Linking Biological & Social Pathways to Adolescent Health & Wellbeing

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Collaborators & Consultants
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Donna McCarthy               Mark Laudenschlager
Laura Szalacha              Narayan Sastry
Add Health saliva collection for cortisol curve (3x/day)
- 25% missing self-report data on timing of collection and only 1/3 fully adhered to collection protocol (Halpern et al. 2012)

Collection of cortisol samples on one day only are common and can capture an acute stress response to a “bad” day versus the intended chronic stress measure

Self-collection of saliva samples and mail return with suboptimal return rates (Sastry & Ghosh-Dastidar, 2011; Halpern et al., 2012)
Aim 1: To field test the collection of biomarkers of stress in adolescents (N=500)
- 1 hair sample and 1 bedtime sample x 6 nights for CORT
- 1 saliva sample for EBV antibody/DNA
- Questions focus on variation in eligibility (insufficient hair, steroidal meds); refusal (hair); missing data (nightly saliva)

Aim 2: To examine the relationships between daily and sociospatial adversity/buffers and (1) cortisol in hair and nightly saliva and (2) EBV antibody/DNA levels in saliva
Cortisol Secretion & Measurement

**SALIVA**
- Diurnal curve

![Graph showing diurnal curve of saliva cortisol levels]

**HAIR**
- Hair growth ~ 1 cm/month slightly less for Blacks or African Americans (0.8mm/month)
- Mean monthly or mean w/growth

Higher bedtime levels found for Black or Hispanic youth vs White (DeSantis et al., 2007; Skinner et al., 2013), perceived neighborhood stress among adults (Karb et al., 2012); PTSD s/s youth (Suglia et al., 2010)
Study design

- Large scale, longitudinal (two-wave) probability sample of urban youth ages 11-17 in Franklin County, OH (target N=4000).

Aims

- Focus on effects of sociospatial and institutional exposures on risk behavior (drug use, violence, etc.), victimization/exposure to violence, and mental/physical health
How relevant is the “neighborhood” (e.g., block group, census tract) as an exposure space?

- Activity space – the set of places that individuals come into contact with as a result of their routine activities
  - GPS measured via cell phones
- Survey data
  - Parents/caregivers
  - Youth
- EMA
  - Youth 5 x daily for 1 week

Kwan, 2013
AHDC & Linking Study Design & Data Collection

**Entrance Survey**
- Main Caregiver & Youth Surveys
- Both: Routine Locations
- Youth: Network Partners

**EMA Week**
- Youth: Smartphone for 1 week
- EMA: 5 short surveys/day
- GPS Location tracking

**Exit Survey**
- Youth: Space/Time Diary
- Caregiver: Neighborhood Survey
- Biomarker Collection
AHDC Pilot Study

- **When**
  - Spring-Summer 2013

- **Sample (N=30)**
  - Adolescents ages 11-17
  - Two census tracts (high/low income)
  - Uptake: 100% acceptance rate for biomarker collection
Bedtime Salivary Cortisol Collection

- 97% of nightly saliva samples returned
  - 4 missing of 180 eligible days
  - 3 outliers dropped

- Mean CORT=0.088 mg/dL (range 0.02-0.35)
  - Normal bedtime range 12-18 years (0.0-0.259 mg/dL)
Bedtime Cortisol Variability
Within and Between Individual

- Decomposition of variance for log cortisol:
  - Within individual variance: 0.30
  - Between individual variance: 0.16
  - Intraclass correlation: 0.35

- 65% of variance within individuals
  - Within-individual variability suggests saliva samples taken at different time points rather than right before interviewer arrived
  - Also would expect day-to-day variability with daily activities (McHale et al., 2012) and stressors
Hair Collection for Cortisol

- 90% eligible in pilot – 3 with no or too short hair
  - With R21 we will assess differences between those not eligible and those in the study

- Using thinning shears
  - Protocol developed by Mark Laudenslager

- Anecdotes from the field:
  - Thinning shears improve uptake, especially among females
  - Interviewer training more intensive
  - Steeper learning curve with thinning vs regular shears
Jodi Taking One for the Team: The Cut
Gently pulling cut hair...
Still pulling...
Holding Root End in Fingers – Twisting the Distal End
Ben’s Sample Taped for Storage
Packet for Hair Collection and Storage

***HAIR***

**If hair > 3 cm:** cut hair & tape to foil with root end placed by the “root end” sticker. Fold foil & place in tan envelope.

**If hair < 3 cm:** cut hair into white envelope, empty the hair onto the foil, fold foil & place in tan envelope.
Hair Preparation and Cortisol Assay

Retsch Mixer Mill 200

Hair sample before and after grinding in the MM 200:

Cortisol extraction and assay from hair protocol

Saliva for EBV Antibodies and DNA

- Passive drool saliva collected by interviewer at visit 2

- Assay protocol developed by Raymond Stowe
  - Elisa based method for antibody titers (EBV VCA IgG)
    - No dilution of saliva as in blood
    - PCR for EBV DNA

- Correlation EBV VCA IgG and EBV DNA
  - $r=0.45$ $p=0.014$
## Correlations: EBV and Mean Bedtime CORT

<table>
<thead>
<tr>
<th>Entire sample N=29</th>
<th>EBV seropositive sample N=24</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean Bedtime CORT</strong></td>
<td><strong>Mean Bedtime CORT</strong></td>
</tr>
<tr>
<td>EBV VCA IgG</td>
<td>0.12 ( (p=0.52) )</td>
</tr>
<tr>
<td>EBV DNA</td>
<td>0.36 ( (p=0.056) )</td>
</tr>
</tbody>
</table>

Pilot currently underway comparing EBV antibodies and DNA in saliva and blood to better tease out infection status and reactivation
Next Steps

- Saliva being collected for future telomere/DNA assay
  - Collaboration with Stacy Drury, PhD at Tulane

- Grant submission for collection of same biomeasures at second wave of AHDC study on the subsample of adolescents in R21 for longitudinal analysis
  - Attempt to capture cortisol curve
  - Additional sample of 500 at second wave to better assess sub-group and within group differences on N=1000
Illustrative Analysis: Activity Space Exposure to Neighborhoods with High Concentrations of Adolescent Males: Implications for Physiological Stress among Urban Adolescent Females

- Adolescent females from the Moving to Opportunity Demonstration (Popkin et al 2010) who lived in high-poverty neighborhoods reported they routinely experienced fear of victimization and harassment by neighborhood males.

- We explore the association between exposure to areas with high concentrations of adolescent males in the daily activity spaces of low-income urban youth, perceived safety & biomeasures of stress (evening cortisol levels), by gender.
Multilevel linear model with days nested within individuals
## Multilevel Linear Models (log cortisol by day)

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age^1</td>
<td>-.05</td>
<td>-.04</td>
</tr>
<tr>
<td>Male</td>
<td>-.96</td>
<td>.01</td>
</tr>
<tr>
<td>% spatial concentration of male youth^1</td>
<td>.03</td>
<td>.07*</td>
</tr>
<tr>
<td>% spatial concentration of male youth^1 X male</td>
<td></td>
<td>-.10+</td>
</tr>
<tr>
<td>% daily EMA with parent present^1</td>
<td>-.05</td>
<td>-.05</td>
</tr>
<tr>
<td>Intercept</td>
<td>-2.1</td>
<td>-2.9</td>
</tr>
</tbody>
</table>

Further investigation with larger sample, including perceptions of safety as mediator

^1 grand mean centered

* p<.05; + p<.10