CANDLE - A Life course view

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Outline
1. CANDLE
2. Life Course - Approach
3. Insights from the CANDLE study
   1. Vitamin D
   2. Obesity
   3. Socio-emotional Health
   4. Resilience

What is CANDLE?
- Birth Cohort Study on early factors affecting neurocognitive development
- Population of Memphis/Shelby County
- Includes genetic, environmental, social, and other measures
- Life Course Approach
- Planning began Jan 2005
- Enrolled 1503 women by July 2011
- Plans to follow these women until their children are eight years of age
Why CANDLE?

5:1 Return on Investment in 0-4 yr.

What Are the Objectives of CANDLE?

To identify effects on cognitive development in the first three years of life due to:

- Home environments
- Prenatal habits
- Environmental conditions
- Genetics
- Nutrition
- Community/Neighborhoods
Qualifications for CANDLE Enrollment

• Low Medical Risk
  Pregnant women between 16 and 28 weeks
  Shelby County resident
  Low medical risk pregnancy
  Between the ages of 16 and 40
  Speak and understand English
  Single pregnancy
  Must be willing to give consent
  Plan to deliver at Baptist Womens, Methodist
  Germantown, St Francis or Region One Health
The CANDLE study is an ongoing research project focusing on early childhood development. The diagram illustrates the current status of data collection up to 48 months, showing a high completion rate of clinic visits.

Adherence to CANDLE Postnatal Clinic Visits (1-4 yrs) is the potential of gaining or losing something of value.
CANDLE Insights

- 25(OH)D
- Socio-emotional Health
- Family Dynamics
- Resilience

Serum 25(OH)D NHANES, 2006

Maternal 25(OH)D CANDLE 2nd Trimester vs NHANES, 2006

25(OH)D funded by ARRA (HD-060713, HD-055462)

CANDLE NHANES, 20-39 yr.

<table>
<thead>
<tr>
<th>Number of Individuals</th>
<th>Median 27 ng/ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whites</td>
<td>26 ng/ml</td>
</tr>
<tr>
<td>Blacks</td>
<td>19 ng/ml</td>
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</tbody>
</table>

Whites

Blacks
Prevalence of Sub-optimal 25(OH)D

Institute of Medicine Cut-points (ng/ml)

NHANES, 2006: < 16 ng/ml: 51% for Blacks, 9.4% for Whites

Cognitive Receptive Language

Expressive Language

Language Composite

Scaled Scores

Bayley Scales of Infant Development III
Brain expresses vitamin 25(OH)D receptors, varying 25(OH)D levels could provide a biological basis linking vitamin 25(OH)D and adult cognitive disorders.

Recent report that prenatal 25(OH)D below 18 ng/ml associated with language impairment at 5 and 10 years. 2x risk of language impairment compared those whose mothers had 25(OH)D above 28 ng/ml.

Hypothesis:
Maternal 2nd trimester 25(OH)D levels will be positively associated with neurocognitive development at age 2 years and will be independent of race.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Estimate</th>
<th>Adjusted R²</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive</td>
<td>0.51</td>
<td>0.23</td>
<td>0.45</td>
</tr>
<tr>
<td>Receptive Language</td>
<td>0.71</td>
<td>0.21</td>
<td>0.017</td>
</tr>
<tr>
<td>Expressive Language</td>
<td>0.45</td>
<td>0.13</td>
<td>0.22</td>
</tr>
</tbody>
</table>

1 Bayley Scales of Infant Development III
Adjusted for tobacco use during pregnancy, total number of pregnancies, maternal IQ, gestational age at birth, and race.

3 Adjusted for tobacco use during pregnancy, maternal IQ, insurance, race, child age at CV2 clinic visit, and race.

4 Adjusted for tobacco use during pregnancy, maternal IQ, education, and race.
25(OH)D and Receptive Scaled Score By Race

25 (OH)D ng/dl
Receptive Scaled Score

White
Black

Are these small #s meaningful?

Receptive Language: 25(OH)D by 10 ng/ml 1 IQ points
1 IQ point translates into $22,000 life earning
Collective earnings >$19,000,000

? Will this widen over time?

Bayley Scales of Infant Development III

Neighborhood Childhood Vulnerability Index

Index based on:
• <HS
• Single Parent
• Poverty
• Subsidized Living Benefits
• Part time work
• Health Insurance
Chicago and Denver Neighborhood studies

9 - 27% of the variance in youth development and prosocial behavior

Majority due to individual characteristics

Socio-Emotional Problems in CANDLE
Early Adversity, Socioemotional Development, and Stress in Urban 1-Year-Old Children

Maternal Characteristics
• Education
• Age
• Parenting Issues
• Mental Health Functioning
• Temperament
• Poverty
• Race

Child Characteristics
• Birth weight & Length
• Gestational Age at Birth
• Gender
• Cognitive and Language Functioning
• Possible SE Problem at 1 yr.
• 33% of Blacks
• 10% of Whites

Parenting Stress
• Global Mental Functioning
• Cyclothymic Temperament
• Dysthymic Temperament

Odds of Socio-emotion Problem at 1 year
Mother Child Interaction

- Child Sub-Scales:
  - Child Providing Cues
  - Child’s Response to Caregiver

- Mother Sub-Scales:
  - Sensitivity to child’s cues
  - Response to child’s distress
  - Socio-emotional growth fostering
  - Cognitive growth fostering.

<table>
<thead>
<tr>
<th></th>
<th>Mother Total</th>
<th>Child Total</th>
<th>Mother-Child Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal Age</td>
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<td>TennCare</td>
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<tr>
<td>Cohabitation</td>
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<td>+</td>
<td></td>
</tr>
<tr>
<td>Full Scale IQ</td>
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<td>+</td>
<td></td>
</tr>
<tr>
<td>Child’s Expressive Language Risk</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Child’s Receptive Language Risk</td>
<td>-</td>
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<td></td>
</tr>
</tbody>
</table>

Resilience
Childhood Resilience

Individuals who are doing better than expected, given a history that includes risk or adverse experiences.