Linking Biological & Social Pathways to Adolescent Health & Wellbeing:
Project Update on Hair for Cortisol

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Acknowledgements

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Collaborators & Consultants

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Donna McCarthy  Anthony Dent
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Laura Szalacha
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
- Added saliva collection for telomeres (assay funding pending)
- 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
Leveraging data from the Adolescent Health & Development in Context study (Browning, 1R01DA032371)

Visit One: Entrance Survey
- Main Caregiver & Youth Surveys
- Both: Routine Locations
- Youth: Network Partners
- Interviewer instruct youth on saliva collection

EMA Week
- Youth: Carry smartphone for 1 week
- EMA: 5 short surveys per day
- GPS Location tracking
- Biomarker Collection
  - Youth collects nightly saliva

Visit Two: Exit Survey
- Youth: Space/Time Diary
- Caregiver: Neighborhood Survey
- Youth Height & Weight
- Biomarker Collection
  - Interviewer collects hair & saliva
Non-Hispanic Black Population

Franklin County ACS 2007-2011
College Degree (of Ages 25+)

Franklin County ACS 2007-2011
## Preliminary Sample Characteristics

<table>
<thead>
<tr>
<th>AHDC/Biomarker Sample (N=570)</th>
<th>Youth</th>
<th>Caregiver</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>White, %</td>
<td>55.7</td>
<td>62.4</td>
<td>61.3</td>
</tr>
<tr>
<td>Black</td>
<td>30.7</td>
<td>30.7</td>
<td>26.5</td>
</tr>
<tr>
<td>Hispanic</td>
<td>5.1</td>
<td>3.7</td>
<td>5.0</td>
</tr>
<tr>
<td>Asian</td>
<td>1.9</td>
<td>1.4</td>
<td>3.5</td>
</tr>
<tr>
<td>Multiracial/Other</td>
<td>6.5</td>
<td>1.7</td>
<td>6.7</td>
</tr>
<tr>
<td>Foreign Born</td>
<td>3.5</td>
<td>5.9</td>
<td>10.0</td>
</tr>
<tr>
<td>Male</td>
<td>50.9</td>
<td>13.9</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>14.6 (1.8)</td>
<td>46.7 (8.0)</td>
<td></td>
</tr>
<tr>
<td>Household Size</td>
<td>4.55 (1.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median Household Income</td>
<td>$50-60k</td>
<td>$48.4k</td>
<td></td>
</tr>
</tbody>
</table>
Hair Collection for Cortisol

- Chronic measure of physiological stress
  - 1 cm hair approximates mean cortisol for 1 month

- Cut hair from the posterior vertex of the scalp using thinning shears
Feasibility of Hair Collection

• N= 516 adolescents aged 11 to 17 years recruited by trained interviewers for participation in the hair cortisol collection

• Participation rates in hair collection
  • N=471 or 91.3% participated
  • N=45 or 8.7% did not participate due to:
    • insufficient hair (n=18)
    • refusal (n=25)
    • unknown reasons (n=2)
Reasons for Refusal of Hair Collection (if given)

- Of the 25 youth/parents who refused
  - privacy concerns w/collection of biomaterial (n=6)
  - did not want hair cut (n=2)
  - did not want to be touched (n=3)
Non-Participation vs Participation

- Differences in sociodemographic factors, stress-related exposures and activity space measures between non-participants & participants examined

- **Dependent Variable**
  - *Non-participation*
    - Adolescents who were ineligible to participate due to insufficient hair or who refused to participate
    - Small cell sizes preclude differentiating analytically those ineligible vs refusals
Non-Participation vs Participation

Independent Variables

- Race and ethnicity
- Male sex
- Age – continuous measure
- Household income – ordinal measure
- Caregiver highest level of education
- Exposure to adverse life events: count
  - Total count & timing (0-5y, 6-11y, >11y)
- Activity space measures
  - Poverty > 25% (yes=1)
  - Income > $50,000 (yes=1)
Activity space – the set of places that individuals come into contact with as a result of their routine activities

Kwan, 2013
Activity Space Measures

- Stationary locations from the space/time budget
  - GPS measures of locations and youth interview to “clean” data for accuracy

- Exposures weighted for amount of time spent at each location, excluding sleep time from EMA reports of wake time and number of hours slept

- Geocoded to Census Block Group

- Linked to 2009-2013 ACS Data
### Differences between Non-Participants vs Participants

Table 1: Means and unadjusted odds-ratios on the associations between demographic characteristics, adverse life exposures, and non-participation in hair collection for cortisol among a probability sample of adolescents aged 11 to 17 years

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Participant Mean (n)</th>
<th>Non-Participant Mean (n)</th>
<th>Unadjusted OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>516</td>
<td>14.6 (471)</td>
<td>14.5 (45)</td>
<td>0.96 (0.81, 1.14)</td>
</tr>
<tr>
<td><strong>Male sex</strong></td>
<td>516</td>
<td>0.50 (471)</td>
<td>0.64 (45)</td>
<td>1.79 (0.95, 3.38)</td>
</tr>
<tr>
<td><strong>Race/Ethnicity</strong></td>
<td>516</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NH black</td>
<td>0.28 (133)</td>
<td>0.58 (26)</td>
<td></td>
<td>3.85 (1.95, 7.62)*****</td>
</tr>
<tr>
<td>‘other’</td>
<td>0.13 (62)</td>
<td>0.11 (5)</td>
<td></td>
<td>1.59 (0.55, 4.58)</td>
</tr>
<tr>
<td>NH white (reference)</td>
<td>0.59 (276)</td>
<td>0.31 (14)</td>
<td></td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Caregiver education</strong></td>
<td>510</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school or less</td>
<td>0.17 (79)</td>
<td>0.20 (9)</td>
<td></td>
<td>1.37 (0.52, 3.60)</td>
</tr>
<tr>
<td>Some college</td>
<td>0.32 (148)</td>
<td>0.38 (17)</td>
<td></td>
<td>1.38 (0.59, 3.21)</td>
</tr>
<tr>
<td>Bachelor’s degree</td>
<td>0.28 (130)</td>
<td>0.22 (10)</td>
<td></td>
<td>0.92 (0.36, 2.35)</td>
</tr>
<tr>
<td>Master’s degree or higher (ref)</td>
<td>0.23 (108)</td>
<td>0.20 (9)</td>
<td></td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Household income range</strong></td>
<td>469</td>
<td>6.89 (428)</td>
<td>6.50 (41)</td>
<td>0.98 (0.90, 1.06)</td>
</tr>
<tr>
<td><strong>Stressful life events (count)</strong></td>
<td>504</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total score: Birth to interview</td>
<td>5.51 (459)</td>
<td>6.93 (45)</td>
<td></td>
<td>1.03 (0.99, 1.07)</td>
</tr>
<tr>
<td>Total score 0-5 years</td>
<td>1.01 (459)</td>
<td>1.22 (45)</td>
<td></td>
<td>1.08 (0.91, 1.28)</td>
</tr>
<tr>
<td>Total score 6-11 years</td>
<td>1.00 (459)</td>
<td>1.38 (45)</td>
<td></td>
<td>1.14 (0.97, 1.35)</td>
</tr>
<tr>
<td>Total score greater than 11 years</td>
<td>0.74 (459)</td>
<td>0.87 (45)</td>
<td></td>
<td>1.10 (0.85, 1.41)</td>
</tr>
<tr>
<td>Activity space % poverty &gt; 25%</td>
<td>474</td>
<td>0.24 (104)</td>
<td>0.35 (13)</td>
<td>1.73 (0.85, 3.53)</td>
</tr>
<tr>
<td>Activity space % income &gt;$50,000</td>
<td>474</td>
<td>0.26 (113)</td>
<td>0.24 (9)</td>
<td>0.92 (0.42, 2.01)</td>
</tr>
</tbody>
</table>

***P<.0001
High uptake of hair collection for cortisol

Consistent with prior research African American participants more likely to refuse participation and they were also more likely to be ineligible due to short hair or braids

- Despite these findings, the racial/ethnic composition of the participating sample is comparable to the study area and includes 28% non-Hispanic black adolescents
- Due to the high feasibility, data collection of hair for cortisol will continue in conjunction with the parent prospective cohort study
Tips for Collecting Hair

- Training of interviewers
- Same interviewer to recruit & interview at both visits
- Thinning shears
  - Mark Laudenslager (UC Denver) recommended
  - Interviewers report facilitated youth willingness to have hair collected
  - Requires more interviewer training
- Sample quality (volume & weight)
  - Photo of hair sample texted during collection
    - Hair volume (weight) increasing after instituted
Tips from the Field: Inside the Hair Collection Kit

If hair > 3cm: cut hair & tape to foil with root end placed by the root end sticker, fold foil as instructed and place in tan envelope.

If hair ≤ 3cm: cut hair into white envelope, empty the hair onto the foil, fold foil and place in tan envelope.

3 cm in length

ROOT END HERE
Special Thanks!

- The youth and their families
- The 40+ interviewers involved
- Chris Browning, Donna McCarthy, Beth Boettner, Samantha Boch & Anthony Dent
- Funders