Using Biomarkers to Understand Stress among Parents at Risk for Child Maltreatment Perpetration: Baseline Results from a Pilot Study

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Presentation Overview

- Introduction/ Background
- Research Challenges
- Purpose of Study
- Study Overview
- Preliminary Findings
- Limitations/Conclusions
- Next Steps

Child Maltreatment

- Child maltreatment (CM) is significant public health problem in the US[1]
  - 88.6% of all perpetrators were parents
    - Parents at greatest risk experience acute & chronic stressors
      - Low socioeconomic status, low household income, substance abuse, depression, trauma history, high parental stress[2-5]
  - Parental stress is particularly important risk factor
    - Can lead to poor parent-child interactions and heighted parent-child conflict[6-11]

Mitigating CM risk among High-Risk Populations

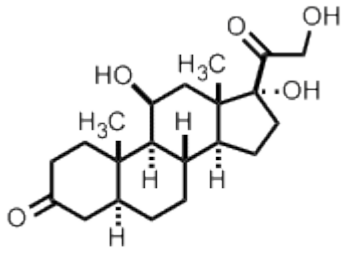
- Behavioral parent training programs are recognized recommendation for CM prevention[12]
- Based on social learning principles and include components such as didactic instruction, modeling, and differential reinforcement[13]
- Attempt to teach parents effective child management skills[14]

- The SafeCare® model
  - Studies show positive reductions in self-reported parental stress
  - *Parent-Child Interaction Module (PCI)[15]

Research Challenges

- Current use and acceptance of perceived stress measures limits ability to identify sub-populations at risk for poor intervention outcomes
- No known studies have explored effects of behavioral parent-training programs on physiological biomarkers of stress among at-risk parents
- **Such markers of parental stress may elucidate how such programs can have an impact on broad-based parental outcomes among parents with varying stress levels.**

Biological Measures of Stress-Cortisol



Cortisol
"The Stress Hormone"

- Primary hormone of neuroendocrine models exacerbating debilitating effects of acute and chronic stress on several physiological outcomes

- **Limited research at caregiver level**
  - Study among employed women high levels of excreted cortisol significantly associated with number of children residing at home [16]
  - No known cortisol studies on behavioral parenting interventions among at-risk populations

- **Studies in literature with focus on child-level outcomes**[17]

Biological Measures of Stress- Dihydroepiandosterone (DHEA)

- Most abundant circulating steroid hormone in humans with known associations with psychosocial stress
  - Studies on posttraumatic stress disorder (PTSD) among war veterans[18]
    - Higher levels of symptomology or PTSD diagnosis associated with increased DHEA levels
      Shown to be modifiable with psychological treatment[19]
  - No known studies of DHEA in parenting literature

Why Biomarkers?

- **New, objective benchmark for stress**
  - Saliva & hair: non-invasive methods to estimate serum levels of hormones

- Need **to understand relationship between perceived parental stress and physiological correlates of stress** with physiological implications

- Research needed **to elucidate the impact of evidence-based practices**, known to reduce parental stress, **on known physiological correlates**

Study Goals

To conduct a multidisciplinary, exploratory study using steroid hormone and genetic biomarkers to understand physiological stress among a high-risk parent population

(1) Recruit 18 mothers at risk of CM who will receive SafeCare® PCI

(2) Conduct repetitive, within subject assessments including measures of parent stress and behavior (self-report, observational), and physiological markers for cortisol, DHEA

- Compare biomarkers to perceived, self-reported levels of stress

Additional Study Aim:

(3) Assess feasibility and participants' willingness to provide physiological measures in this research project

- Qualitative semi-structured interviews conducted at baseline
  - Feasibility of providing samples:
    - Saliva using salivette and passive drool
    - Hair
    - (Cheek swab)

Research Question

- *Mothers who report higher levels of self-reported stress and mental health problems at baseline will have *impaired steroid hormone levels (i.e., cortisol, DHEA)*
  - Correlations between self-reported stress, mental health, and physiological measures collected at baseline and post-intervention

*Impaired: deviation from standard levels of steroid hormones

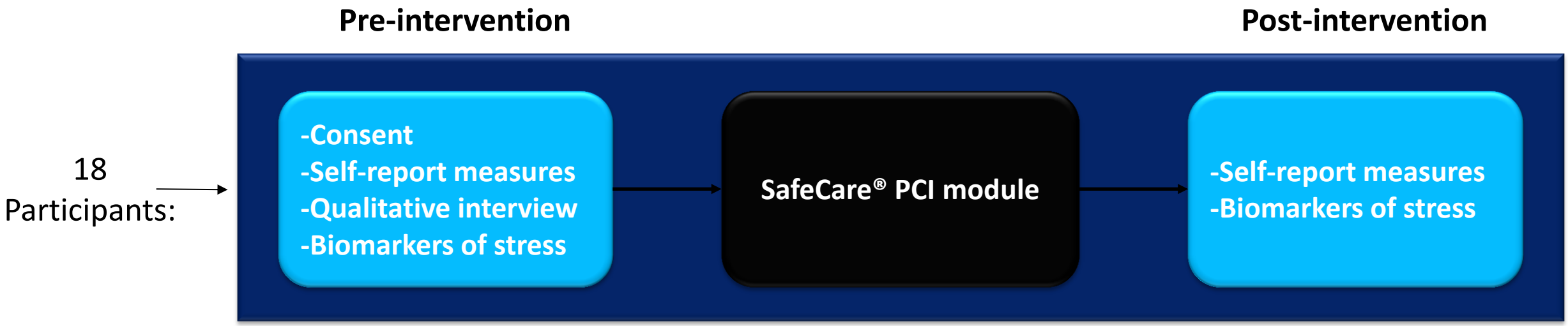
- Cortisol normal range: .053-.359ug/ml
- DHEA normal range: 15.9-303.8pg/mL

Study Overview

- Recruited 18 high-risk mothers from GSU community partner Hughes Spalding Children's Hospital of Atlanta
- **Inclusion criteria**
  - ≥ 18 years of age
  - Biological and custodial caregivers of target child
  - At least 1 child between 0-5 years of age
- **Exclusion Criteria**
  - Self-report of medical/ psychological conditions, and/or consistent use of steroid medications likely to interfere with bio-measures

Study Design

- **Quasi-Experimental Design: Pretest/Posttest**



Study Assessments

Table 1. Assessment Schedule

Baseline/ Pre-intervention	Intervention	Post-intervention
Week 1	*Weeks 2-7*	*Week 8*
Consent ▪ **Survey** ▪ **Qualitative Interview** ▪ **Biomarker Samples:** ❑ Cortisol ❑ DHEA ❑ (telomere length)	**SafeCare® Intervention**	▪ **Survey** ▪ **Biomarker Samples:** ❑ Cortisol ❑ DHEA ❑ (telomere length)

Intervention Procedures

- **Parent-Child Interaction (PCI) Module of SafeCare®**
  - 6 home-visiting sessions with a SafeCare ® home visitor (6 weeks)
  - Providers teach parents to structure activities with their children, while reducing problematic behavior and reinforcing positive behavior
  - Home visitors assess parenting skills pre- and post- PCI for mastery

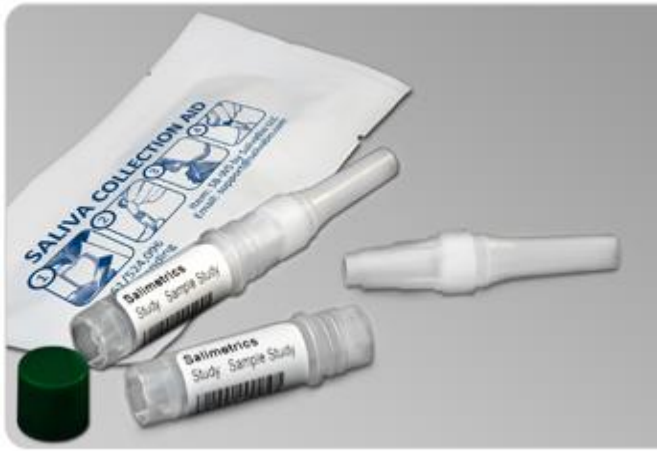
Self-Report Measures

- **Demographics Information Form** *-to collect basic demographic information on all participants*
- **Parenting Stress Inventory (PSI-SF)** [30]-to *examine parent stress*
- **Brief Symptom Inventory (BSI)** [31]-to *evaluate depression and other psychopathology*
- **Posttraumatic Diagnostic Scale (PDS)**[32]*-to examine trauma history*

Biomarker Measures

- **Cortisol-** Saliva, Hair
  - Saliva measured using Salivette
  - Acute and Chronic Stress
  - Saliva time dependent*
- **DHEA-** Saliva
  - Using passive drool
  - Time independent

Salivette



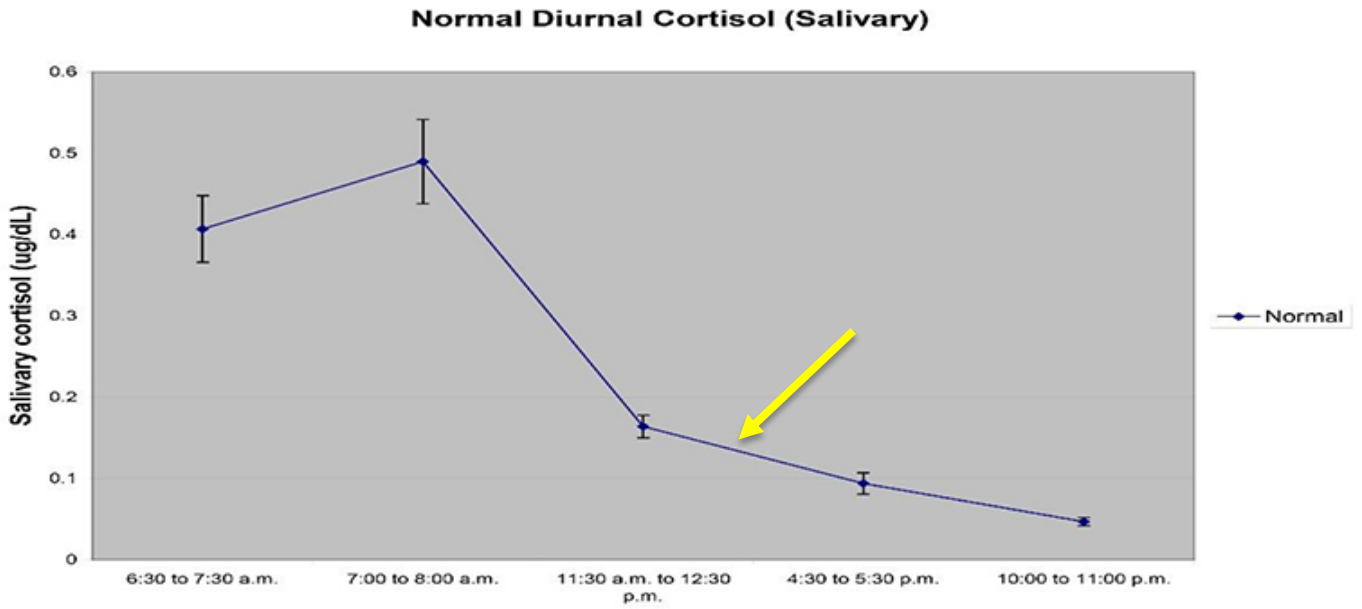
Passive Drool

- Cortisol, DHEA- extracted from saliva; enzymeimmunoassay (EIA) performed after to measure hormone levels

Acute vs. Chronic Stress- Cortisol

- **Acute Stress (saliva):** salivary samples collected consistently

at same time (12-3:30pm) when cortisol levels appear stable



Picture from : tps://www.salimetrics.com/assets/documents/1-3002.pdf

- **Chronic Stress (hair)**[34-36]**:** Hair samples of 2-3cm may provide a 2-3 month estimation to chronic stress exposure

Baseline Characteristics

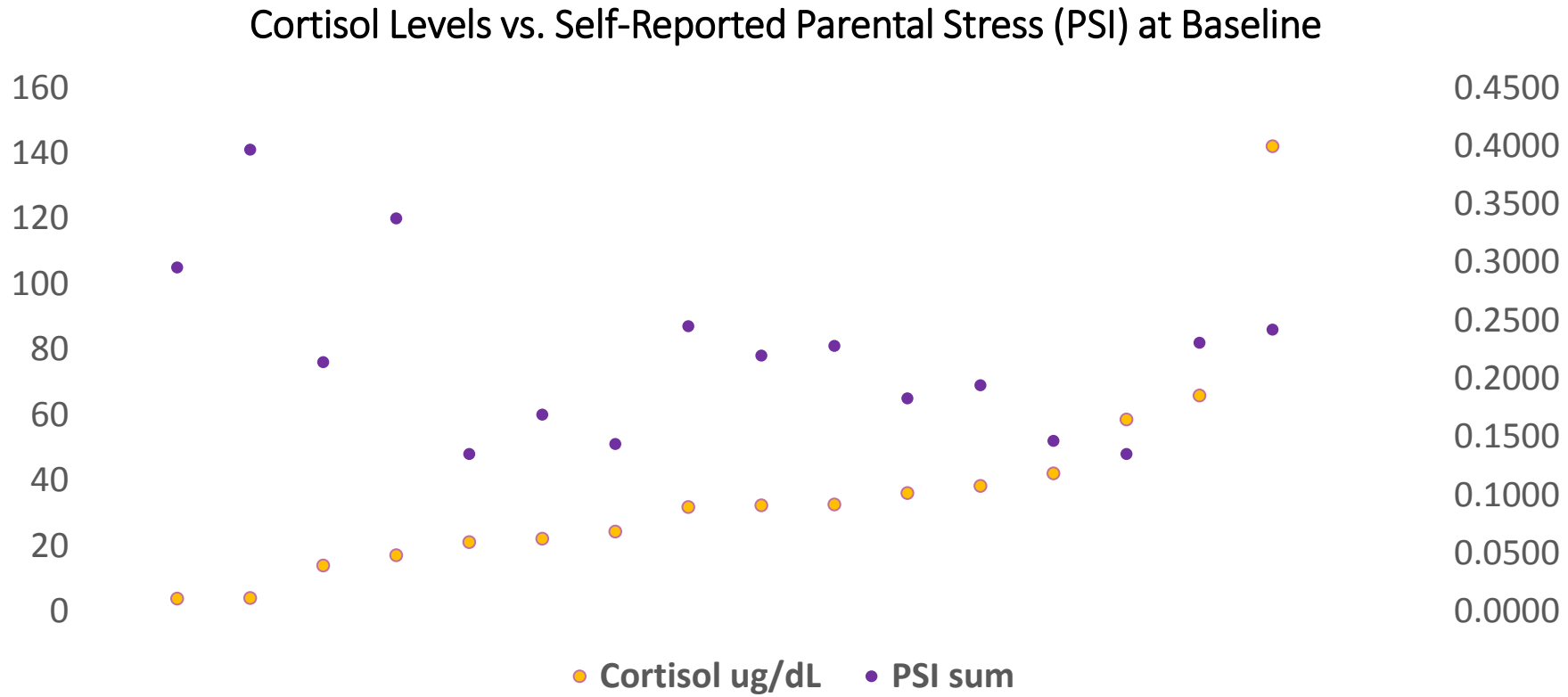
- n=18, African American, Age 18-40 yrs, M=27 yrs
- 50% single, 33% with partner
- 50% high school degree or less
- 81% not working
- 60% with income < $20,000
- 44% with 1 biological child
- 78% with more than 2 children living in household

- 69% reported >1 stressor in the month prior to the study

Measure	All Participants Baseline (n=18) M(SD)	Completers Baseline (n=10) M(SD)
Trauma		
Trauma Exposure	1.7; 77%: 1 ≥ traumatic event	1.7; 70% 1 ≥ traumatic event
PTS symptomology	22.56 (11.7)	22.0 (12.6)
Mental Health		
Depressive Symptomology	.80 (.85)	**.67 (.88)**
Anxiety Symptomology	.50 (.63)	.32 (.52)
Global Distress	.93 (.65)	**.83 (.67)**
Stress		
Parental Stress Score	78.0 (26.35)	**75 (25.2)**
Physiological Measures		
Cortisol (salivary) 0.053-0.359ug/ml	.011-.39 ug/dl	.011-.19 ug/dl
DHEA (drool) (15.9-303.8pg/ml)	16.96-661.50 pg/ml	63.69-506.90 pg/ml

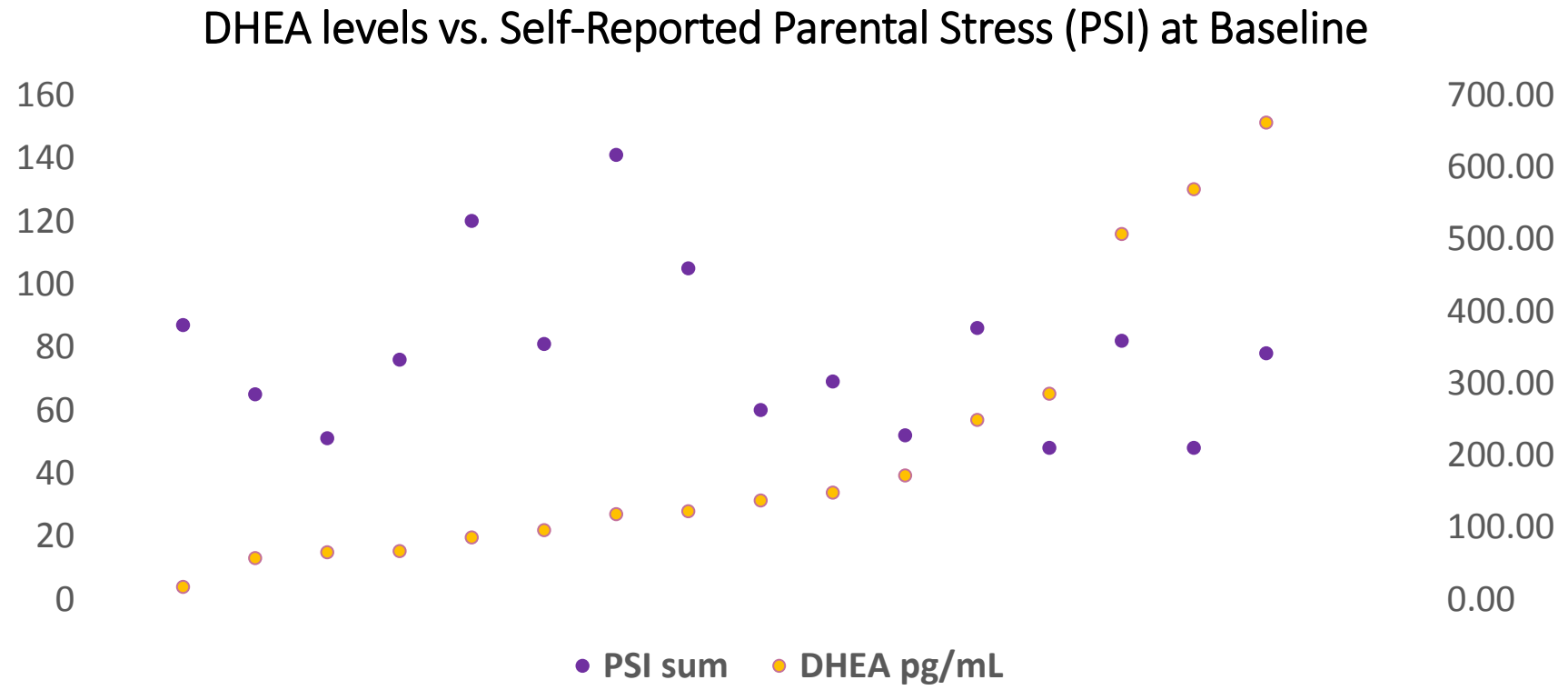
Cortisol vs. Self Reported Stress-Preliminary Findings: Baseline

Mothers who report higher levels of self-reported stress and mental health problems will have impaired steroid hormone levels (i.e., cortisol, DHEA).



DHEA Levels vs. Self Reported Stress Stress-Preliminary Findings: Baseline

Mothers who report higher levels of self-reported stress and mental health problems will have impaired steroid hormone levels (i.e., cortisol, DHEA)



Participant Quotes from Qualitative Interviews at Baseline

Drool Sample: "Ew"; " It was kind of **weird** but it was okay.. well the spitting in the tube was kind of weird, I felt like I was like I a felon or something"; "I felt that was a little weird";

Cotton Tube (under tongue): "That was **easy**. I'd do that one again. It was actually comfortable" ; "Yeah that was, **it was okay**"

Cheek Swab: "That was **the best**"; "Oh it was okay- it **didn't feel like nothing**"; "It was fun *laughs*"

Hair sample: "Yeah you just pulled a little piece out from back here"; "That felt **okay**…"; "That was nothing, **it was okay, I'm fine with that**"

All participants stated they would engage in this research and would recommend friends to participate

"Yes, because it's easy and **you learn a lot about stressing with your child…it's easy"**

"Yes, I think the only thing that would gross them out is the same thing that grossed me out that saliva [drool] part"

Limitations

- Retention of participants (smaller n)
- Self-report of medications/ foods
- No comparison group
- Convenient, homogenous sample
- Unanticipated events during the study (e.g., pregnancy, death within family)

Implications/Conclusions

- **Novel Benchmark for parental stress**, possibly mental health symptomology
  - Biomarkers of stress may correlate with self-reported stress among at-risk parents
- **Feasibility**- high acceptability among participants; simple methodology
- **Timing considerations** (cortisol diurnal patterns)
  - Inclusion of child populations
    - Measuring saliva from infants and young populations
- **Monitoring medications and food intake**

Next Steps

- Telomere length, hair (chronic cortisol) analyses
- New biomarkers: DNA methylation, alpha amylase
- In-depth qualitative analyses
- Follow-up assessment data analyses and correlations
- Examine PDS in relation to biomarkers? Map individual trajectories?
- Pre-/Post-intervention comparison- Repeated measures ANOVA

Thank You!

- **Primary Investigators:**

Laura Carruth, PhD

Shannon Self-Brown, PhD

- **Home Visitors:**

Akilah Thomas, Courtney Jones, Lacell Joseph, Leslie Sewall, Lisa Dickman-Jackson, Roddey Jones

- **Graduate Research Assistants**:

Charles Robinson, Colleen McCarty

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