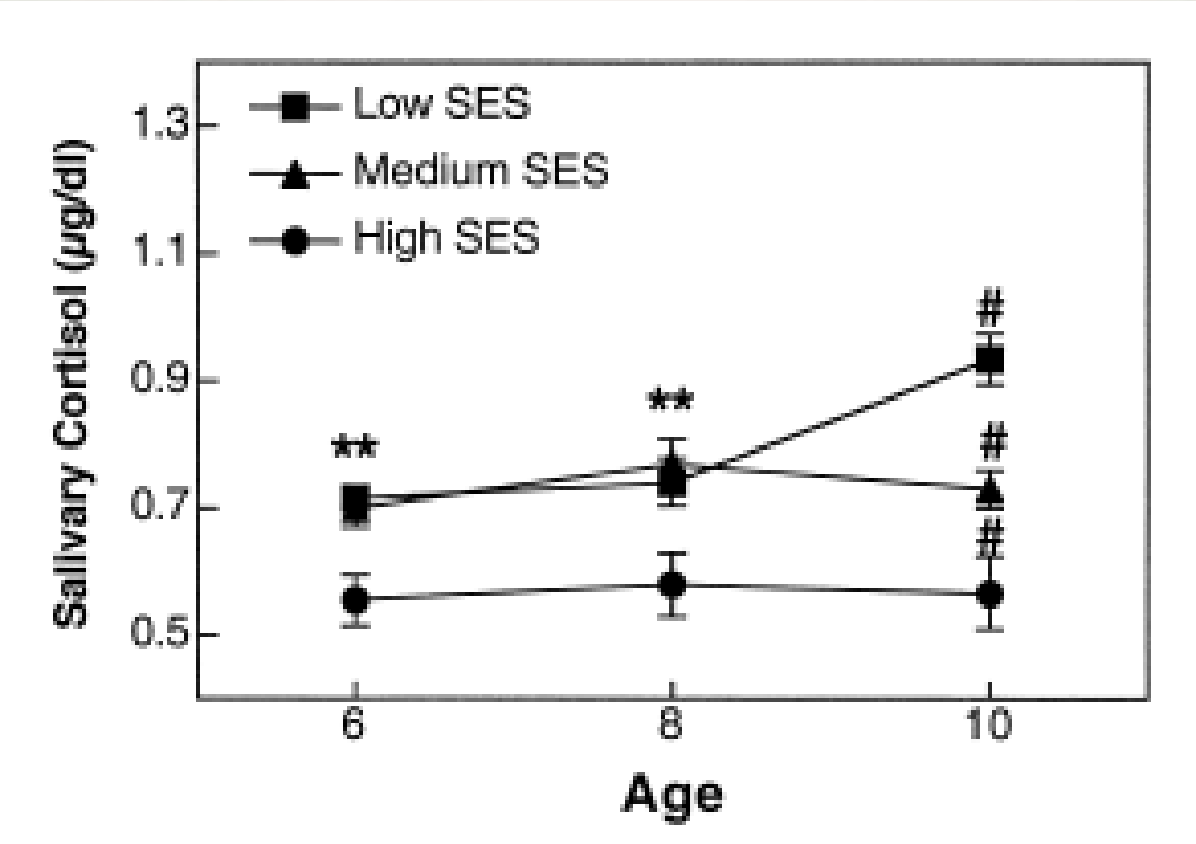
Psychobiological Reactivity and Health among Children and Macaques (Boyce WT, et al., 1994-2004)

- Internalizing Behavior Problems
- Respiratory Illnesses
- Injuries in Children
- Violent Injuries in Rhesus Macaques
- Memory for Stressful Events



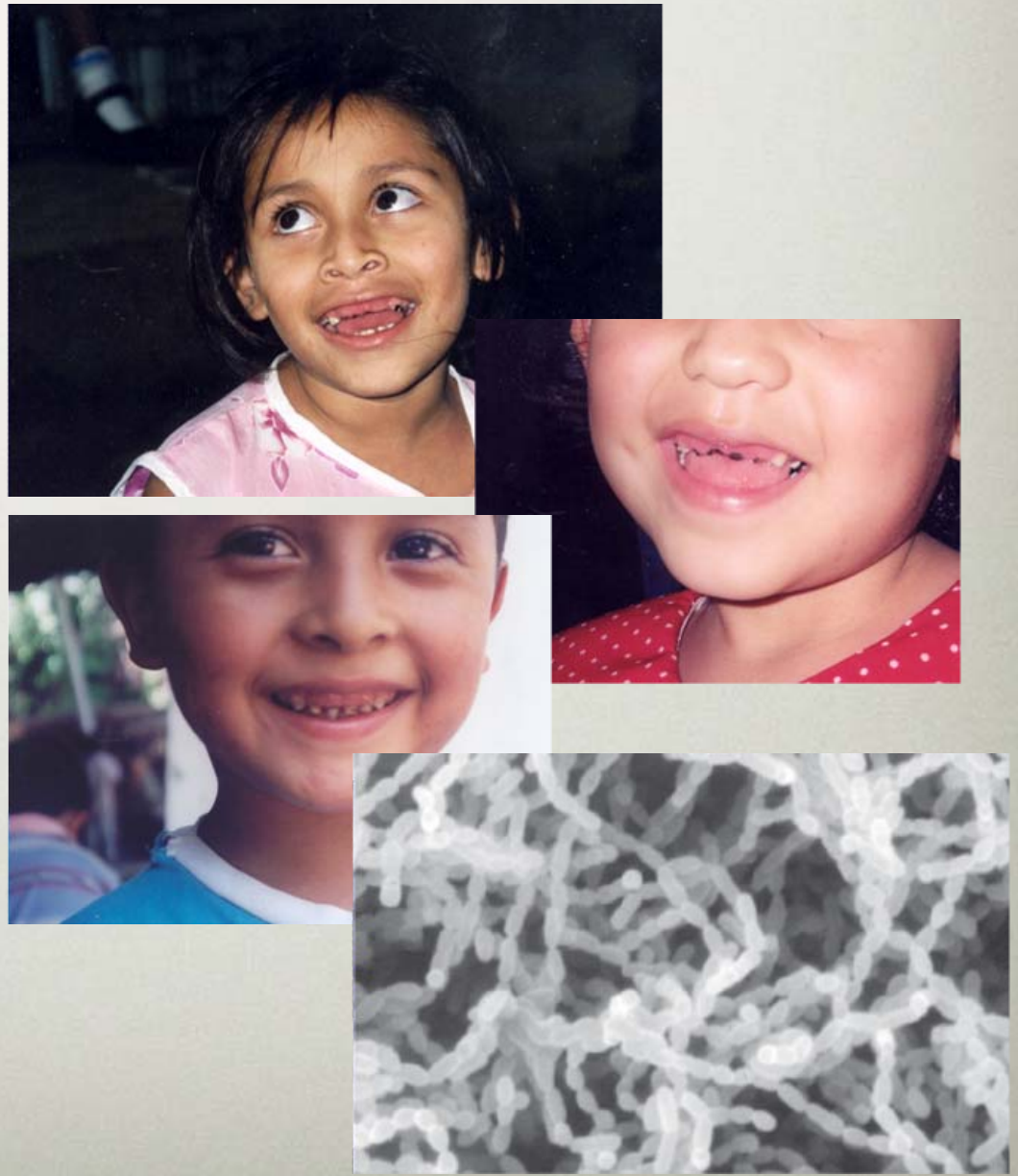
- Multiple samples of 3-8 year old children
- Troop of rhesus macaques
- Naturally occurring stressors and supports within epidemiologic study designs

Lupien et al, 2000

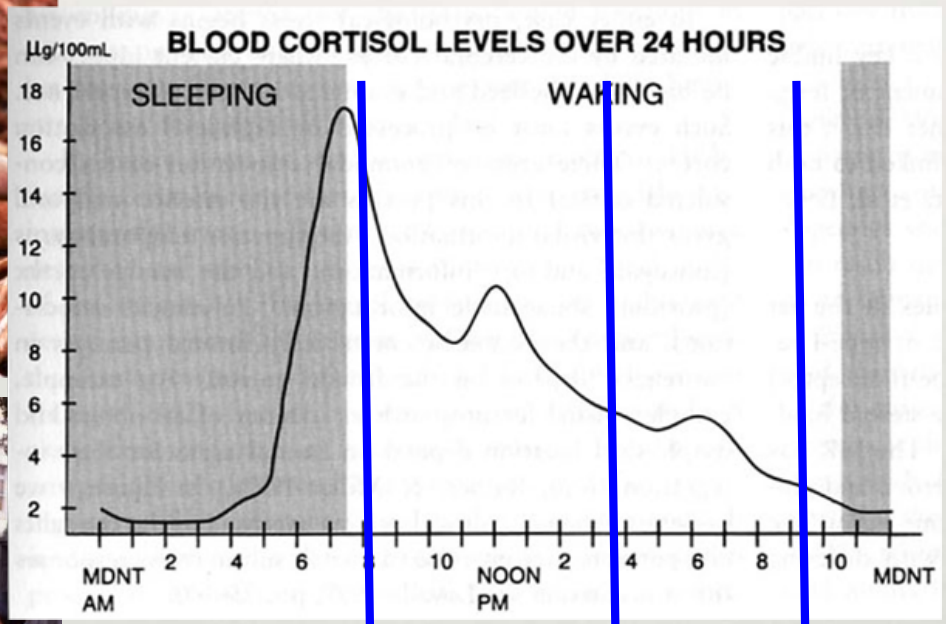


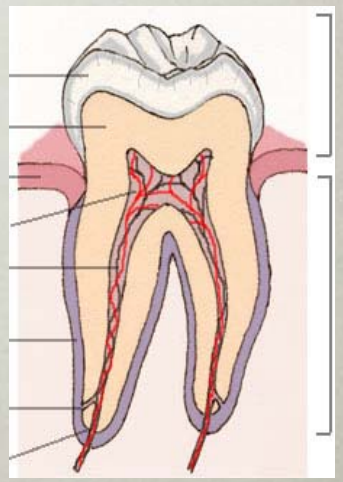
SES, Stress and Dental Pathology

- **Dental caries = single most common chronic disease of childhood**
- **U.S. treatment cost $4.5 billion annually**
- **Strong SES and racial disparities**
- **Related to lead exposure, tobacco smoke, diet, access to fluoridated water, but these are only partial accounts**
- **Oral bacteria *Strep mutans* and *Lactobacillus acidophilus***
- **Leading account: neglect of children's dental hygiene by low SES parents**



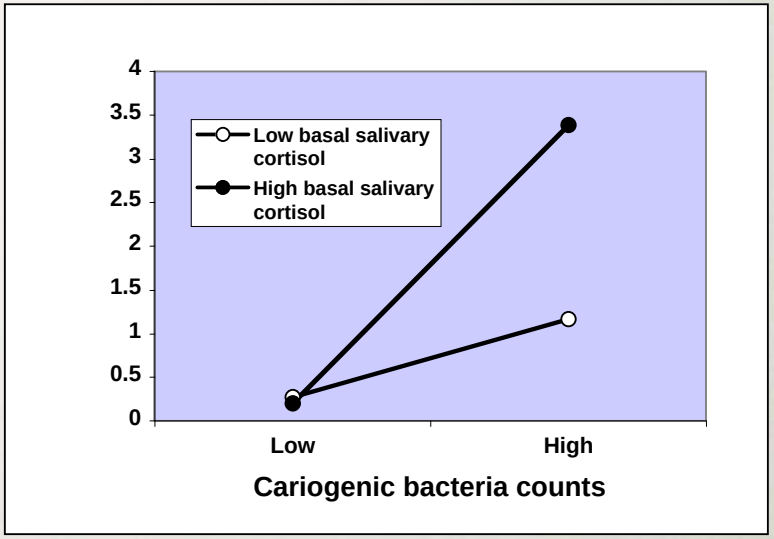
Deciduous Teeth as a Stress Biomarker in Young Children

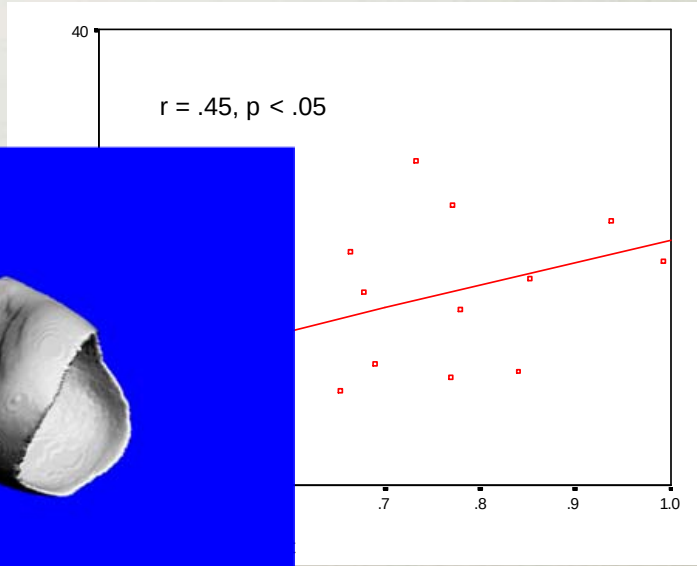


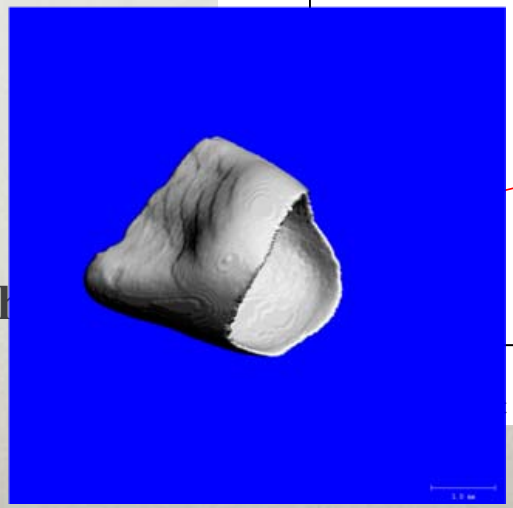


SES Differences in Childhood Dental Caries

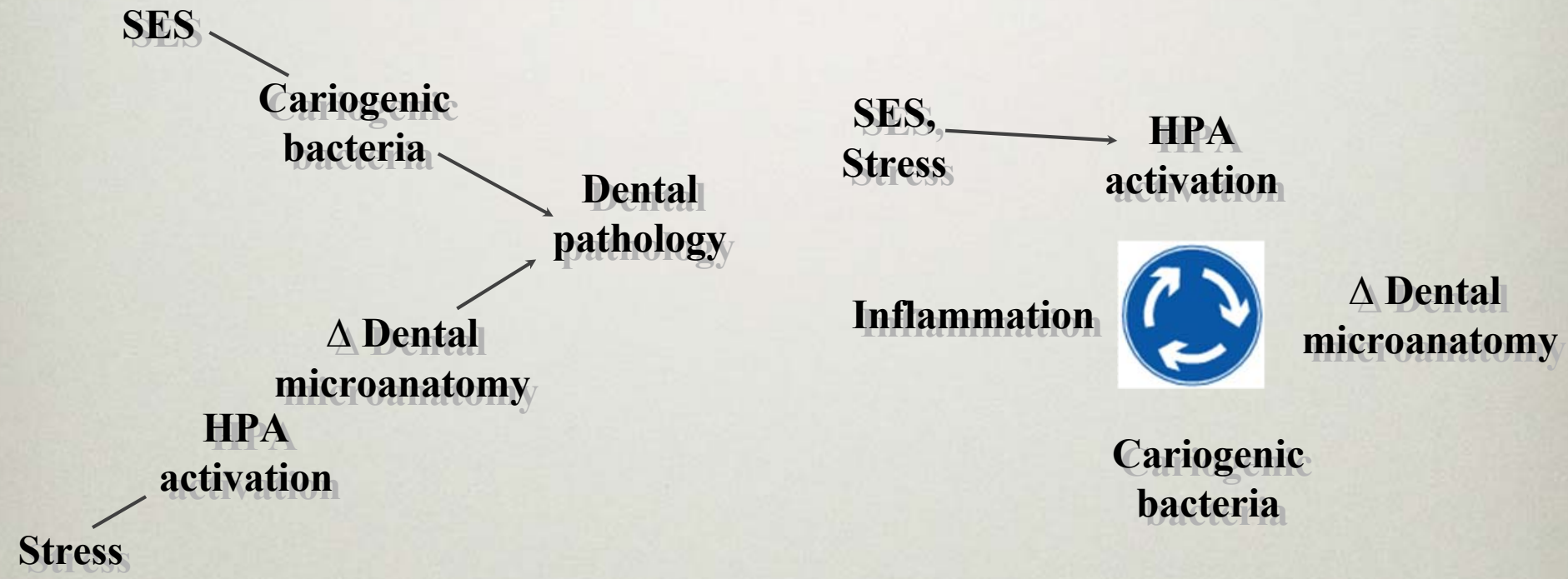
- **96 5-year-old children from PAWS Project**
- **One third had a filling or decay in at least one primary or secondary tooth**
- **Maternal education associated with counts of filled and decayed teeth**
- **Bacterial counts and salivary cortisol independently and interactively associated with filled and decayed teeth**
- **Basal cortisol secretion associated with differences in dental microanatomy**







Models of Sociobiological Effects on Childhood Dental Caries



Observations/ Conclusions

- **Strong social disparities in the incidence and severity of dental caries in early childhood**
- **Though a leading explanation is parental neglect of dental hygiene, a more accurate accounting may be a combination of cariogenic bacteria exposure and socially partitioned stress and adversity**
- **Salivary cortisol—a biomarker of SES-related stress—may produce dental vulnerability by: a) altering mucosal immune factors, and b) changing microanatomic features of teeth**

Questions

- **Should early interventions take into account individual differences in children's 'susceptibility' to contextual effects?**
- **Might early interventions be capable of changing biological susceptibility?**
- **In designing or deploying new interventions, how do we take into account population-level variation in risk and resilience?**

Might studies of how social contexts and biological susceptibility work together to create or ablate health disparities produce more just, impartial accounts of SES-related differences in outcomes?