Research Report

The Urban Child Institute CANDLE Study

Methodological Overview and Baseline Sample Description

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Preface

This report provides background information and descriptive statistics for the first year of the Urban Child Institute (UCI) Conditions Affecting Neurocognitive Development and Learning in Early Childhood (CANDLE) Study. The UCI populated the CANDLE Study with data that the University of Tennessee Department of Preventive Medicine collected. RAND Corporation researchers reviewed the data and prepared them for further analysis.

We have designed the content and format of the report to provide researchers interested in using the CANDLE data with a framework for understanding what data are available for their research and analysis. The UCI funded this research, which was conducted within RAND Health and RAND Education.

Researchers who are interested in gaining access to the data should do so by submitting a Manuscript Analysis Plan Proposal and cover form. Guidelines and more information can be found at CANDLE Study, 2015a.

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Summary

The Urban Child Institute (UCI) developed the Conditions Affecting Neurocognitive Development and Learning in Early Childhood (CANDLE) Study, designed by Grant W. Somes, chair of the Department of Preventive Medicine at the University of Tennessee Health Sciences Center. A team of academic and community consultants designed the project, which Somes led. Once the project was approved, the UCI provided funding to the University of Tennessee Department of Preventive Medicine to launch CANDLE in 2006. The partnership was leveraged to support collection of prenatal and early-childhood data on a healthy and ethnically diverse sample. As part of its broader relationship with the UCI (started in 2011), the RAND Corporation was then asked to review the data already collected for CANDLE, create a strategic plan for its use (Chandra, Shih, and Sellers, 2013), and prepare the data for further analysis.

The main goal of the UCI CANDLE Study was to investigate the separate and combined effects that a mother's prenatal experiences, as well as a child's home environment, experiences, exposure to potentially harmful toxins, and genetic makeup, can have on the child's brain development from birth to three years of age. The study was funded through the Urban Child Institute. Following are CANDLE's specific research aims:

- Estimate the effect that in utero exposure to environmental toxins can have on birth outcomes and neurocognitive development in a child's first three years of life.
- Determine whether nutrition factors (prenatal and infant diet) improve cognitive function during the first years of life.
- Explore psychosocial phenomena and patterns of mothers and children, and assess the effects that intra- and interpersonal factors and social development can have on cognitive development in children over time.
- Identify the genetic variants that contribute to mothers' and children's responses to nutrient intake and the physical and psychosocial environment and that consequently contribute to birth weight and neurocognitive development.

The long-term objective of this study is to provide information that will ultimately lead to improvements in the health, development, and well-being of children in Shelby County, Tennessee, through interventions and policy enforcement or development.

Roughly 1,500 pregnant women were enrolled throughout the duration of the study. There were eight in-person data-collection points per family (two prenatal clinic visits, one hospital visit at delivery, three clinic visits, and two home visits) and nine phone-based assessments that occurred every three months, starting when the child in the study was three months old. Data collection began during the second trimester and continued until the child's third birthday.

This report provides a methodological overview of the UCI CANDLE Study and describes and summarizes the data collected during the visits that occurred in the first year of the study.

The design of and results from the UCI CANDLE Study provide an opportunity for researchers to examine early drivers and markers of healthy early-childhood development and the influences of genetics, biology, family, and community environment within a large, racially and economically diverse sample. The multiple data points and multiple types of data will allow researchers to examine both objective (e.g., bio specimen) and self-report (e.g., survey) measures.

Researchers interested in the CANDLE data can learn more about the study from CANDLE Study, 2015b.

Acknowledgments

We are grateful to the study participants for their contributions to the Urban Child Institute Conditions Affecting Neurocognitive Development and Learning in Early Childhood Study. We also fondly acknowledge Grant W. Somes, Ph.D., our friend and colleague, who died in 2010. He provided invaluable support as the study's original principal investigator and is greatly missed.

We appreciate the thoughtful reviews of Eugene K. Cashman, Jr., Henry G. Herrod, Heather L. Schwartz, and Sandraluz Lara-Cinisomo.

Abbreviations

BD	block design
BISQ	Brief Infant Sleep Questionnaire
BITSEA	Brief Infant Toddler Social Emotional Assessment
BMI	body mass index
BSI	Brief Symptom Inventory
BSID-III	Bayley Scales of Infant Development, 3rd ed.
CANDLE	Conditions Affecting Neurocognitive Development and Learning in Early Childhood
CAPI	Child Abuse Potential Inventory
CDC	Centers for Disease Control and Prevention
C-section	caesarean section
CSHCN	child with special health care needs
CTS	Conflict Tactics Scales
CV1	first clinic visit
DC	difficult child
EPDS	Edinburgh Postnatal Depression Scale
ER	emergency room
FFQ	Block Food Frequency Questionnaire
GSI	Global Security Index
HV1	first home visit
IFQ	Infant Feeding Questionnaire
KIDI	Knowledge of Infant Development Inventory
M1	first maternal or baseline visit
M2	second maternal visit
M3	third maternal or birth visit
MR	matrix reasoning
NCAST	Nursing Child Assessment Satellite Training
P-CDI	parent–child dysfunctional interaction
PCI	Parent–Child Interaction
PD	parental distress
PIQ	performance intelligence quotient
PSI	Parenting Stress Index
PSI/SF	Parenting Stress Index Short Form
RSE	Rosenberg Self-Esteem Scale
S	similarities

SD	standard deviation
SIB-R	Scales of Independent Behavior—Revised
SSQ6	Social Support Questionnaire 6
TEMPS	Temperament Evaluation of Memphis, Pisa, Paris, and San Diego
TLEQ	Traumatic Life Events Questionnaire
UCI	Urban Child Institute
USDA	U.S. Department of Agriculture
UTHSC	University of Tennessee Health Science Center
V	vocabulary
VIQ	verbal intelligence quotient
WASI-III	Wechsler Abbreviated Scale of Intelligence, 3rd ed.
WHO	World Health Organization
WIC	Special Supplemental Nutrition Program for Women, Infants, and Children

Chapter One. Introduction

The Importance of Examining Early-Childhood Cognitive and Behavioral Development

Epidemiological and health services research has demonstrated that the first few years of a child's life represent a period of unparalleled brain development. Exposure to negative environments and stressors in utero through age 3 can result in poor neurocognitive development, which increases risk for delayed school readiness and the incidence and severity of physical and mental health problems (Schlotz and Phillips, 2009; Salum et al., 2010; Malacova et al., 2008; Reichman, 2005; Eriksson et al., 2001; Wadhwa et al., 2001; Shonkoff et al., 2011).

Research in child development shows that children's experiences in their earliest years affect the architecture of their brains, responses to stress, formation of trusting relationships, and the way their bodies mature (Shonkoff et al., 2011). It is during these years that the brain undergoes its most dramatic growth, setting the stage for socialization and emotional development. We also know that a child's brain doubles in size in the first year and, by age 3, reaches 80 percent of its adult volume (Gilmore et al., 2007; Nowakowski, 2006).

During these critical years of development, the experiences children have play a huge role in making their brains more efficient, allowing them to engage in multiple tasks at the same time, think through complex problems, and tune out the extra information around them that might be distracting (Fox, Levitt, and Nelson, 2010). Moreover, these experiences during the first years of life are strongly associated with long-term cognitive, emotional, and social outcomes through adulthood (Fox, Levitt, and Nelson, 2010).

The Collaborative Perinatal Project, initiated in the late 1950s, was the first U.S.-based birth cohort study and yielded major findings, including maternal smoking as a risk factor for sudden infant death syndrome; neonatal jaundice in the absence of bilirubin toxicity as not being associated with major long-term neurodevelopmental outcomes; and labor and delivery events as not being major contributors to cerebral palsy or most other neurodevelopmental disorders (Klebanoff, 2009). More-current cohort studies of the perinatal period are needed given the breadth of environmental exposures that children now experience (Landrigan et al., 2002), the increased rates of neurodevelopmental disorders in early childhood (Pastor and Reuben, 2008), and our greater understanding of how psychosocial risk factors can affect health and well-being. Although several additional perinatal studies within and outside the United States have contributed, or are expected to contribute, to the science on early-life determinants of neurodevelopment, they are not without limitations. U.S. studies that have been completed have not had data on prenatal environments, genetic markers, and postnatal environmental exposures on predominantly minority populations, particularly blacks, within which to examine their

interactive effects on neurocognitive trajectories. Including blacks in research on birth outcomes is particularly important because of the disproportionate rates of adverse birth outcomes that have persisted over time among blacks (Ananth et al., 2003; Iyasu, Tomashek, and Barfield, 2002). Further, most U.S. studies have not had the benefit of a solely "healthy" pregnant sample of mothers to observe infant development from pregnancy through age 3 with regular and frequent assessments of potential risk and protective biological, clinical, environmental, and psychosocial factors.

The Urban Child Institute and the History of the CANDLE Study

The Urban Child Institute (UCI) in Memphis, Tennessee, designed and funded the Conditions Affecting Neurocognitive Development and Learning in Early Childhood (CANDLE) Study. Grant W. Somes, a professor at the University of Tennessee Health Science Center (UTHSC), led the design team and initial implementation of the UCI CANDLE Study. He viewed the study as an opportunity to address a growing gap in local knowledge about early brain development. The UCI then partnered with UTHSC to help conduct the study. This included project data-collection staff housed in the UCI who managed recruitment of participants, survey administration, and data collection, cleaning, and analysis. The principal investigator of the study is now Frances Tylavsky, a UTHSC professor who assumed the role of principal investigator after Somes's untimely passing.

As part of its broader relationship with the UCI (started in 2011), the RAND Corporation was then asked to review the data already collected for CANDLE, create a strategic plan for its use (Chandra, Shih, and Sellers, 2013), and prepare the data for further analysis. As part of that effort, the UCI asked RAND to create this summary report on the UCI CANDLE Study design and the baseline findings.

CANDLE is a large-scale study of roughly 1,500 pregnant women living in Shelby County, Tennessee, who began participating in the study during their second trimesters and who continued until the child's third birthday. The UCI designed the study to identify the factors during pregnancy and early childhood that affect a child's development and ability to learn. Data collection is now complete, and data analysis is ongoing.

More specifically, CANDLE's primary goal is to investigate the separate and combined effects that the mother's prenatal experiences, as well as the child's home environment, experiences, exposure to potentially harmful toxins, and genetic makeup, can have on a child's brain development up through age 3. The specific research aims included the following:

- Estimate the effect that in utero exposure to environmental toxins can have on birth outcomes and neurocognitive development in a child's first three years of life.
- Determine whether nutrition factors (prenatal and infant diet) improve cognitive function during the first years of life.

- Explore psychosocial phenomena and patterns of mothers and children, and assess the effects that intra- and interpersonal factors and social development can have on cognitive development in a child over time.
- Identify the genetic variants that contribute to mothers' and children's responses to nutrient intake and the physical and psychosocial environment and that consequently contribute to birth weight and neurocognitive development.

The long-term objective of this study is to provide information that will ultimately lead to improvements in the health, development, and well-being of children in Shelby County, Tennessee, through interventions and policy enforcement or development. Additional information regarding the UCI CANDLE Study can be found in UCI, undated, and CANDLE Study, 2015b.

Purpose of This Report

This report serves as a comprehensive user manual for researchers interested in using the CANDLE baseline data. We describe this unique cohort study that aims to identify demographic, clinical, behavioral, biological, and psychosocial risk and protective factors related to young children's neurocognitive development. We also summarize the CANDLE cohort's prenatal, maternal, and birth characteristics and exposures and provide a description of the data collected on outcomes at four weeks and one year following the birth of the CANDLE child. Research teams can use this report as a primary citation for the study design and approach. Although the UCI CANDLE Study followed children to age 3, this report is intended to be a baseline report and, as such, includes descriptive statistics for the prenatal visits up through the first-year clinic visit. Future reports and journal articles will describe the data from time points after the first clinic visit.

Structure of the Report

Chapter Two provides background information about the study design, the study population (eligibility, recruitment, and attrition), methodology for creating sample weights representative of Shelby County, sample characteristics, a brief description of the measures, and a study timeline. Chapters Three through Eight provide detailed information about each of the study forms, including background, description, notes about administration, information about scoring, any other relevant information about the data, and descriptive tables for the measures. In the cases in which less than 1.5 percent of the sample reported an outcome or response, we do not report those small numbers. Chapter Nine concludes the report with a summary of the research implications and potential benefits that the UCI CANDLE Study could have for researchers.

Chapter Two. Study Design and Methods

In this chapter, we provide additional detail about the UCI CANDLE Study design and methods, including eligibility, recruitment, data-collection efforts, sample size, attrition, study population characteristics, and weighting. We also provide a high-level summary of the types of data collected, with additional detail on the measures and baseline characteristics summarized in the subsequent chapters.

Study Design

The UCI CANDLE Study is an observational, longitudinal cohort research study of mothers and children that includes outcomes from the prenatal period, birth, and the early-childhood period (birth to age 3). The UCI CANDLE Study was conducted in Shelby County, Tennessee, which includes the city of Memphis.

Eligibility

The study population included women, recruited during their second trimesters of pregnancy, and the children who were born at the birth visit. The UCI CANDLE Study considered a woman eligible for participation if she met all the following criteria:

- was a Shelby County resident
- was pregnant between 16 and 28 weeks gestation
- was between the ages of 16 and 40
- could speak and understand English
- had a singleton pregnancy
- had a low-risk pregnancy[1]
- had plans to deliver at one of the five participating health care settings in Shelby County.[2]

CANDLE selected these settings to represent the diversity of patients or health consumers in the county, including sites that served middle- and low-income families. It chose Shelby County as

[1] The UCI defined a pregnancy as low risk if it *lacked* all of the following: chronic hypertension requiring therapy or vascular disease requiring therapy; maternal red-cell alloimmunization except Rhesus (Rh) factor; hemoglobinopathy, including sickle-cell trait and severe iron-deficiency anemia (hemoglobin less than 9); insulin-dependent diabetes; appreciable renal or cardiopulmonary disease; prolapsed or ruptured membranes; oligohydramnios; complete placenta previa; endocrine disease; collagen disease (e.g., lupus erythematosus or scleroderma); active or chronic hepatitis; renal disease; pulmonary or heart disease requiring therapeutic medication or limitation of physical activity; major fetal anomaly (e.g., aneuploidy, major organ-system defect); and human immunodeficiency virus.

[2] Baptist Memorial Hospital—Memphis, Methodist Le Bonheur Germantown Hospital, Regional Medical Center, Saint Francis Hospital—Bartlett, and Saint Francis Hospital—Memphis.

the setting because the population is diverse (52 percent non-Hispanic blacks) (U.S. Census Bureau, undated; U.S. Census Bureau, 2015), and the infant mortality rates and adverse birth outcomes far exceed those of the United States overall (Bauer, 2014). Further, the UCI is committed to improving the health and well-being of Shelby County residents.

Recruitment

Study recruitment occurred in two stages. The first stage of recruitment took place between December 2006 and August 2008 at the UT (University of Tennessee) Medical Group clinic, where the project recruited pregnant patients via discussions with clinic staff. The UTHSC project coordinator asked each eligible patient to participate in the study while the patient was in the UT Medical Group clinic during her regular obstetric appointment. UCI CANDLE Study staff at UTHSC asked each woman who met screening criteria to participate; if she agreed, the UTHSC project coordinator provided her with a consent form. CANDLE required each woman under the age of 18 to have a legally authorized representative cosign the consent form. CANDLE enrolled a total of 344 women from the UT Medical Group clinic through August 2008.

The second stage of recruitment started in September 2007 and lasted until July 2011. The purpose of the second stage was to increase the study sample and to improve distribution across the county. The second stage of recruitment focused on community sources, including mailings to obstetric practices, flyers in obstetric practices, referrals by friends and relatives, and television advertisements. During the second stage of recruitment, CANDLE enrolled an additional 1,160 women. During this recruitment wave, women telephoned the UTHSC recruitment center, which screened them for eligibility. The recruiters provided consent forms and obtained signatures, and eligibility was confirmed at the woman's in-person enrollment visit (M1, or first maternal or baseline visit). CANDLE required each woman under the age of 18 to have a legally authorized representative cosign the consent form. Out of 5,228 women who were screened for eligibility through both waves of recruitment, 3,320 (63 percent) met inclusion criteria, and 1,503 (45 percent) agreed to participate in the study.

The institutional review boards at UTHSC and the three hospital systems (for the five health care settings) at which enrollees planned to deliver reviewed and approved this study.

Data Collection

UCI CANDLE Study staff at UTHSC, including research assistants, research nurses, and project coordinators, gathered data during the prenatal and early-childhood periods at multiple times and in multiple settings. They conducted eight of the study visits in person (two prenatal clinic visits, one hospital visit at delivery, three clinic visits, and two home visits), and nine assessments took place via phone every three months, starting when the child was three months old (see Table 2.1).

Table 2.1. Schedule of Visits, Incentives, Questionnaires, and Biological Specimens for Prenatal, Birth, and First-Year Visits

Visit Schedule	Incentive	Questionnaire or Construct
M1: enrollment or baseline clinic (first maternal or baseline) visit: 16–27 weeks gestation	$50 gift card	Demographic survey; Maternal Baseline Enrollment Data Form; FFQ; Choline Inhibitor Questionnaire; TEMPS (temperament); maternal blood and urine
M2: third-trimester clinic (second maternal) visit: 28–42 weeks gestation	$30 gift card	CTS (intimate-partner violence by partner); TLEQ (traumatic life events); SSQ6 (social support); RSE (self-esteem); BSI GSI (psychological distress); maternal blood and urine
M3: birth (third maternal or birth) visit: delivery (newborn)	$50 gift card	Labor and Delivery Updates and Complications Form; Labor and Delivery Summary Form; Neonatal Summary Form; maternal blood and urine; placental tissue and cord blood
HV1: first home visit: four weeks after birth	$35 gift card	FFQ; Choline Inhibitor Questionnaire; IFQ; Food Supplement Information; 24-hour food recall; Residence Establishment and Lead Risk Assessment; Child Health Update Form; EPDS (maternal depression); household questionnaire
CV1: first clinic visit: one year after birth	$100 gift card	Choline Inhibitor Questionnaire; IFQ; Food Supplement Information; 24-hour food recall; Residence Establishment and Lead Risk Assessment; Child Exam; CSHCN screener; BISQ; Family Health History; Child Health Update Form; NCAST PCI Teaching Scale; BSID-III (Bayley); CAPI; SIB-R Early Development Form; WASI-III subscales (maternal intelligence); BITSEA (social and emotional development); BSI (psychological symptoms); EPDS (maternal depression); PSI (maternal stress); childcare information

NOTE: FFQ = Block Food Frequency Questionnaire. IFQ = Infant Feeding Questionnaire. TEMPS = Temperament Evaluation of Memphis, Pisa, Paris, and San Diego. CTS = Conflict Tactics Scale. TLEQ = Traumatic Life Events Questionnaire. SSQ6 = Social Support Questionnaire 6. RSE = Rosenberg Self-Esteem Scale. BSI = Brief Symptom Inventory. GSI = Global Severity Index. EPDS = Edinburgh Postnatal Depression Scale. CSHCN = child with special health care needs. BISQ = Brief Infant Sleep Questionnaire. NCAST = Nursing Child Assessment Satellite Training. PCI = Parent–Child Interaction. BSID-III = Bayley Scales of Infant Development, 3rd ed. CAPI = Child Abuse Potential Inventory. SIB-R = Scales of Independent Behavior—Revised. WASI-III = Wechsler Abbreviated Scale of Intelligence, 3rd ed. BITSEA = Brief Infant Toddler Social Emotional Assessment. PSI = Parenting Stress Index. Additional clinic visits took place at 24 months and 36 months after birth. An additional home visit took place at 24 months after birth. CANDLE staff conducted phone visits at three, six, nine, 15, 18, 21, 27, 30, and 33 months after birth. Additional clinic visits took place when the CANDLE child was two and three years old, and an additional home visit took place when the CANDLE child was one year old.

Table 2.1 displays a detailed schedule of visits, incentives, and types of data collected at each study time point. For women who enrolled through the UT Medical Group, research nurses (registered nurses who work on research projects through UTHSC) conducted the first maternal or baseline (M1, or 16 to 27 weeks gestation) and second maternal (M2, or 28 to 42 weeks gestation) visits at the clinic at which the woman was receiving prenatal care. For women enrolled in the community, research assistants conducted baseline (M1) and third-trimester (M2) visits at UTHSC's preventive-medicine clinics.

At baseline (M1), research nurses or research assistants collected maternal demographic information, including age, race and ethnicity, educational attainment, income, marital status, and health insurance status and collected maternal blood and urine samples. During the second

maternal visit (M2), researcher assistants collected maternal blood and urine samples and conducted a battery of psychosocial tests.

Birth visits (M3) occurred at the birth hospital. UTHSC CANDLE staff provided each hospital with a list of CANDLE participants who had plans to deliver at that hospital and their anticipated delivery dates. The hospitals noted in the preadmission paperwork that these women were CANDLE participants. At delivery, each woman informed hospital staff that she was a CANDLE participant. Either of these two notifications triggered the collection of maternal blood, urine, cord blood, and placental tissue by hospital nurses. The data-collection team was also made aware of the CANDLE participant's delivery and worked with hospital nurses to ensure that samples were collected. Of the 1,483 women who did not experience miscarriages before their birth visits and had not withdrawn at M2, 1,457 (98.2 percent) had birth-visit records. However, the study team did not collect an actual missing rate against total deliveries by hospital or their initial CANDLE records. Delivery nurses measured birth weight (in grams), length (in centimeters), and head circumference (also in centimeters). UTHSC research nurses obtained labor and delivery information through abstraction of birth records provided by the hospital. UTHSC research nurses also obtained information about complications and medical updates since the third-trimester (M2) visit through interview of the mother and confirmed the information by chart abstraction.

The first home visit (HV1) occurred in the mother's home approximately four weeks after delivery. Research assistants collected information about the mother's nutrition and participation in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) or other food-related programs and screened for depression. They also collected information on the infant's feeding practices and exposure to lead; a 24-hour dietary recall; an update on the child's health; and data on who lives in the household with the mother and infant.

The first clinic visit (CV1) took place at UTHSC's preventive-medicine clinics with the mother and infant. Research assistants conducted the clinic visits. They collected information on the family's health history; the mother's nutrition and participation in WIC or other food-related programs; assessed the mother's intelligence, parenting stress, and potential for child abuse; and screened for maternal depression. They also collected information on childcare arrangements, the child's feeding practices, dietary intake for the previous 24 hours, exposure to lead, the child's sleeping habits, the child's social and emotional development, and an update on the child's health and conducted an examination of the child. Cognitive examiners (master's or doctoral-level personnel) were trained to administer all neurocognitive assessments with 85 percent or better interrater reliability.

Note that Table 2.1 presents the schedule of visits for only the first year of data.

Study Population

Analytic Sample and Attrition over Time

Although 1,503 women enrolled in the study, the sample sizes for the descriptive data in the chapters that follow vary because of fetal demise, withdrawal from the study, or loss to follow-up. To create sample weights, we excluded women who reported fetal demise at the birth visit (as described in more detail below), and we do not include these women in the descriptive tables. However, these women's prenatal visit records are present in the data that are made available to researchers; therefore, the numbers in the prenatal and birth-visit codebooks and the numbers provided in this report might be slightly different.

As reflected in Table 2.2, follow-up participation rates for each study visit (ranging from 97 percent to 75 percent) were comparable to those for other major studies on children and families that used prenatal recruitment approaches (e.g., Avon Longitudinal Study of Parents and Children [70 percent] and Wisconsin Study of Families and Work [85 percent]) (Eunice Kennedy Shriver National Institute of Child Health and Human Development, 2015).

Table 2.2. Study Time Point Details Through the Year 1 Visit

Time Point	Detail	Age	Total		Loss Due to Fetal Demise		Did Not Participate in Study Visit		Withdrew from Study or Lost to Follow-Up	
			N	%	*n*	%	*n*	%	*n*	%
M1	Enrollment clinic visit	16–26 weeks pregnant	1,503	100	—	—	—	—	—	—
M2	Third-trimester clinic visit	27–42 weeks pregnant	1,363	90.7	4	0.3	120	8.0	16	1.1
M3	Birth	Newborn	1,463	97.3[a]	4	0.3	17	1.1	19	1.3
HV1	Home visit	4 weeks	1,262	84.0	13	0.9	195	13.0	33	2.2
CV1	Clinic visit	12 months	1,132	75.3	16	1.1	303	20.2	52	3.5

[a] Seven individuals have visit records for M3 but did not have live births. We include them in the "loss due to fetal demise" column for visits HV1 and CV1.

Approach to Weighting the CANDLE Sample

Because the UCI CANDLE Study participants represent a convenience sample from Shelby County, Tennessee, certain considerations should be taken into account, including the potential that the sample does not fully represent the general population from which it was drawn and the biases that might result from that lack of generalizability. Table 2.3 shows comparisons between the UCI CANDLE Study participants and the target population of Shelby County, Tennessee

(i.e., healthy pregnant women ages 16 to 40 with singleton live births between 2006 and 2011), on key demographic and clinical characteristics.

Table 2.3. Descriptive Characteristics of CANDLE (*N* = 1,494) and Shelby County Births

	CANDLE Unweighted Sample (mean age = 26.0 years, SD = 5.4)		CANDLE Weighted Sample (mean age = 25.9 years, SD = 5.6)		Shelby County Birth Sample (mean age = 26.5 years, SD = 5.6)	
Variable	***n***	**%**	***n***	**%**	***n***	**%**
Race/ethnicity						
Black	967	64.7	870	58.2	51,295	58.2
White	472	31.6	400	26.8	23,617	26.8
Hispanic	32	2.1	166	11.1	9,770	11.1
Other	21	1.4	51	3.4	2,998	3.4
Missing or unknown	2	0.1	7	0.5	434	0.5
English as primary language	1,475	98.7	1,459	97.7		
Educational attainment						
Less than high school	184	12.3	369	24.7	21,756	24.7
High school diploma or equivalent	703	47.1	740	49.5	43,650	49.5
Technical school	138	9.2	60	4.0	3,541	4.0
College degree	296	19.8	200	13.4	11,813	13.4
Graduate or professional degree	171	11.4	118	7.9	6,958	7.9
Unknown or missing	2	0.1	7	0.4	396	0.5
Income, in dollars per year						
Less than 25,000	595	50.7	757	50.7	44,660	50.7
25,000–less than 75,000	532	39.1	276	18.5	16,328	18.5
75,000 or more	233	17.1	195	13.1	11,504	13.1
Unknown or missing	134	9.0	265	17.7	15,622	17.7
Health insurance status						
Medicaid or TennCare	881	59.0	1,048	70.1		
Employer or union	576	38.6	402	27.0		
Medicare	2	0.1	3	0.2		
Other (private, employer, or military)	59	4.0	45	3.0		
Marital status						
Never married	610	40.9	666	44.7		
Married	561	37.6	460	30.9		
Widowed	1	0.1	0	0.0		
Divorced	23	1.5	24	1.6		

Variable	CANDLE Unweighted Sample (mean age = 26.0 years, SD = 5.4)		CANDLE Weighted Sample (mean age = 25.9 years, SD = 5.6)		Shelby County Birth Sample (mean age = 26.5 years, SD = 5.6)	
	n	%	*n*	%	*n*	%
Separated	16	1.1	27	1.8		
Living with partner	282	18.9	313	21.0		
Unknown or missing	1	0.1	3	0.2		

NOTE: SD = standard deviation. The weighting procedure used a binary age variable that indicated whether the participant's age was above or below the median age of mothers who gave birth in Shelby County (age 26). Although the distribution of the mothers who were above and below the median age was the same for the Shelby County population (49 percent and 51 percent, respectively) and the weighted CANDLE population (49 percent and 51 percent, respectively), the weighted mean age, presented as a continuous variable (which was not used in the weighting procedure) is slightly lower for the weighted CANDLE sample. English as the primary language in the home, health insurance status, and marital status were unavailable for comparison in Shelby County birth-record data. Participants may have selected more than one health insurance option, and there was no option for "no health insurance."

As shown, we note some significant differences (see the full discussion of differences in the next section). For example, women enrolled in the CANDLE sample tended to have higher incomes, had attained higher levels of education, and were more likely to be black or white than Hispanic or another race. In light of these differences, we estimated poststratification weights for each wave of the UCI CANDLE Study that aim to make the respondents in the CANDLE sample representative of women having healthy births in Shelby County, Tennessee, between 2006 and 2011. We will make these weights available to researchers upon request.

We estimated weights for 1,494 records (women whose M3 records did not indicate fetal demise) using a raking procedure, which iteratively adjusts the poststratification weights so the adjusted (weighted) distribution of the analytic sample matches the distribution of the target population on each covariate included in the model (Bacharach, 1965). Estimation took place in the R package using the *rake* command and the weights controlled for maternal age, race, education, and income. We note that, prior to creating the weights, we selected the target Shelby County sample by applying a subset of the inclusion and exclusion criteria of the UCI CANDLE Study to the Shelby County births because those data did not include all CANDLE inclusion factors. This resulted in a Shelby County sample of women who had single pregnancies, were between 16 and 40 years of age in the second trimester, and were not infected with hepatitis B or C. We also note that these weights have some limitations because perfect alignment between Shelby County data and the target population of healthy mothers enrolled in the UCI CANDLE Study is not feasible based on existing data (for example, the Tennessee Department of Health does not have enough health information on mothers delivering live births in Shelby County to determine whether a mother was as healthy as would be required to enroll in the UCI CANDLE Study).

Table 2.3 shows the unweighted and weighted descriptive characteristics of the CANDLE sample and the Shelby County birth sample. After weighting, the two samples showed similar

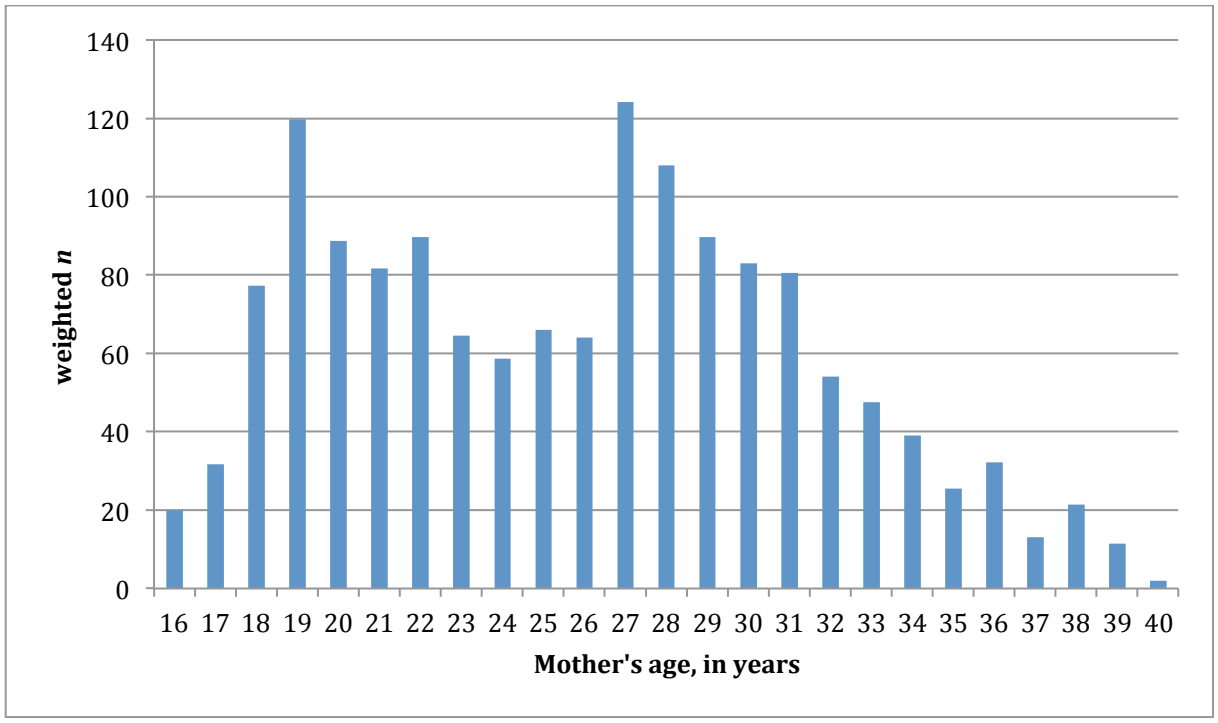
characteristics on all variables used to estimate the weights (age, race, education, and income). The weighting procedure used a binary age variable (above or below the median age).

Sample Characteristics

Sample Characteristics Used for Weighting (Age, Race, Education, Income)

The weighted analytic sample of mothers was, on average, 25.9 years old, with an even distribution of mothers between 19 and 31 years (see Table 2.3). Figure 2.1 provides the distribution of mothers' ages at the baseline visit, showing that most were between 19 and 31 years.

Figure 2.1. Distribution of Mothers' Ages at Baseline Visit



According to the weighted data, 58 percent of mothers were black, 27 percent white, 11 percent Hispanic, 3 percent other race or ethnicity, and less than 1 percent unknown. Seventy-four percent of mothers had a high school education or less, and 51 percent had less than $25,000 annual income (see Table 2.3).

Other Demographic Characteristics of the Mothers in the Sample

Although these characteristics were not available for comparison in the Shelby County birth sample, we also examined the distribution of health insurance coverage and marital status among

CANDLE mothers at the baseline visit (see Table 2.3). The majority of mothers received health insurance through Medicaid or TennCare (70 percent) or their employers (27 percent).

Additionally, 45 percent of mothers were never married, and 31 percent were married at the time of the baseline visit. The vast majority (98 percent) of CANDLE mothers identified English as the language spoken primarily in the home (comparisons with Shelby County data were unavailable) (see Table 2.3).

Demographic Characteristics of the Child's Father

At the baseline visit (M1), CANDLE investigators also collected information about each CANDLE child's father from the enrolled mothers. The average age of the CANDLE child's father at M1 was 28.8 years (SD = 6.4). Sixty-three percent of CANDLE fathers were identified as black, 35 percent of CANDLE fathers were identified as white, and 2 percent were identified as other races or ethnicities. Eleven percent of the CANDLE fathers had less than a high school education; 55 percent completed high school degrees or equivalent; 6 percent completed some college or trade school; 19 percent had college degrees; and 10 percent had graduate or professional degrees. Most responses to the income question were "unknown" or missing (75 percent of those who were asked). Among those with nonmissing data (this question was added to the protocol in 2009), 62 percent of fathers had income levels under $25,000 per year. There were 839 participants who were not asked this question.

Measures

Table 2.4 provides a summary of the types of data that were collected during each data-collection period as part of the UCI CANDLE Study up to the first clinic visit. The measures can be grouped into eight high-level topics: demographics; prenatal and birth characteristics; child and family health; child and family nutrition; mother's mental and behavioral health; cognitive performance; psychosocial measures; and biological samples. We have provided demographic information in this chapter (Chapter Two). Subsequent chapters provide baseline data (for all measures through year 1) and additional information about the forms used to capture this information, including background information for each data-collection form, a description of the form, administration and scoring information for measures contained within each form, and notes about systematic missingness or data issues.

Table 2.4. Study Timeline and Forms Through the First-Year Clinic Visit

Condition	M1 Enrollment Visit (16–26 weeks pregnant)	M2 Second Prenatal Visit (27–42 weeks pregnant)	M3 Birth	HV1 Home Visit (4 weeks)	CV1 Clinic Visit (1 year)
Parental demographics					

Condition	M1 Enrollment Visit (16–26 weeks pregnant)	M2 Second Prenatal Visit (27–42 weeks pregnant)	M3 Birth	HV1 Home Visit (4 weeks)	CV1 Clinic Visit (1 year)
Demographic survey (mother and father) includes gender, language, age, race, ethnicity, income, education, insurance status, marital status, and paternal information	x				x
Prenatal and birth characteristics					
Maternal Baseline Enrollment Data Form (mother) includes BMI measurements, substance-abuse history, obstetric and gynecological history, medical history, and sexual history	x				
Labor and Delivery Summary Form (mother)			x		
Labor and Delivery Updates and Complications Form (mother) includes complication history, type of labor, and delivery classification			x		
Neonatal Summary Form (child) includes birth status, infant gender, and discharge diagnosis			x		
Child and family health					
Child Health Update Form (child) includes hospitalizations, illnesses, and weight				x	x
BISQ (child) assesses characteristics of sleep behaviors					x
Family Health History (child) includes family history of substance abuse, developmental learning disabilities, dementia, autism, psychiatric disorders, cardiovascular health, obesity, and related complications					x
Residence Establishment and Lead Risk Assessment (child)				x	x
Child Exam (child)					x
CSHCN (child) includes medications; medical, behavioral, or health conditions; educational services; physical therapy, occupational therapy, and speech therapy; and anthropometry measurements					x
Child and family nutrition					
FFQ (mother)	x			x	
Choline Inhibitor Questionnaire (mother)				x	x
IFQ (child)				x	x

Condition	M1 Enrollment Visit (16–26 weeks pregnant)	M2 Second Prenatal Visit (27–42 weeks pregnant)	M3 Birth	HV1 Home Visit (4 weeks)	CV1 Clinic Visit (1 year)
Food program questionnaire (mother and child)				x	x
24-hour food recall (mother)				x	x
Mother's mental and behavioral health					
TEMPS (mother)	x				
BSI (mother)		x			x
RSE (mother)		x			
EPDS (mother)				x	x
Child cognitive performance					
BSID-III (child)					x
WASI-III subscales (mother)					x
Child and family psychosocial characteristics					
CTS2 (mother)		x			
TLEQ (mother)		x			
SSQ6 (mother)		x			
KIDI (mother)		x			
Household questionnaire (mother and child) includes who lives in the home and feelings about the neighborhood				x	
CAPI (mother)					x
PSI (mother)					x
NCAST PCI (mother and child)					x
Child Care Arrangements Questionnaire (Child Care Information) (mother and child)					x
SIB-R (child)					x
BITSEA (child)					x
Biological samples					
Blood (mother)	x	x	x		
Urine (mother)	x	x	x		
Umbilical-cord blood			x		
Placental tissue			x		
Blood (child)			x		

NOTE: BMI = body mass index. KIDI = Knowledge of Infant Development Inventory.

Chapter Three. Prenatal and Birth Measures

This chapter provides additional information on the types of data collected to capture relevant prenatal and birth characteristics. CANDLE staff used four forms to collect these data: the Maternal Baseline Enrollment Data Form, labor and delivery forms (Labor and Delivery Updates and Complications Form and Labor and Delivery Summary Form), and Neonatal Summary Form. Information about these forms, the types of data collected, and baseline results are presented in this chapter.

Maternal Baseline Enrollment Data Form

Background

CANDLE investigators at UTHSC created the Maternal Baseline Enrollment Data Form for the specific purpose of CANDLE data collection about the current pregnancy and mother's health history.

Description

The Maternal Baseline Enrollment Data Form assesses information about the current pregnancy, including self-reported prepregnancy weight (in kilograms), self-reported current weight (in kilograms), self-reported height (in meters), expected due date, gestational age, and date of first prenatal visit. The obstetrics and gynecological history section obtains general information about history of pregnancies. The form also assesses information about the participants' history of medical conditions, sexual history, and substance history during the current pregnancy and over the course of the mother's life. For most of the items in the latter two sections, the form also asks the biological mother to report whether these questions apply to any current or prior sexual partner. The final section asks whether the mother is currently taking any medications on a given list.

Administration

A trained UCI CANDLE Study research assistant administers the Maternal Baseline Enrollment Data Form during an in-person clinic visit using a paper form. A research assistant also enters data into the database. CANDLE administered the Maternal Baseline Enrollment Data Form at the first maternal or baseline visit (M1).

Scoring

The Maternal Baseline Enrollment Data Form includes three calculated variables: gestational age, BMI classification, and pregnancy interval.

Based on an expected full-term pregnancy of 280 days, CANDLE researchers calculated gestational age at enrollment (in weeks) as

$$\frac{MaternalBaselineVisitDate - \left(DateofEstimatedDueDate - 280\right)}{7}.$$

CANDLE researchers calculated BMI classification based on self-report prepregnancy weight (in kilograms) and height (in meters).

Because some participants fell below the age 20 cutoff for adult classification, CANDLE researchers used two classification guidelines. They based BMI classifications for participants ages 16 to 20 on BMI percentiles following the Centers for Disease Control and Prevention (CDC) classification guidelines (CDC, 2015).

CANDLE researchers based BMI classifications for participants older than 20 years of age on BMI percentiles following the World Health Organization (WHO) classification recommendations (WHO, 2015).

The information used to calculate the time elapsed between pregnancies (pregnancy interval) was the mother's estimated date of delivery and date of last pregnancy termination (e.g., miscarriage, delivery). To calculate pregnancy interval, CANDLE researchers followed these steps:

1. Subtract 280 days or (40 weeks, by CDC standards) from the estimated delivery date variable, providing the mother's last period date.
2. Subtract the date of last pregnancy from the last period date, providing the time frame between the mother's last pregnancy and current conception.

In cases in which the date of last pregnancy was reported (or documented) as later than the calculated last pregnancy dates, a negative value resulted for the pregnancy variable. Because these dates resulted in errors in the raw reporting form, the RAND data-cleaning team set these cases to missing (coded as $.V$ for impossible value).

Data Notes

We have numbered survey items for convenience in the codebook appendix, which we will make available to researchers who request the data, and we use these item numbers in the labels. We number items with dates as responses, although, as of this time, no dates are released in public files. All participants have data for some items in the Maternal Baseline Enrollment Data Form. For items assessing experiences for the current pregnancy versus ever, the intent was to distinguish between conditions experienced during the current pregnancy and those experienced at an earlier time in the mother's life but not during current pregnancy. If a respondent answered

"yes" to both, we interpreted this response as having happened both before and during the current pregnancy.

Data

This section contains descriptive data from the Maternal Baseline Enrollment Data Form (current pregnancy, obstetric and gynecological history, medical-condition history, sexual history, substance-abuse history, and medication history).

Current Pregnancy

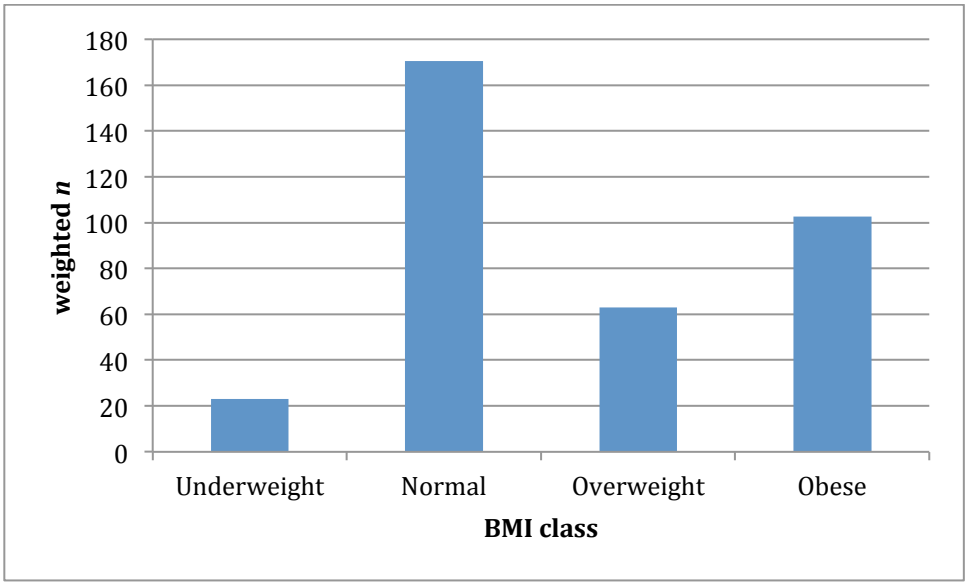
The average prepregnancy weight of the CANDLE mothers was 74 kg (see Table 3.1).

Table 3.1. Self-Reported Weight of Mother, in Kilograms

		Unweighted		Weighted	
Weight	***N***	**Mean**	**SD**	**Mean**	**SD**
Prepregnancy	1,489	74.25	21.28	73.97	21.93
At M1	1,488	81.92	21.27	81.98	22.41

Roughly half of CANDLE mothers had normal BMIs (see Figure 3.1).

Figure 3.1. Body Mass Index Class of Mother at Prepregnancy Weight

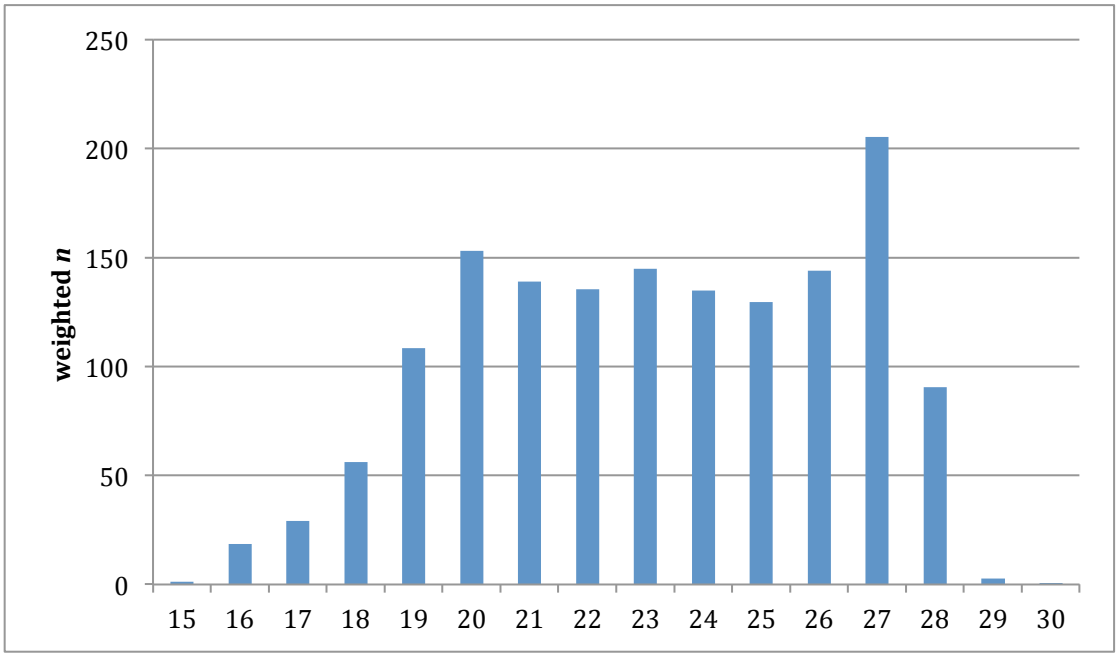


NOTE: BMI class data were missing for 1,134 weighted observations.

Figure 3.2 shows the distribution of gestational age at enrollment in weeks. Gestational age at enrollment was self-reported as less than 28 weeks. When CANDLE investigators obtained

additional information, the gestational age for four participants reflected the early third trimester, i.e., 28 to 30 weeks. The average gestational age at enrollment was 23 weeks.

Figure 3.2. Estimated Gestational Age at Enrollment, in Weeks



Obstetric and Gynecological History

On average, mothers had 2.81 (SD = 1.88) pregnancies prior to the current pregnancy, with an average of 2.95 years (1,078.49 days) between pregnancies. Table 3.2 and Table 3.3 present additional information about pregnancy history.

Table 3.2. Pregnancy History of Mother: Number and Frequency

Pregnancy	*N*[a]	Unweighted		Weighted	
		Mean[b]	SD[c]	Mean[d]	SD[e]
Total number of pregnancies (including current pregnancy, miscarriages, abortions, and stillbirths)	1,494	2.57	1.65	2.81	1.88
Delivered full-term (≥37 weeks)	1,494	1.00	1.21	1.18	1.39
Delivered preterm (<37 weeks)	1,494	0.10	0.34	0.10	0.34
Induced abortions	1,494	0.21	0.58	0.22	0.60
Spontaneous abortions	1,493	0.27	0.58	0.31	0.63
Multiple gestations	1,491	0.03	0.16	0.03	0.17

NOTE: Less than 1.5 percent of the CANDLE sample experienced placental previa (ever). A participant has a value for "time interval between pregnancies" only if she reported a previous pregnancy.
[a] 874 days between pregnancies.
[b] 1,029.97 days between pregnancies.
[c] 1,031.47 days between pregnancies.
[d] 1,078.49 days between pregnancies.
[e] 1,113.04 days between pregnancies.

Table 3.3. Pregnancy History of the Mother: Infertility and Complications

History	*N*	Unweighted		Weighted	
		n	%	*n*	%
Infertility treatment	1,485	49	3.3	50	3.4
Pregnancy complications[a]					
Preeclampsia (ever)	1,480	67	4.5	76	5.1
Preterm labor (ever)	1,492	102	6.8	94	6.3

NOTE: Less than 1.5 percent of the CANDLE sample experienced placental previa (ever).

The most common gynecological health conditions were related to vaginal discharge ever and during the current pregnancy. Forty-three percent of mothers experienced malodorous vaginal discharge ever and 40 percent during the current pregnancy. Similarly, 40 percent of mothers reported abnormal vaginal discharge ever and 19 percent during the current pregnancy (Table 3.4).

Table 3.4. Gynecological Conditions of Mother

Condition	N	Unweighted		Weighted	
		n	%	n	%
Abnormal vaginal discharge					
Ever	1,486	633	42.6	593	39.9
Current pregnancy	1,490	270	18.1	288	19.4
Malodorous (foul-smelling) vaginal discharge					
Ever	601	261	43.4	259	43.1
Current pregnancy	252	103	40.9	101	39.9

NOTE: CANDLE asked a participant about malodorous discharge only if she responded "yes" to the question about abnormal vaginal discharge.

Medical-Condition History

The most common medical health conditions were asthma and group B strep (Table 3.5).

Table 3.5. Medical Conditions of Mother

Condition	N	Unweighted		Weighted	
		n	%	n	%
Asthma					
Ever	1,484	160	10.8	158	10.7
Current pregnancy	1,489	85	5.7	93	6.2
Group B strep (ever)	1,474	120	8.1	110	7.4
Major accidents requiring hospitalization or surgery (ever)	1,485	79	5.3	92	6.2

NOTE: Less than 1.5 percent of the CANDLE sample experienced the following: Rhesus sensitized (ever or during the current pregnancy), diabetes (ever or during the current pregnancy), thyroid disease (ever or during the current pregnancy), seizure disorder (ever or during the current pregnancy), sickle-cell disease (ever or during the current pregnancy), and major accidents requiring hospitalization or surgery (during the current pregnancy).

Sexual History

The most common sexually transmitted infections were chlamydia, trichomoniasis, and genital herpes (herpes simplex virus) (see Table 3.6).

Table 3.6. Sexually Transmitted Infections During Current Pregnancy

		Unweighted		Weighted	
Infection	***N***	***n***	**%**	***n***	**%**
Chlamydia	1,482	76	5.1	88	5.9
Trichomoniasis	1,482	49	3.3	55	3.7
Genital herpes (herpes simplex virus)	1,487	36	2.4	41	2.8

NOTE: Less than 1.5 percent of the CANDLE sample experienced the following during pregnancy: sex-work exposure, genital warts (HPV), gonorrhea, syphilis, pelvic inflammatory disease, hepatitis B, or other sexually transmitted disease.

Substance-Abuse History

At baseline, less than 15 percent of the CANDLE mothers reported using tobacco during the pregnancy; 7 percent of mothers reported using alcohol during the pregnancy. Less than 5 percent of CANDLE mothers reported noninjection drug use during the pregnancy; 30 percent of CANDLE mothers reported any noninjection drug use (before or during the current pregnancy). According to CANDLE mothers' reports, 41 percent of their current sex partners used noninjection drugs. Very few CANDLE mothers reported any personal injection drug use or injection drug use by their partners. See Table 3.7 for more details about specific drugs that were used during the current pregnancy, ever, and by the participant's sex partner.

Table 3.7. Substance Use: Current Pregnancy Use, Use over Lifetime, and Sex-Partner Use

		Unweighted		Weighted	
Substance Use	***N***	***n***	**%**	***n***	**%**
Maternal tobacco use during current pregnancy	1,493	151	10.1	215	14.4
Maternal alcohol use during current pregnancy	1,493	121	8.1	107	7.1
Maternal noninjection drug use during current pregnancy	1,463	51	3.5	62	4.3
Marijuana	67	50	74.6	53	78.8
Heroin or methadone	43	3	7.0	2	3.6
Other noninjection drug	43	1	2.3	1	1.6
Maternal noninjection drug use ever	1,460	414	28.4	441	30.2
Marijuana	420	400	95.2	396	94.3
Heroin or methadone	383	10	2.6	8	2.0
Cocaine	381	34	8.9	38	10.0
Amphetamines	375	7	1.9	5	1.4
Methamphetamines	380	8	2.1	10	2.7
Other noninjection drug	381	46	12.1	34	9.0
Sex partner's noninjection drug use ever	1,420	589	41.5	578	40.7
Marijuana	591	571	96.6	573	97.0
Heroin or methadone	548	14	2.6	12	2.2
Cocaine	547	66	12.1	59	10.7
Amphetamines	533	12	2.3	9	1.8
Methamphetamines	543	12	2.2	11	2.0
Other noninjection drug	544	57	10.5	56	10.4

NOTE: Less than 1.5 percent of the CANDLE sample reported the following: injection drug use (current, ever, or partner use) or noninjection use of cocaine, amphetamines, or methamphetamines during the current pregnancy. CANDLE asked about specific drugs only if the participant answered in the affirmative to questions asked about categories of drugs; the percentages for specific drugs reflect this.

Medication History

The vast majority of CANDLE mothers took vitamins or supplements during pregnancy (94 percent). Nearly one-third reported taking analgesics, and one-fifth reported taking antacids. Table 3.8 reports use of other medications.

Table 3.8. Medications During Current Pregnancy

Medication	Unweighted		Weighted	
	n	%	*n*	%
Vitamin or supplement (including prenatal vitamin)	1,384	94.7	1,371	93.7
Analgesic	508	34.7	495	33.8
Antacid	311	21.3	298	20.4
Cold or allergy medication	244	16.7	229	15.6
Nausea medication	190	13.0	185	12.7
Antibiotic	149	10.2	176	12.0
Nonsteroidal anti-inflammatory drug	40	2.7	66	4.5
Sleep aid	57	3.9	49	3.3
Antidepressant	32	2.2	41	2.8
None of these medications	30	2.1	44	3.0

NOTE: *N* = 1,462. Less than 1.5 percent of the CANDLE sample reported the use of the following medications during the current pregnancy: medications for premature contractions, tranquilizers, antiseizure medication, hypertension medication, or diuretics.

Labor and Delivery Form

Background

The labor and delivery forms obtain information about characteristics of labor and possible pregnancy complications since the second maternal visit.

Description

CANDLE investigators used the Labor and Delivery Updates and Complications Form and the Labor and Delivery Summary Form to collect data abstracted from the participants' medical records. The Labor and Delivery Summary Form, which CANDLE investigators created, includes such information as the admission and discharge information, type of labor, and labor and delivery characteristics.

The CANDLE team used the Labor and Delivery Updates and Complications Form to abstract information about the following complications since the mother's last CANDLE visit: admitted to hospital or had labor and delivery visit for preterm labor; tocolytic drugs administered for preterm labor; sexually transmitted disease; gestational diabetes; oligohydramnios; significant antepartum bleeding; preeclampsia or gestational hypertension; abruption; confirmed clinical chorioamnionitis; cerclage placement; or other complications.

Administration

The researchers obtained information for the Labor and Delivery Updates and Complications Form and the Labor and Delivery Summary Form through medical record abstraction by a registered nurse with training in obstetrics. They collected the data on paper forms and then scanned them into the database. CANDLE administered the Labor and Delivery Summary Form and the Labor and Delivery Updates and Complications Form at the second maternal visit (M2).

Scoring

The researchers calculated mother's length of stay in the hospital by subtracting the admission date from the discharge date. They calculated length of labor by subtracting the date and time of labor onset from the date and time of delivery. They calculated the time between membrane rupture and delivery by subtracting the date and time of membrane rupture from the date and time of delivery. In the event that any of these calculations was negative, indicating an error with the calculation, they recoded the variable as a special missing (*.V*) or impossible value.

Data

Labor and Delivery Characteristics

Tables 3.9 and 3.10 describe the labor experiences of CANDLE mothers. More than 90 percent delivered after 37 weeks gestation. Nearly two-thirds had vaginal deliveries; one-third of deliveries were by caesarean section (C-section). The most common reasons for C-section were previous section, fetal distress, failed induction, or other.

Table 3.9. Delivery Characteristics: Type, Classification, and Route

Characteristic	*N*	Unweighted *n*	Unweighted %	Weighted *n*	Weighted %
Type of labor	1,447				
Spontaneous		338	23.36	383	26.48
Spontaneous, augmented		417	28.82	438	30.32
Induced[a]		444	30.68	409	28.31
No labor		248	17.14	215	14.89
Delivery classification	1,447				
Delivery ≥37 weeks gestation		1,319	91.15	1,310	90.57
Spontaneous preterm labor with delivery		38	2.63	41	2.87
Premature rupture of membranes, leading to spontaneous preterm delivery		26	1.8	27	1.9
Premature rupture of membranes, leading to preterm induction or C-section		14	0.97	16	1.07
Preterm delivery for fetal indications[b]		14	0.97	14	1
Preterm delivery for maternal indications[b]		36	2.49	38	2.59
Delivery route	1,448				
Vaginal		908	62.71	946	65.34
C-section		540	37.29	502	34.66
C-section indication	540				
Cephalopelvic disproportion		22	4.07	17	3.39
Failed induction		101	18.7	78	15.57
Fetal distress		97	17.96	97	19.24
Abnormal presentation		40	7.41	44	8.8
Previous section		214	39.63	211	42.05
Preeclampsia or hypertension		39	7.22	27	5.37
Other		151	27.96	141	28.05

NOTE: Less than 1.5 percent of the CANDLE sample experienced abruption, infarct, or previa as an indication for C-section. C-section indication information is provided for only those participants who delivered by C-section.
[a] Reasons for induction included elective (46 percent), postterm (21 percent), preeclampsia or hypertension (15 percent), prelabor rupture of membranes, suspect intrauterine growth restriction, chorioamnionitis, and diabetes.
[b] Reasons for preterm delivery for fetal indications were mostly classified as “other” (44 percent); other specified reasons include preeclampsia or hypertension, fetal distress, and oligohydramnios.

Table 3.10. Delivery Characteristics: Length of Stay, Length of Labor, and Time from Membrane Rupture to Delivery

Characteristic	*N*	Unweighted Mean	Unweighted SD	Weighted Mean	Weighted SD
Mother's hospital length of stay (discharge date – admission date)	1,440	2.65	4.62	3.50	12.24
Number of minutes spent in labor (delivery date and time – date and time of labor onset)	1,040	622.39	373.57	651.74	401.33
Number of minutes between membrane rupture and delivery (delivery date and time – membrane rupture date and time)	1,400	295.64	338.21	306.67	375.32

NOTE: Less than 1.5 percent of the CANDLE sample experienced abruption, infarct, or previa as an indication for C-section. C-section indication information is provided for only those participants who delivered by C-section.

Labor and Delivery Complications

Generally, few mothers experienced complications of the current pregnancy as reported at the time of delivery (M3). The most common complication at the time of delivery was preeclampsia or gestational hypertension (9.1 percent of the weighted sample). See Table 3.11.

Table 3.11. Complications at Time of Delivery

Complication	*N*	Unweighted *n*	Unweighted %	Weighted *n*	Weighted %
Preeclampsia or gestational hypertension	1,442	140	9.7	132	9.1
Preterm labor hospital admission or labor and delivery visit for >6 contractions per hour	1,443	82	5.7	84	5.8
Gestational diabetes	1,444	79	5.5	78	5.4
Sexually transmitted disease	1,439	68	4.7	59	4.1
Tocolytic drugs administered for <6 contractions per hour	1,442	64	4.4	53	3.7
Oligohydramnios	1,442	32	2.2	36	2.5
Other complication	1,438	100	7.0	95	6.6

NOTE: Less than 1.5 percent of the CANDLE sample experienced the following: preeclampsia (prenatal), preterm labor (prenatal), placental previa (prenatal), significant antepartum bleeding, abruption of placenta, confirmed clinical chorioamnionitis, or cerclage placement.

Neonatal Summary Form

Background

The Neonatal Summary Form obtains information about the birth of the CANDLE child and medical care until discharge from the hospital.

Description

CANDLE investigators created the Neonatal Summary Form and used it to collect information about the birth of the CANDLE child and medical care until discharge from the hospital. It includes such information as gestational age; live or stillbirth; baby's sex, length, birth weight, head circumference, Apgar scores, any congenital malformation and corresponding diagnosis codes; highest level of care received; and discharge information (location, caretaker, and discharge diagnosis codes). We do not report here on the *International Classification of Diseases and Related Health Problems*, 9th ed. (ICD-9), diagnosis codes in the data, but those are available in the data sets for researchers who want to explore those outcomes.

Administration

A registered nurse with training in obstetrics abstracted the information in the Neonatal Summary Form from the medical record. Investigators collected the data on paper forms and then scanned them into the database. CANDLE administered the Neonatal Summary Form at the third maternal visit (M3).

Data

Child Demographics and Birth Measurements

Tables 3.12 and 3.13 describe the demographics of the CANDLE child and his or her birth measurements. Average length of gestation was nearly 39 weeks.

Table 3.12. Child Demographics

		Unweighted		Weighted	
Demographic	***N***	***n***	**%**	***n***	**%**
Child sex	1,448				
Male		730	50.41	733	50.67
Female		718	49.59	714	49.33
Child race	1,365				
Black		886	64.91	859	64.36
White		416	30.48	335	25.07
Asian		12	0.88	32	2.37
Other		51	3.74	110	8.21

NOTE: Child race is missing for approximately 7 percent of the population for unknown reasons.

Table 3.13. Birth Measurements

		Unweighted		Weighted	
Measurement	***N***	**Mean**	**SD**	**Mean**	**SD**
Gestational age, in weeks	1,448	38.81	1.76	38.83	1.82
Length, in centimeters	1,408	50.05	3.18	49.73	3.46
Birth weight, in kilograms	1,445	3.24	0.55	3.20	0.56
Head circumference, in centimeters	1,397	33.81	2.03	33.72	2.17

NOTE: Some participants are missing measurement data for unknown reasons.

Birth Outcomes

Tables 3.14 and 3.15 describe other birth outcomes. Most infants received well-baby care and did not require resuscitation, while the majority of those who did require resuscitation received oxygen only. The tables show distributions of one-minute and five-minute Apgar scores and indicate that the majority of infants' scores were 8 or above. The vast majority of infants were discharged to home following their stays in the hospital.

Table 3.14. Birth Outcomes

Outcome	*N*	Unweighted *n*	Unweighted %	Weighted *n*	Weighted %
Level of care	1,444				
Well-baby nursery or routine		1,298	89.89	1,267	87.78
NICU or intermediate nursery		146	10.11	176	12.22
Highest level of resuscitation[a]	1,437				
None		1,038	72.23	1,042	72.97
Oxygen		336	23.38	315	22.08
Bagging and mask		41	2.85	50	3.51
1-minute Apgar score	1,445				
1		4	0.28	5	0.32
2		19	1.31	18	1.21
3		17	1.18	13	0.93
4		15	1.04	13	0.92
5		27	1.87	35	2.42
6		29	2.01	34	2.39
7		87	6.02	98	6.77
8		847	58.62	782	54.14
9		398	27.54	445	30.81
10		2	0.14	1	0.1
5-minute Apgar score	1,437				
3		1	0.07	2	0.11
4		4	0.28	6	0.45
5		6	0.42	5	0.34
6		10	0.69	8	0.57
7		19	1.31	19	1.3
8		75	5.19	85	5.89
9		1,321	91.42	1,307	90.49
10		9	0.62	12	0.85
Final status of infant[b]	1,448				
Discharged to home		1,445	99.79	1,442	99.64

NOTE: NICU = neonatal intensive care unit.
[a] Less than 1.5 percent of infants required chest, intubation, or drug resuscitation.
[b] Less than 1.5 percent of infants were discharged to chronic-care facilities.

Table 3.15. Birth Outcomes: Length of Resuscitation and Length of Stay in the Neonatal Intensive Care Unit

		Unweighted		Weighted	
Outcome	***N***	**Mean**	**SD**	**Mean**	**SD**
Length of resuscitation, in minutes	28	2.43	2.10	2.33	2.36
Length of stay in NICU, in days	128	12.09	18.71	11.98	20.19

NOTE: Investigators asked length of resuscitation and length in NICU only of participants whose infants required resuscitation or spent time in the NICU, respectively.

Chapter Four. Child and Family Health

This chapter provides information on the types of data collected to capture relevant information about the child's and family's health. Investigators used five forms to collect these data: Child Health Update Form, BISQ, Family Health History, Residence Establishment and Lead Risk Assessment, Child Exam, and CSHCN. Information about these forms, the types of data collected, and baseline results are presented below.

Child Health Update Form

Background

UCI CANDLE Study staff created the Child Health Update Form to collect information on health care usage for the CANDLE child.

Description

The Child Health Update Form includes questions on whether the CANDLE child has been hospitalized, ill, or evaluated by a health professional in a context other than a regular checkup since the child's last visit. It also asks the respondent about any concerns about the CANDLE child's health or development and information about the child's last weight assessment.

Administration

A research assistant administered the Child Health Update Form, and responses were entered into a scannable form. CANDLE administered the Child Health Update Form at the first home visit (HV1) and the first clinic visit (CV1).

Data Notes

Four respondents were missing this form for unknown reasons at CV1. Fifty-six were missing the form at HV1.

Data

Child's Experience with Illness and the Medical System

Table 4.1 summarizes the CANDLE child's experience with illness and the medical system at four weeks and at one year. At four weeks, 15 percent of CANDLE children had been hospitalized or seen at the emergency room (ER); at one year, 37 percent had been hospitalized or seen at the ER. Twenty percent of the sample was evaluated by a health provider for a reason other than a well-baby visit at four weeks; the proportion doubled to 40 percent at one year.

Roughly 15 percent of infants at four weeks experienced illnesses that did not require a trip to the hospital or doctor's office; at one year, approximately 69 percent experienced such illnesses.

Table 4.1. Child Hospitalization and Health History

	HV1					CV1				
		Unweighted		Weighted			Unweighted		Weighted	
Item	***N***	***n***	**%**	***n***	**%**	***N***	***n***	**%**	***n***	**%**
Has your baby been hospitalized or seen at the ER?	1,205	138	11.5	179	14.8	1,128	382	33.9	421	37.3
Has your baby been evaluated by any health provider for any reason other than well-baby checkups or shots?	1,204	268	22.3	240	20.0	1,127	480	42.6	451	40.0
Has your baby had a sickness or illness that did not require a trip to the doctor's office or hospital?	1,206	163	13.5	185	15.4	1,128	770	68.3	777	68.9
Common cold (e.g., upper respiratory infection, flu, virus)	159	66	41.5	69	43.5	768	647	84.2	635	82.7
Wheezing	159	—	—	—	—	768	51	6.6	53	6.9
Coughing (without other cold symptoms)	159	—	—	—	—	768	83	10.8	72	9.4
Diarrhea (lasting >24 hours)	159	—	—	—	—	768	106	13.8	118	15.4
Vomiting (lasting >24 hours)	159	—	—	—	—	768	37	4.8	49	6.4
Eye drainage (lasting >24 hours)	159	—	—	—	—	768	—	—	—	—
Other illness	160	76	47.5	68	42.6	768	97	12.6	94	12.3

NOTE: Less than 1.5 percent of infants at HV1 experienced wheezing, coughing without other cold symptoms, diarrhea, vomiting, or eye drainage. Less than 1.5 percent of children at CV1 experienced eye drainage. Participants provided examples of sickness or illness only if they answered the previous question affirmatively (whether they experienced such an illness).

Child Weight

Self-reported weights were recalled from previous doctor's visits; information from CV1 might have been recalled from doctor's visits that occurred between three and ten months of age, and many mothers could not recall the exact date when the child was weighed. For CV1, infants were also weighed by a nurse (see "Child Exam" section later in this chapter). Researchers should use these weights for more-accurate measurement of the child's weight at one year. Table 4.2 displays only the self-reported weights at four weeks.

Table 4.2. Child Weight at Four Weeks

	Unweighted		Weighted	
Weight	**Mean**	**SD**	**Mean**	**SD**
In pounds (mother's self-report)	8.33	1.53	8.27	1.48
In kilograms (based on self-report in pounds)	3.78	0.69	3.75	0.67

NOTE: *N* = 1,082. Self-reported weights are missing for approximately 15 percent of the sample who could not recall the weight or are missing for some other unspecified reason. The data do not indicate why a particular individual is missing data.

Brief Infant Sleep Questionnaire

Background

BISQ is a standardized, brief, valid instrument to screen infants for sleep difficulties (Sadeh, 2004).

Description

BISQ is a 16-item questionnaire developed to identify sleep issues in infants (Sadeh, 2004). The UCI CANDLE Study used the modified 12-item version of the full 16-item questionnaire. The 12-item BISQ assesses a child's sleep problems, sleeping arrangements, sleep duration, wakefulness, and ability to fall back to sleep. For each question, the mother is asked to refer to her child's sleep during the past week. The BISQ contains six multiple-choice questions. The remaining six questions ask respondents to write in the duration of sleep in hours and minutes, the average number of wakings per night, and what time the infant usually falls asleep. According to the cutoff-score approach tested in Sadeh, 2004, a poor sleeper is defined as one who meets any of the following three criteria: (1) The child wakes more than three times per night, (2) nocturnal wakefulness is more than one hour, or (3) the total sleep time is less than nine hours.

Administration

The parent self-administers BISQ and can complete it in five to ten minutes. Participants record their responses in a scannable form. CANDLE administered BISQ at the first clinic visit (CV1).

Data Notes

For the question about time spent sleeping between 7 p.m. and 7 a.m., some participants provided answers that were outside the possible range of 12 hours. A flag variable identifies these participants whose values are outside the possible range.

Forty-seven participants did not fill out this form at CV1 and have missing data.

Data

Tables 4.3 and 4.4 summarize infant sleep items. Very few CANDLE parents reported that their children's sleep was a problem. The most common infant sleeping arrangements were in the parent's bed, in an infant crib in a separate room, and in an infant crib in the parent's room. Most children slept on their bellies (44 percent) or backs (32 percent) and fell asleep in bed alone (35 percent) or being rocked (21 percent).

Table 4.3. Brief Infant Sleep Questionnaire: Child Characteristics

Characteristic	*N*	Unweighted		Weighted	
		n	%	*n*	%
Birth order	1,084				
Oldest		389	35.89	337	32.11
Middle (any child between oldest and youngest)		17	1.57	16	1.54
Youngest		678	62.55	696	66.35
Consider child's sleep a problem	1,073				
A very serious problem		—	—	—	—
A small problem		83	7.74	92	8.96
Not a problem at all		979	91.24	929	90.14
Child's sleeping arrangement	1,082				
Infant crib in separate room		374	34.57	258	24.60
Infant crib in parent's room		186	17.19	211	20.06
Infant crib in room with sibling		60	5.55	39	3.70
In parent's bed		365	33.73	445	42.36
Bed in separate room		31	2.87	25	2.42
Bed in parent's room		38	3.51	44	4.18
Bed in room with sibling		—	—	—	—
Other		—	—	—	—
Child's sleeping position	1,083				
On belly		536	49.49	464	44.18
On side		203	18.74	247	23.51
On back		344	31.76	339	32.31
How child falls asleep	1,085				
While feeding (bottle or cup)		142	13.09	166	15.84
Being rocked		189	17.42	219	20.79
Being held		97	8.94	95	9.03
In bed alone		455	41.94	368	35.05
In bed near parent		178	16.41	181	17.2
Watching television		24	2.21	22	2.09

NOTE: Less than 1.5 percent considered the CANDLE child's sleep "a very serious problem." Less than 1.5 percent of sleeping arrangements were "bed in room with sibling" or "other." Some individuals are missing data because the reported value (e.g., number of hours the child spends awake between 10 p.m. and 6 a.m.) was outside the possible range; these are given a special missing value in the data.

Table 4.4. Brief Infant Sleep Questionnaire: Sleep Characteristics

Characteristic	*N*	Unweighted		Weighted	
		Mean	SD	Mean	SD
Average number of hours of nighttime sleep (7 p.m.–7 a.m.)	1,084	9.67	1.44	9. 51	1.40
Average number of hours of daytime sleep (7 a.m.–7 p.m.)	1,084	2.70	1.34	2.70	1.30
Average number of hours it takes to put the child to bed	1,073	0.30	0.35	0.31	0.35
Average number of night wakings	1,085	0.62	0.93	0.66	0.94
Average number of hours the child spends awake between 10 p.m. and 6 a.m.	1,080	0.25	0.60	0.27	0.61

NOTE: Investigators calculated the average number of hours of nighttime sleep, the average number of hours of daytime sleep, the average number of hours it takes to put the child to bed, and the average number of hours the child spends awake between 10 p.m. and 6 a.m. by combining the hour and minute variables for each of these concepts and converting the result to hours. Some individuals are missing data because the reported value (e.g., number of hours the child spends awake between 10 p.m. and 6 a.m.) was outside the possible range; these are given a special missing value in the data.

Family Health History

Background

CANDLE investigators created the Family Health History questionnaire to collect information about the child's family health history.

Description

The Family Health History questionnaire assesses whether the participant has knowledge of the biological mother's and biological father's family health history and obtains information, such as family history of diabetes, high blood pressure, heart attack, stroke, being overweight, birth defects, learning disabilities, and other chronic health issues. The full data set contains information on which family members have a particular health condition (father, mother, paternal or maternal grandparents, sibling, maternal or paternal aunt, or maternal or paternal uncle); however, the results presented in this section are restricted to whether there is any history within the family (i.e., not just the focal mother) for the conditions of interest.

Administration

The primary caregiver (in most cases, the biological mother) self-administers the Family Health History by filling in responses on a scannable form. CANDLE administered the Family Health History at the first clinic visit (CV1).

Data Notes

Eleven percent of respondents were missing this form (n = 132). Fifteen forms were missing for an unknown reason, and 117 were collected at a later visit.

Data

Table 4.5 shows the family history of various health conditions. The most commonly cited conditions were high blood pressure (78 percent), smoking (63 percent), and being overweight (56 percent). Only 4 percent of the CANDLE children's primary caregivers reported suffering from chronic medical conditions.

Table 4.5. Family Health History

		Unweighted		Weighted	
Condition	***N***	***n***	**%**	***n***	**%**
Diabetes	1,000	531	53.1	545	54.5
High blood pressure	1,000	773	77.3	775	77.5
Heart attack over 50 years of age	1,000	181	18.1	193	19.3
Heart attack less than 50 years of age	1,000	136	13.6	128	12.8
Stroke over 50 years of age	1,000	132	13.2	160	16.0
Stroke less than 50 years of age	1,000	133	13.3	162	16.2
Overweight	1,000	586	58.6	561	56.1
Birth defects, such as cleft lip or palate or spina bifida	1,000	54	5.4	76	7.6
Learning disability that affected school performance	1,000	179	17.9	199	19.9
Mental retardation	1,000	54	5.4	66	6.6
Genetic condition, such as sickle cell or cystic fibrosis	1,000	70	7.0	71	7.1
Seizures	1,000	151	15.1	150	15.0
Heart problems as a child	1,000	122	12.2	121	12.1
Heart problems other than heart attack as an adult	1,000	195	19.5	178	17.8
Cancer as a child	1,000	38	3.8	36	3.6
Cancer as an adult (over 21 years of age)	1,000	294	29.4	283	28.3
Lung problems	1,000	215	21.5	224	22.4
Hearing problems as a child	1,000	142	14.2	142	14.2
Vision problems as a child	1,000	367	36.7	356	35.6
Muscle or joint disease onset as a child	1,000	67	6.7	67	6.7
Alcohol-abuse problem or disorder	1,000	259	25.9	211	21.1
Drug-abuse problem or disorder	1,000	193	19.3	172	17.2
Smoking	1,000	623	62.3	629	62.9
Alzheimer's disease	1,000	70	7.0	101	10.1
Cerebral palsy	1,000	37	3.7	41	4.1

Condition	N	Unweighted		Weighted	
		n	%	*n*	%
Autism	1,000	43	4.3	58	5.8
Serious psychiatric or mental illness, such as schizophrenia, a paranoid disorder, bipolar disorder, or manic episodes	1,000	176	17.6	198	19.8
Has the CANDLE child's primary caregiver suffered from any chronic medical condition?	976	39	4.0	31	3.4
If yes, has this condition affected his or her ability to care for the CANDLE child?	38	5	13.2	5	17.5

NOTE: Twenty-four people did not provide a response to the question about whether the primary caregiver suffered from any chronic medical condition.

Residence Establishment and Lead Risk Assessment

Background

The Residence Establishment and Lead Risk Assessment is taken from the lead poisoning screener from the Tennessee Department of Health (see Tennessee Department of Health, 2012).

Description

The Residence Establishment and Lead Risk Assessment assesses the risk of lead exposure based on the child's living situation and surrounding areas (e.g., proximity to highways), siblings or playmates who have or have had lead poisoning, whether the child has low iron, whether the child has consumed items that can cause lead exposure, and whether the child has been exposed to products used in cooking and preparing foods that can contain lead.

Administration

A research assistant administered the Residence Establishment and Lead Risk Assessment and entered the participant's responses in a scannable form. CANDLE administered the Residence Establishment and Lead Risk Assessment at the first home visit (HV1) and the first clinic visit (CV1).

Data Notes

Ten respondents were missing this form for unknown reasons at CV1. For HV1, 17 percent of the forms are missing ($n = 205$), mostly because this form was added to the protocol after many of the HV1 study visits had taken place.

Data

Table 4.6 shows the summary measures for selected Residence Establishment and Lead Risk Assessment questions, which were asked at four weeks and at one year following birth. The most

frequently endorsed risk for lead poisoning was living within close proximity to a busy street or highway.

Table 4.6: Residence Establishment and Lead Risk Assessment

	HV1					CV1				
		Unweighted		Weighted			Unweighted		Weighted	
Item	***N***	***n***	**%**	***n***	**%**	***N***	***n***	**%**	***n***	**%**
Does your child live in or regularly visit a house built before 1950? (This could include a day care center, home of a babysitter, or a relative). That is, spend more than three days a week at the place.	957	134	14.0	119	12.5	1,025	139	13.6	152	14.8
Does your child live in or regularly visit a home built before 1978 with recent, ongoing, or planned renovations or remodeling (within the past six months)?	995	81	8.1	87	8.7	1,068	93	8.7	83	7.8
Have you ever been told that your child has low iron?	1,052	12	1.1	20	1.9	1,119	106	9.5	138	12.3
Have you seen your child eating paint chips, crayons, soil, or dirt?[a]	1,057	—	—	—	—	1,120	249	22.2	218	19.5
Does your child live within 80 feet (or one block) of areas with a constant flow of traffic, such as busy intersections and streets, highways, and interstates?	1,050	409	39.0	455	43.3	1,118	514	46.0	536	48.0

[a] At the HV1 visit, there were no reports of children eating paint chips, crayons, soil, or dirt.

Child Exam

Background

A research assistant conducted a physical exam of the child at the clinic visit. The research assistant collected weight, height, and head circumference.

Description

The data include measures of weight, height, and head circumference and calculated percentiles.

Administration

A research assistant collected the data for this form, and a research assistant hand-entered them into a database. CANDLE staff completed the child exam at the first clinic visit (CV1).

Data Notes

For the anthropometric variables (e.g., height, weight), several measurements were taken until the difference between measurements was within an acceptable range (up to 0.2 kg for weight, up to 1.0 cm for weight, and up to 0.2 cm for head circumference). The data set includes all measurement values and contains a variable with the "final" value for each of the anthropometric measurements.

Investigators determined z-scores and percentiles for full-term infants (at least 37 weeks gestation at birth) through age 1 year and 364 days were determined using the WHO growth charts (WHO, 2006). These calculations were based on recumbent length (lying down).

Data

Table 4.7 summarizes child measurements (taken by a research assistant or nurse) and percentiles for comparison. On average, infants at the one-year assessment were between the 52nd and 69th percentiles on the various growth measurements.

Table 4.7. Child Measurements at 12 Months

		Unweighted		Weighted	
Measurement	***N***	**Mean**	**SD**	**Mean**	**SD**
Child's weight, in kilograms	1,127	10.27	1.30	10.26	1.32
Child's height, in centimeters	1,125	76.23	3.53	76.30	3.55
Child's head circumference, in centimeters	1,127	46.40	3.54	46.35	3.08
Height-for-age percentile	1,125	51.62	31.33	51.97	31.90
Weight-for-age percentile	1,125	66.18	26.32	65.60	27.47
Weight-for-length percentile	1,125	69.95	26.16	68.89	27.04
BMI-for-age percentile	1,125	69.67	26.75	68.39	27.36
Head circumference–for-age percentile	1,125	68.78	28.67	66.36	29.34

NOTE: Some people might be missing data because the values were out of range.

Children with Special Health Care Needs Screener

Background

The CSHCN screener allows public agencies, health care plans, providers, and consumer organizations to identify CSHCN (Bethell et al., 2002). CANDLE researchers used this existing form to identify CSHCN in the CANDLE sample.

Description

The CSHCN screener contains five yes/no question sequences (e.g., "Does your child currently need or use medicine prescribed by a doctor?"). For each question, if the participant answers "yes," the screener presents additional follow-up questions. If the participant answers "no," the screener skips to the next question. The CSHCN screener is designed to detect whether the child (1) is limited or prevented in any way in his or her ability to do things most children of the same age can do; (2) needs or uses medications prescribed by a doctor (other than vitamins); (3) needs or uses specialized therapies, such as physical, occupational, or speech therapy; (4) has more than routine need or use of medical, mental health, or educational services; or (5) needs or receives treatment or counseling for an emotional, behavioral, or developmental problem (Bethell et al., 2002).

Administration

The parent self-administers the CSHCN screener, and responses were entered into a scannable form that clinic staff provided to the participant. CANDLE administered the CSHCN screener at the first clinic visit (CV1).

Data Notes

One respondent was missing this form for an unknown reason.

Data

Table 4.8 summarizes the items for the CSHCN assessment. Approximately 11 percent of CANDLE children might have special health care needs, including dependency, service use, and functional limitations.

Table 4.8. Children with Special Health Care Needs Items at 12 Months

Item	*N*	Unweighted *n*	Unweighted %	Weighted *n*	Weighted %
Does your child currently need or use medicine prescribed by a doctor (other than vitamins)?	1,131	211	18.7	201	17.8
Is this because of *any* medical, behavioral, or other health condition?	208	186	89.4	190	91.6
Is this a condition that has lasted or is expected to last for at least 12 months?	186	89	47.8	95	51.2
Does your child need or use more medical care, mental health, or educational services than is usual for most children of the same age?	1,131	40	3.5	46	4.1
Is this because of *any* medical, behavioral, or other health condition?	40	38	95.0	39	97.4
Is this a condition that has lasted or is expected to last for at least 12 months?	38	29	76.3	33	85.6
Is your child limited or prevented in any way in his or her ability to do things that most children of the same age can do?	1,131	25	2.2	35	3.1
Is this because of *any* medical, behavioral or other health condition?	25	14	56.0	17	69.4
Is this a condition that has lasted or is expected to last for at least 12 months?	14	13	92.9	14	98.9
Does your child need or get special therapy, such as physical, occupational, or speech therapy?	1,131	32	2.8	42	3.7
Is this because of *any* medical, behavioral or other health condition?	32	26	81.3	29	91.1
Is this a condition that has lasted or is expected to last for at least 12 months?	26	21	80.8	24	91.1
Does your child have any kind of emotional, developmental, or behavioral problem for which he or she needs or gets treatment or counseling?		—	—	—	—
Is this a condition that has lasted or is expected to last for at least 12 months?		—	—	—	—
Flag for CSHCN	1,131	113	10.0	124	10.9
Special health care need status: definitional domain	1,131				
No special needs		1,018	90.0	1,005	89.1
Dependency		71	6.3	73	6.5
Service use		—	—	—	—
Functional limitations		—	—	—	—
Dependency and service use		—	—	—	—
Service use and functional limitations		—	—	—	—
Dependency, service use, and functional limitations		—	—	—	—

NOTE: Less than 1.5 percent of participants reported that their children had any kind of emotional, developmental, or behavioral problem for which they needed to get treatment or counseling. Less than 1.5 percent of participants had children with service use; functional limitations; dependency and service use; service use and functional limitations; or dependency, service use, and functional limitations for their functional status. The screener asked follow-up questions ("Is this because of *any* medical, behavioral, or other health condition?" and "Is this a condition that has lasted or is expected to last for at least 12 months?") only if the participant answered the previous question affirmatively.

Chapter Five. Child and Family Nutrition

This chapter provides information on the types of data collected to capture relevant information about the mother's and child's nutrition. We describe the following forms: FFQ, Choline Inhibitor Questionnaire, IFQ, and Food Supplement Information.

Block Food Frequency Questionnaire

Background

The FFQ, an existing measure, estimates food and nutrition intake over a three-month period and was developed using data from the second National Health and Nutrition Examination Survey (Block, Hartman, et al., 1986). The FFQ assesses the frequency and amount of consumption of 111 different food and beverage items. The full FFQ has been shown to be a valid and reliable method to describe nutrient intake from diet for groups and to rank individuals according to nutrient intake (Block, Hartman, et al., 1986; Mares-Perlman et al., 1993; Block, Coyle, et al., 1994; Subar et al., 2001; Johnson et al., 2007; Block, Woods, et al., 1990).

Description

The UCI CANDLE Study used the FFQ to estimate mothers' food and nutrition intake in a three-month window. The FFQ assesses the frequency and amount of consumption of 111 different food and beverage items and use of vitamin and mineral supplements.

Administration

Trained research assistants administered the full-length (111–food item) questionnaire to the UCI CANDLE Study participants and entered responses onto a paper form at the first maternal visit (M1) and the first home visit (HV1). A research assistant hand-entered data into the database. The UTHSC team did not double-key data, but UTHSC analysts ran queries to check for possible errors and checked suspicious values against a hard copy of the form. NutritionQuest in Berkeley, California processed the FFQ. Using the data that the research assistants collected, the output from NutritionQuest yields levels of macro- and micronutrients that participants consumed, as well as serving size and frequency of intake of the food items (Völgyi et al., 2013).

Data Notes

The UCI CANDLE Study data available to researchers provide both the raw data and the calculated output from NutritionQuest. We include data below from the M1 study visit only;

similar data are available from the HV1 study visit but are not shown here because the prenatal nutritional information might be a more useful measure of infant exposure.

Data

Tables 5.1 and 5.2 summarize selected nutrition measures that were collected during the first maternal or baseline visit. Table 5.1 summarizes the macro- and micronutrients. The selected nutrients displayed in the table represent those nutrients most relevant for neurocognitive development. The FFQ data set contains a larger array of nutrients, nutrient indices (e.g., Healthy Eating Index 2005 and 2010), and subgrouping of food groups that can be used in statistical analyses. Table 5.2 describes selected MyPyramid variables.

Table 5.1. Block Food Frequency Questionnaire Nutrient and Vitamin Table

	Unweighted		Weighted	
Nutrient	**Mean**	**SD**	**Mean**	**SD**
Food energy, in kilocalories	2,715.98	1,625.70	2,932.22	1,762.52
Percentage of energy from protein	14.90	2.47	14.82	2.46
Percentage of energy from carbohydrate	50.49	6.46	50.25	6.29
Dietary fiber, in grams	22.77	12.27	24.01	13.31
Sugars, total, in grams	168.32	107.16	180.11	113.43
Percentage of calories from fat	36.50	5.04	36.75	4.84
Saturated fat, in grams	36.41	23.90	39.38	25.96
Monounsaturated fatty acids, in grams	42.84	27.77	46.70	30.52
Polyunsaturated fatty acids, in grams	23.43	14.80	25.51	16.07
Trans fats, total, in grams	4.31	3.14	4.66	3.36
Omega-3 fatty acids, in grams	2.32	1.53	2.50	1.69
Cholesterol, in milligrams	379.48	277.27	415.31	303.52
Vitamin A, retinol activity equivalent	1,080.25	704.11	1,157.57	787.88
Thiamin (vitamin B1), in milligrams	2.13	1.29	2.28	1.38
Riboflavin (vitamin B2), in milligrams	2.65	1.49	2.80	1.61
Niacin, in milligrams	28.55	17.55	30.37	18.98
Average daily dietary folate equivalents, in micrograms	737.92	435.34	777.45	463.19
Vitamin B6, in milligrams	2.58	1.47	2.71	1.57
Vitamin B12, in micrograms	6.67	4.65	7.25	5.24
Total choline, in milligrams	393.38	237.34	424.56	262.86
Betaine, in milligrams	237.34	189.38	254.81	201.61
Vitamin C, in milligrams	189.27	128.43	201.32	136.84
Vitamin D, in international units	192.44	130.64	202.31	142.58
Vitamin E, in milligrams	5.23	4.24	5.32	4.48
Vitamin K as phylloquinone, in micrograms	245.69	201.31	255.35	212.27
Glutathione, total, in milligrams	58.69	35.05	62.71	38.61
Vitamin E as alpha-tocopherol, in milligrams	10.06	5.70	10.75	6.20
Calcium, in milligrams	1,202.15	651.52	1,259.37	712.81
Phosphorus, in milligrams	1,700.62	948.97	1,808.43	1,041.63
Potassium, in milligrams	3,446.33	1,816.34	3,644.37	1,993.46
Iron, in milligrams	19.63	11.37	20.94	12.16
Zinc, total, in milligrams	14.80	9.58	15.96	10.63
Magnesium, in milligrams	367.39	193.83	389.10	211.46
Copper, in milligrams	1.68	0.96	1.82	1.06

	Unweighted		Weighted	
Nutrient	**Mean**	**SD**	**Mean**	**SD**

NOTE: *N* = 1,297. The U.S. Department of Agriculture (USDA) released the 2005 dietary guidelines for Americans as a food pyramid. In 2011, USDA released MyPlate, the 2010 dietary guidelines. The FFQ provided MyPyramid food servings as part of the nutrient analyses. Some of the subgroup food servings from MyPyramid are not directly transferable to MyPlate because USDA recategorized some foods.

Table 5.2. MyPyramid Nutrition

	Unweighted		Weighted	
Item	**Mean**	**SD**	**Mean**	**SD**
Fruit: total, including juice, in cups	1.87	1.27	1.93	1.31
Vegetables: not legumes or potatoes, in cups	1.67	1.17	1.75	1.28
Vegetables: dark green, in cups	0.48	0.44	0.48	0.46
Vegetables: orange, in cups	0.12	0.16	0.14	0.18
Legumes, soy: in cup equivalents	0.12	0.26	0.16	0.38
Vegetables: potato, in cups	0.45	0.40	0.47	0.42
Vegetables: other, including tomatoes, in cups	1.04	0.71	1.10	0.79
Grain: total, 1-oz. equivalents	8.06	5.18	8.69	5.50
Grain: whole, 1-oz. equivalents	1.74	1.17	1.78	1.17
Meat: fish, chicken, meat, 1 oz.	5.52	4.29	6.07	4.73
Nuts, seeds: 1-oz. meat equivalent	0.55	0.69	0.57	0.71
Eggs: meat equivalent (1 egg = 1 oz.)	0.69	0.78	0.75	0.82
Dairy: milk, cheese, 1-c. equivalents	1.91	1.23	1.95	1.31
Beneficial oils: dressings, fish, nuts, avocado (1 t.)	2.74	2.08	2.96	2.32

NOTE: *N* = 1,297. USDA released the 2005 dietary guidelines for Americans as a food pyramid. In 2011, USDA released MyPlate, the 2010 dietary guidelines. The FFQ provided MyPyramid food servings as part of the nutrient analyses. Some of the subgroup food servings from MyPyramid are not directly transferable to MyPlate because USDA recategorized some foods.

Choline Inhibitor Questionnaire

Background

The UTHSC CANDLE team developed the Choline Inhibitor Questionnaire to obtain information about use of products that could contain choline inhibitors. Choline is an essential nutrient for growth and development; it is especially important during pregnancy and lactation (Zeisel and da Costa, 2009).

Description

The Choline Inhibitor Questionnaire is a four-item free-response questionnaire that assesses participants' use of lotions, sunscreens, and shampoos and the frequency with which they use them. For items assessing type, the respondent writes in the brand or name of the product. The respondent could provide up to five types of shampoo and five types of lotion or sunscreen. The questionnaire also asks the respondent to report how many times per month he or she uses or applies shampoo or lotion or sunscreen. The UCI CANDLE Study research team is currently developing a list of shampoos and sunscreens containing known and potential choline inhibitors (diethanolamine, triethanolamine, and monoethanolamine) based on the U.S. Department of Health and Human Services electronic database on household products (U.S. Department of Health and Human Services, 2015). We will make this list available to researchers who request the choline data files.

Administration

A research assistant administered the maternal Choline Inhibitor Questionnaire to mothers, recorded data on a paper form, and hand-entered text responses into a database. CANDLE administered the Choline Inhibitor Questionnaire at the first maternal visit (M1), the first home visit (CV1), and the first clinic visit (CV1).

Data Notes

The raw data for the Choline Inhibitor Questionnaire contain only information about which products were used and how often. Information about whether these products contain choline inhibitors is not yet available; therefore, we do not include summary statistics in this report. However, researchers interested in this topic can obtain a crosswalk file that links products to potential choline inhibitors.

Infant Feeding Questionnaire

Background

Baughcum and colleagues developed the IFQ to measure feeding practices for children from birth to two years of age (Baughcum et al., 2001). The IFQ is built on contextual factors that describe maternal feeding practices (such as how, when, and why children are fed) and maternal beliefs about child feeding or child's weight that guide those practices (Baughcum et al., 2001).

Description

The IFQ is a 28-item self-administered questionnaire designed for mothers of infants ages 11 months to 24 months. The IFQ asks respondents to retrospectively think about the feeding practices during the child's first year of life. The first 17 items assess the frequency (never,

rarely, sometimes, often, or always) of feeding behaviors (e.g., “Did you allow your baby to eat only at set times?” “Was it a struggle to get your baby to eat?”). The remaining 11 items assess maternal beliefs about feeding practices (e.g., “Feeding my baby was the best way to stop his/her fussiness” and “I believed it was important for my baby to finish all the formula in his bottle”) on a five-point Likert scale (disagree a lot, disagree a little, no strong feelings either way, agree a little, or agree a lot). The IFQ has seven scale scores derived from the 18 items: (1) concern about infant undereating or becoming underweight, (2) concern about infant’s hunger, (3) awareness of infant’s hunger and satiety cues, (4) concern about infant overeating or becoming overweight, (5) feeding infant on a schedule, (6) using food to calm infant’s fussiness, and (7) social interaction with the infant during feeding.

Administration

The IFQ is a self-administered questionnaire that a research assistant gives to mothers. Mothers entered responses onto a scannable form. CANDLE administered the IFQ at the first home visit (CV1) and the first clinic visit (CV1).

Data Notes

Two respondents were missing this form in CV1 (reason unknown). Twenty-nine respondents were missing data at HV1 (12 were missing because the survey was not administered, 13 were missing because the data were accidentally deleted, and four forms were lost).

Data

Table 5.3 displays mean factor summary scores from the IFQ.

Table 5.3. Infant Feeding Practices at Four Weeks and at One Year After Delivery

	HV1					CV1				
		Unweighted		Weighted			Unweighted		Weighted	
Factor	*N*	Mean	SD	Mean	SD	*N*	Mean	SD	Mean	SD
1: Concern about infant undereating or becoming underweight	1,230	0.54	0.61	0.56	0.63	1,129	0.62	0.71	0.62	0.70
2: Concern about infant's hunger	1,221	0.23	0.57	0.33	0.68	1,128	1.09	1.02	1.21	1.03
3: Awareness of infant's hunger and satiety cues	1,230	3.61	0.52	3.60	0.57	1,129	3.56	0.53	3.56	0.56
4: Concern about infant overeating or becoming overweight	1,223	0.46	0.57	0.45	0.58	1,127	0.45	0.59	0.42	0.59
5: Feeding infant on a schedule	1,231	1.97	0.64	1.97	0.66	1,127	1.83	0.65	1.80	0.65
6: Using food to calm infant's fussiness	1,225	1.74	1.01	1.73	1.03	1,126	1.49	0.97	1.53	0.98
7: Social interaction with the infant during feeding	1,220	3.25	0.73	3.28	0.73	1,126	2.95	0.80	2.86	0.82

Food Supplement Information

Background

CANDLE investigators developed the Food Supplement Information to obtain information about the respondents' participation in programs that provide food or access to food for the CANDLE child. This form also includes a question about whether the mother became pregnant again since the birth of the CANDLE child.

Description

CANDLE investigators created the Food Program Questionnaire to gather information on respondents' participation in programs that provide food or access to food for the CANDLE child (e.g., WIC program), as well as participation in home visitation or parenting programs.

Administration

Research assistants administer the Food Program Questionnaire to respondents then entered the data into a scannable form at the first home visit (HV1) and the first clinic visit (CV1).

Data Notes

Thirty-seven percent of respondents were missing this form because it was not administered at HV1 (n = 471). Ten percent of respondents were missing this form because it was added to the protocol after some of the CV1 study visits had taken place (n = 117).

Data

Table 5.4 describes the proportion of CANDLE mothers who were receiving food-related assistance during pregnancy, at four weeks, and at one year after delivery. More than half were receiving WIC aid at four weeks; slightly less than half were receiving WIC aid at one year. More than half of the participants were receiving food stamps at both time periods.

Table 5.4. Food Supplement Information at Four Weeks and at One Year After Delivery

	HV1					CV1				
		Unweighted		Weighted			Unweighted		Weighted	
Item	***N***	***n***	**%**	***n***	**%**	***N***	***n***	**%**	***n***	**%**
Received WIC benefits during pregnancy	790	418	52.9	466	59.0	1,014	585	57.7	673	66.3
Currently receiving WIC benefits	791	397	50.2	448	56.6	1,013	414	40.9	498	49.2
Other supplemental foods[a]	789	14	1.8	16	2.0	1,014	—	—	—	—
Currently receiving food stamps	791	352	44.5	415	52.5	1,013	463	45.7	607	59.9
Any children enrolled in free lunch or breakfast program	784	166	21.2	204	26.1	1,014	244	24.1	332	32.8
Household member participates in home visitation programs[b]	786	46	5.9	56	7.1	1,013	58	5.7	71	7.0

[a] This includes Metropolitan Inter-Faith Association, Neighborhood Christian Center, and the U.S. government. At CV1, less than 1.5 percent indicated receipt of other supplemental foods.
[b] Examples include Porter-Leath (the Maternal Infant Health Outreach Worker program and Home Instruction Program for Preschool Youngsters), Le Bonheur (Healthy Families and Parent Outreach), and Memphis and Shelby County Health Department (Help Us Grow Successfully [HUGS] and Healthy Start).

At the four-week home visit, less than 1.5 percent of CANDLE mothers reported becoming pregnant since the birth of the CANDLE child. At the one-year clinic visit, 12.5 percent of CANDLE mothers reported becoming pregnant since the birth of the CANDLE child (15.0 percent weighted).

Chapter Six. Mother's Mental and Behavioral Health

This chapter provides information on the types of data collected to capture relevant information about the mother's mental and behavioral health. Four forms are included in this section: TEMPS, BSI, RSE, and EPDS.

Temperament Evaluation of Memphis, Pisa, Paris, and San Diego

Background

TEMPS is a self-rated questionnaire designed to measure emotional reactivity in healthy subjects and psychiatric patients (Akiskal et al., 2005).

Description

The UCI CANDLE Study used the 84-item TEMPS questionnaire to measure a mother's temperament on four domains: dysthymic, cyclothymic, hyperthymic, and irritable temperaments. The respondent rated an item "yes" if the statement applied to much of her life or "no" if the statement did not apply to much of her life. Items were developed from the diagnostic criteria formulated by Hagop S. Akiskal and colleagues (Akiskal et al., 2005).

Administration

Each participant completed TEMPS at the first maternal visit (M1). The respondent entered her data into a scannable form.

Scoring

A clinical trait score was created for any participant who scored positively on at least 75 percent of all items for a scale.

Data Notes

Nineteen participants are missing this form. One person refused to fill it out, three are missing for unknown reasons, and 15 were not given the form.

Data

Table 6.1 reports mean scores. More than half of participants had scores that indicated hyperthymic temperaments. Roughly 3 percent of participants had scores that indicated cyclothymic temperaments. Less than 1.5 percent of participants had scores that reflected irritable or dysthymic temperaments.

Table 6.1. Temperament Evaluation of Memphis, Pisa, Paris, and San Diego

		Unweighted		Weighted	
Scale	***N***	**Mean**	**SD**	**Mean**	**SD**
Cyclothymic temperament score	1,472	2.65	2.81	2.88	2.94
Irritable temperament score	1,474	1.12	1.45	1.23	1.51
Hyperthymic temperament score	1,474	7.66	2.14	7.46	2.16
Dysthymic temperament score	1,474	1.81	1.40	1.82	1.39
Cyclothymic temperament (yes)	1,472	33	2.2	44	3.0
Irritable temperament (yes)	1,474	—	—	—	—
Hyperthymic temperament (yes)	1,474	896	60.8	830	56.3
Dysthymic temperament (yes)	1,474	—	—	—	—

NOTE: Less than 1.5 percent of participants had scores that reflected irritable or dysthymic temperaments.

Brief Symptom Inventory

Background

BSI was developed to assess psychological symptom status of psychiatric and medical patients and can be used for nonclinical populations (Derogatis and Melisaratos, 1983).

Description

BSI is a self-administered 53-item questionnaire in which the participant responds to 53 symptoms and indicates how distressed she has been by these in the past seven days. The respondent indicates her distress level using a five-point scale (not at all, a little bit, moderately, quite a bit, and extremely). Possible overall scores range from 0 to 212. BSI measures nine primary dimensions or constructs: somatization (e.g., "faintness or dizziness"), obsessive-compulsive (e.g., "having to check and double-check what you do"), interpersonal sensitivity (e.g., "feeling inferior to others"), depression (e.g., "feeling no interest in things"), anxiety (e.g., "feeling tense or keyed up"), hostility (e.g., "having urges to break or smash things"), phobic anxiety (e.g., "feeling uneasy in crowds, such as shopping or at a movie"), paranoid ideation (e.g., "others not giving you proper credit for your achievements"), and psychoticism (e.g., "the idea that something is wrong with your mind"). The scale also contains three global indices of distress: GSI (mean score of all 53 items); the Positive Symptom Distress Index (mean of non–zero-rated items); and the Positive Symptom Total (count of nonzero items) (Derogatis and Melisaratos, 1983). A GSI score greater than or equal to a t-score of 63 or any two subscales greater than or equal to a t-score of 63 indicate clinical significance (Derogatis and Melisaratos, 1983).

Administration

Each participant completed BSI at the second maternal visit (M2). The participant entered her responses into a scannable form.

Data Notes

Two respondents were missing the BSI form. One form was lost, and one was missing for unknown reasons.

Data

Table 6.2 displays the mean summary scores for BSI.

Table 6.2. Brief Symptom Inventory

	Unweighted		Weighted	
Index	**Mean**	**SD**	**Mean**	**SD**
GSI	50.52	9.26	50.34	9.63
T-score for Positive Symptom Distress Index	52.31	8.37	51.99	8.55
T-score for Positive Symptom Total	49.62	9.56	49.46	9.85

NOTE: *N* = 1,357.

Rosenberg Self-Esteem Scale

Background

The RSE assesses self-esteem as a one-dimensional positive or negative orientation toward oneself or the overall evaluation of one's worth or value (Gray-Little, Williams, and Hancock, 1997).

Description

The RSE is a ten-item measure that is typically administered using a Likert-type response format, employing four-, five-, or seven-point scales ranging from strongly disagree to strongly agree. In the UCI CANDLE Study, the four-point scale ranging from 0 to 3 was used (strongly agree, agree, disagree, or strongly disagree), and some items were reverse-coded. Total sum scores are calculated by summing all ten items. Higher scores represent higher self-esteem. Scores range from 0 to 30, with a score of 30 as the highest score possible. The RSE does not have a universal, established cut point for clinical significance.

Administration

CANDLE administered the RSE at the second maternal visit (M2). This ten-item scale is self-administered and takes approximately two minutes to complete. The participant records her responses on a scannable form.

Data Notes

Two respondents were missing this form. One was not administered because the visit was cut short, and one was lost.

Data

Table 6.3 presents mean self-esteem summary scores.

Table 6.3. Rosenberg Self-Esteem Scale

	Unweighted		Weighted	
Scale	**Mean**	**SD**	**Mean**	**SD**
Overall self-esteem	25.50	4.10	25.21	4.14

NOTE: *N* = 1,358.

Edinburgh Postnatal Depression Scale

Background

The EPDS assesses symptoms of depression over the past seven days (Cox, Holden, and Sagovsky, 1987). It was developed from a selection of several combined depression and anxiety scales (King, 2012).

Description

The EPDS is a brief ten-item measure. Items 1 and 2 directly inquire about symptoms of depression. Item 10 represents the only question measuring suicidality (King, 2012). EPDS items are scored on a four-point Likert-type scale (0 = no, not at all to 3 = yes, most of the time). Higher scores indicate higher reported frequency or severity of symptoms. Sum scores range from 0 to 30, with a score of 10 or greater indicating possible depression and a score of 13 or greater indicating likely depression. There is also an indicator for suicidal ideation.

Administration

The EPDS is a self-reported measure that can be completed in five minutes. Research assistants provide the mother with a paper form to fill in their responses. A research assistant

hand-entered data into the database. CANDLE administered the EPDS at the first home visit (HV1) and the first clinic visit (CV1).

Data Notes

Two respondents were missing this form in CV1 because the mother was not present. Five respondents were missing the form at HV1 (four forms were not administered, and one was lost).

Data

At four weeks postpartum, 11 percent of mothers reported possible depression, 5 percent reported likely depression, and 3 percent reported suicidal thoughts. At one year postpartum, 12 percent of mothers reported possible depression, 6 percent reported likely depression, and 5 percent reported suicidal thoughts (see Tables 6.4 and 6.5).

Table 6.4. Edinburgh Postnatal Depression Scale: Total Score

	HV1					CV1				
		Unweighted		Weighted			Unweighted		Weighted	
Score	***N***	**Mean**	**SD**	**Mean**	**SD**	***N***	**Mean**	**SD**	**Mean**	**SD**
EPDS total score	1,257	4.58	4.09	4.66	4.16	1,130	4.35	4.12	4.66	4.28

Table 6.5. Edinburgh Postnatal Depression Scale: Depression Indicators

	HV1					CV1				
		Unweighted		Weighted			Unweighted		Weighted	
Indicator	***N***	***n***	**%**	***n***	**%**	***N***	***n***	**%**	***n***	**%**
Possible depression	1,257	141	11.2	135	10.8	1,129	111	9.8	136	12.1
Likely depression	1,257	59	4.7	68	5.4	1,130	57	5.0	69	6.1
Suicidal thoughts	1,257	45	3.6	42	3.3	1,129	47	4.2	58	5.1

Chapter Seven. Cognitive Performance

This chapter provides information on the types of data collected to capture relevant information about a child's cognitive performance. Two scales are described: BSID-III and WASI-III.

Bayley Scales of Infant Development

Background

BSID-III was designed to identify possible developmental delay in infants, inform health professionals about areas of strength or weakness when planning an intervention, and monitor progression of the child's development (Albers and Grieve, 2007; Bayley, 2006).

Description

BSID-III consists of five scales (cognitive, language, motor, social-emotional, and adaptive behavior) that assess areas of development for children from birth to age 3 (Albers and Grieve, 2007). The UCI CANDLE Study used only the cognitive and language scales. The cognitive scale consists of 91 items (Albers and Grieve, 2007). The language scale contains 97 items from the receptive (49 items) and expressive communication (48 items) subtests that are designed to provide information about a child's ability to understand and respond to verbal stimuli, to name pictures and objects, and to communicate with others (Albers and Grieve, 2007).

Administration

BSID-III must be administered by a professional trained in developmental assessment and interpretation. BSID-III can be administered in 50 minutes for children ages 12 months and younger or 90 minutes for children ages 13 months or older (Albers and Grieve, 2007). A master's- or doctoral-level cognitive examiner hand-entered the results into a database. UTHSC analysts ran queries to check for possible errors and checked suspicious values against a hard copy of the form. CANDLE administered BSID-III at the first clinic visit (CV1).

Data Notes

The developmental disability indicator was created using items from BSID-III, as well as BITSEA (described below).

One participant's form was missing for an unknown reason.

Data

Tables 7.1 and 7.2 display the raw scores and risk categories for BSID-III. Raw scores ranged from 39 to 87 on the cognitive measure; 6 to 47 on the receptive communication measure, and 1 to 18 on the expressive communication measure. Most children had scores that placed them in the competent range for the cognitive (86 percent), receptive communication (76 percent), and expressive communication (84 percent) scales.

Table 7.1. Bayley Scales of Infant Development: Total Raw Scores

	Unweighted		Weighted	
Score	**Mean**	**SD**	**Mean**	**SD**
Cognitive	16.97	2.03	16.93	2.09
Receptive communication	11.77	2.10	11.59	2.03
Expressive communication	12.64	2.08	12.46	2.11

NOTE: *N* = 1,131.

Table 7.2. Bayley Scales of Infant Development: Category Scores

	Unweighted		Weighted	
Score	***n***	**%**	***n***	**%**
Cognitive risk				
Competent	968	85.59	977	86.33
Emerging	150	13.26	144	12.71
At risk	13	1.15	11	0.96
Receptive communication risk				
Competent	873	77.19	863	76.26
Emerging	216	19.1	227	20.06
At risk	42	3.71	42	3.68
Expressive communication risk				
Competent	963	85.15	954	84.27
Emerging	151	13.35	163	14.41
At risk	17	1.5	15	1.32
Developmental disability indicator	277	24.49	288	25.43

NOTE: *N* = 1,131.

Wechsler Abbreviated Scale of Intelligence

Background

The WASI-III was developed to provide a short and reliable measure of intellectual functioning for children and adults ages 6 to 89 (Axelrod, 2002) and normed across the life span (Wechsler, 1999).

Description

The UCI CANDLE Study used the WASI-III to assess the mother's intelligence. The WASI-III consists of four subtests: vocabulary (V), similarities (S), block design (BD), and matrix reasoning (MR). The V and S subtests, which are the verbal tests, combine to estimate verbal intelligence quotient (VIQ), while BD and MR, which are performance tests, combine to estimate performance intelligence quotient (PIQ) (Axelrod, 2002). The full scale score is calculated by adding the VIQ and PIQ scores.

Administration

A trained master's- or doctoral-level cognitive examiner administered the WASI-III to the mother. A cognitive examiner hand-entered the results into a database. UTHSC analysts ran queries to check for possible errors and checked suspicious values against a hard copy of the form. CANDLE administered the WASI-III at the first clinic visit (CV1).

Data Notes

Seventeen respondents were missing this form. Three were missing for unknown reasons, three were missing because the visit was cut short, and ten were excluded due to special circumstances.

Data

Table 7.3 presents weighted raw scores and T-scores. The table displays the overall VIQ and PIQ measures, as well as the two pairs of components (V/S and BD/MR) that make up the overarching intelligence quotient measures. The T-scores normalize the respondent's raw scores based on the participant's age and in reference to a national sample. Percentiles for the VIQ and PIQ measures are available in the data but not shown in Table 7.3.

Table 7.3. Wechsler Abbreviated Scale of Intelligence

		Unweighted				Weighted			
		Raw Score		T-score		Raw Score		T-score	
Measure	*N*	Mean	SD	Mean	SD	Mean	SD	Mean	SD
VIQ	1,113	94.82	16.01	92.41	21.61	90.82	16.64	86.86	22.71
V	1,115	52.42	12.18	45.44	12.24	49.19	12.76	42.30	12.68
S	1,113	33.77	6.27	47.05	10.39	32.32	6.69	44.66	11.04
PIQ	1,113	98.62	15.90	97.74	20.11	95.56	16.26	93.86	20.79
BD	1,112	35.81	17.76	46.09	11.81	32.86	17.75	44.06	11.96
MR	1,114	25.66	5.23	51.91	10.02	24.68	5.58	49.94	10.74

Chapter Eight. Psychosocial Measures

This chapter provides information on the types of data collected to capture relevant information about a mother's and child's psychosocial measures. Eleven scales are described: CTS, TLEQ, SSQ6, KIDI, Household Questionnaire, CAPI, PSI, NCAST PCI Teaching Scales, Child Care Arrangements Questionnaire, SIB-R, and BITSEA.

Conflict Tactics Scales

Background

The CTS measures the extent to which partners in a dating, cohabiting, or marital relationship engage in psychological and physical attacks on each other and their use of reasoning or negotiation to deal with conflict (Straus and Douglas, 2004; Straus, 1979; Straus, 1990).

Description

The original CTS form is a 39-item questionnaire containing five scales: sexual coercion, physical aggression, negotiation, psychological aggression, and injury by partner. For the UCI CANDLE Study, the short form of the CTS was used (Straus and Douglas, 2004), which contained two items from each of the five scales. For each question, the participant reports the frequency with which each issue occurred in the past year (0 = this has never happened, 1 = once in the past year, 2 = twice in the past year, 3 = three to five times in the past year, 4 = six to ten times in the past year, 5 = 11–20 times in the past year, 6 = more than 20 times in the past year, 7 = not in the past year but it did happen before). Frequency scores are derived using the midpoint substitution method, which allows a respondent to estimate not simply the types of different aggressive behaviors in which the pair engaged but also the frequency of their occurrence (Vega and O'Leary, 2007; Straus and Gelles, 1990; Straus, Hamby, et al., 1996).

Administration

Each mother self-administered the CTS at the second maternal visit (M2). The mother answered questions about both her experience and her partner's experience. The respondent recorded her answers on a scannable form.

Data Notes

Seven respondents were missing this form. Five were not administered, one was lost, and one was missing for unknown reasons.

Data

Table 8.1 displays the summary scores for the CTS; it shows both the mother's and the partner's prevalence scores, indicating the prevalence of the various conflicts.

Table 8.1. Conflict Tactics Scale

	Unweighted						Weighted					
	Mother			Partner			Mother			Partner		
Scale	***N***	**Mean**	**SD**	***N***	**Mean**	**SD**	***N***	**Mean**	**SD**	***N***	**Mean**	**SD**
Sexual coercion	1,353	0.06	0.23	1,353	0.10	0.30	1,353	0.06	0.24	1,353	0.10	0.30
Physical aggression	1,353	0.09	0.29	1,353	0.12	0.32	1,353	0.13	0.34	1,353	0.16	0.37
Negotiation	1,352	0.96	0.21	1,353	0.96	0.21	1,352	0.93	0.26	1,353	0.94	0.25
Psychological aggression	1,352	0.77	0.42	1,353	0.66	0.47	1,352	0.77	0.42	1,353	0.66	0.47
Injury	1,352	0.18	0.38	1,352	0.11	0.31	1,352	0.21	0.41	1,352	0.12	0.33

Traumatic Life Events Questionnaire

Background

The TLEQ assesses current and prior exposure to traumatic life events (Carlson et al., 2011; Kubany et al., 2000).

Description

The TLEQ 2 is a brief self-report inventory that assesses current and prior exposure to 20 potentially traumatic life events. If the respondent endorses a traumatic life event, she then indicates whether she experienced intense fear, helplessness, or horror when it happened. In addition, the respondent indicates which event caused the most distress of all the events endorsed and the month, day, and year at which it last occurred. For the UCI CANDLE Study, the percentage of traumatic events (number of traumatic events divided by 20) is reported.

Administration

The TLEQ is a self-administered questionnaire given at the second maternal visit (M2). The mother enters her responses onto a scannable form.

Data Notes

Two respondents were missing this form. One was not administered, and one was lost.

Data

Tables 8.2 and 8.3 highlight the prevalence of various traumatic life events experiences by CANDLE mothers at the time of the second prenatal visit. On average, CANDLE mothers experienced 3.8 traumatic life events during their lifetimes. The tables display prevalence of specific types of traumatic life events.

Table 8.2. Traumatic Life Events Questionnaire: Specific Events

		Unweighted		Weighted	
Event	***N***	***n***	**%**	***n***	**%**
Natural disaster	1,354	238	17.6	233	17.2
Motor vehicle accident	1,357	279	20.6	264	19.4
Other accident	1,358	93	6.8	98	7.2
Sudden death of loved one	1,357	884	65.1	900	66.3
Life-threatening event of loved one	1,357	586	43.2	547	40.3
Life-threatening illness	1,354	64	4.7	63	4.7
Robbery	1,357	199	14.7	235	17.3
Assault	1,350	76	5.6	93	6.9
Witnessed violence	1,353	145	10.7	158	11.7
Threatened with death or harm	1,356	211	15.6	241	17.8
Physically punished growing up	1,356	105	7.7	107	7.9
Witnessed violence growing up	1,358	368	27.1	380	28.0
Intimate-partner violence	1,357	283	20.9	332	24.5
Molestation before 13th birthday	1,354	230	17.0	250	18.5
Sexual harassment or assault	1,355	344	25.4	333	24.6
Stalked	1,357	200	14.7	210	15.5
Miscarriage	1,354	318	23.5	340	25.1
Abortion	1,356	249	18.4	253	18.7
Other traumatic event	1,352	112	8.3	123	9.1

NOTE: Less than 1.5 percent of the CANDLE sample reported war-zone experience.

Table 8.3. Traumatic Life Events Questionnaire: Total Traumatic Events

	Unweighted		Weighted	
Events	**Mean**	**SD**	**Mean**	**SD**
During adulthood	3.16	2.34	3.27	2.55
During mother's childhood	0.52	0.78	0.54	0.79
All	3.68	2.74	3.81	2.99

NOTE: *N* = 1,358.

Social Support Questionnaire, 6th Edition

Background

The SSQ6 is designed to measure perceptions of social support and satisfaction with that social support (Sarason et al., 1987).

Description

The SSQ6 is a shortened six-item version of the 27-item SSQ6. For each scenario, the respondent lists all the people she knows, excluding herself, on whom she can count for help or support (the respondent is limited to listing nine persons per question). For the second part, the participant selects how satisfied she is with the overall support she has. If the participant has no support for a question, she checks the words "no one" but still rates her level of satisfaction. An average number of support people across all items and an average satisfaction score are calculated for each respondent.

Administration

The SSQ6 was self-administered at the second maternal visit (M2). The respondent entered her responses on a scannable form.

Data Notes

Three respondents were missing this form. Two were not administered, and one was lost.

Data

The average number of people providing social support to the CANDLE mother at the second prenatal visit was 3.3; the average satisfaction score was 5.7 (on a scale from 0 to 6) (see Table 8.4).

Table 8.4. Social Support Questionnaire, 6th Edition

		Unweighted		Weighted	
Measure	***N***	**Mean**	**SD**	**Mean**	**SD**
Number of people providing social support	1,357	3.57	1.88	3.28	1.81
Social-support satisfaction score	1,353	5.69	0.68	5.67	0.70

Knowledge of Infant Development Inventory

Background

The KIDI assesses a person's familiarity with infant norms and milestones related to infant development up to 24 months; developmental principles and processes; parenting practices and child-rearing strategies; and health care and safety guidelines and practices (MacPhee, 1981; Winter, Morawska, and Sanders, 2012). The KIDI does not contain subscales but can be grouped into four nonexclusive categories (derived from sampling of the literature on infancy) to obtain more-specific information on a person's (1) knowledge on infant norms and milestones, (2) principles of infant development, (3) parenting, and (4) health and safety (Veddovi et al., 2001).

Description

The KIDI is a 58-item inventory. Each item describes what a typical infant might be like or what could affect the infant's growth and behavior. The participant is asked to rate her degree of agreement (agree, disagree, or not sure) on items that describe typical infant behavior, what could affect infant growth or behavior, and the typical age at which infants engage in a particular behavior. Three summary scores are calculated: (1) attempted score = percentage of items attempted (i.e., not answered with "not sure") as a measure of confidence; (2) accuracy score = percentage correct of the attempted answers; and (3) total correct score = percentage correct of all the KIDI items. Possible scores range from 0 to 100.

Administration

The KIDI is a self-administered questionnaire that takes about 20 minutes to complete. The respondent records her answers on a scannable form. CANDLE administered the KIDI at the second maternal visit (M2).

Data Notes

Seven respondents were missing this form. Five were not administered, one was lost, and one was missing for unknown reasons.

Data

CANDLE mothers were asked a series of knowledge-based questions regarding infant development. The average overall weighted score was 62 percent; the average score on attempted questions (for which the answer was something other than "I don't know" and not left blank) was 83 percent (see Table 8.5).

Table 8.5. Knowledge of Infant Development Inventory

	Unweighted		Weighted	
Score	**Mean**	**SD**	**Mean**	**SD**
Total correct	0.65	0.15	0.62	0.16
Accuracy	0.84	0.14	0.83	0.16

NOTE: *N* = 1,358.

Household Questionnaire

Background

CANDLE investigators created the Household Questionnaire to assess the number and type of people living with the CANDLE participant and other information about the CANDLE participant's romantic partner and daily life.

Description

The Household Questionnaire contains items about the number and type of individuals in the household (and relationship to the participant or primary caregiver). In addition, the questionnaire includes questions about the father of the CANDLE child, the CANDLE participant's romantic partner, attendance at religious services, employment, and the CANDLE participant's neighborhood.

Administration

Research assistants administered the Household Questionnaire and entered data into a scannable form at the first home visit (HV1).

Data Notes

Fourteen respondents were missing this form. One was missing for an unknown reason; 13 are missing because the data were accidentally deleted.

Data

Table 8.6 displays information about the makeup of the CANDLE mother and child's household at four weeks. Most CANDLE mothers and children lived in a household of five or fewer individuals (including the CANDLE mother and child). Slightly more than half of fathers lived in the household. The majority of families reported attending religious services more than once or twice per year. The majority of CANDLE mothers indicated that they felt that their neighborhoods were good places to raise children and that the neighborhoods were safe.

Table 8.6. Household Questionnaire: Household Characteristics

Characteristic	*N*	Unweighted		Weighted	
		n	%	*n*	%
Number of people in household	1,248				
2		42	3.37	50	4.03
3		344	27.56	316	25.3
4		367	29.41	313	25.08
5		255	20.43	246	19.65
6		130	10.42	169	13.49
7		60	4.81	76	6.08
8		31	2.48	42	3.4
9		11	0.88	26	2.06
10 or more		8	0.64	11	0.91
Father lives in household	1,243	724	58.2	648	52.1
Spouse or romantic partner in household is currently employed	765	653	85.4	629	82.3
Religious service attendance	1,234				
Never		159	12.88	195	15.77
Once or twice during the year		170	13.78	187	15.07
Several times during the year		253	20.5	296	23.9
About once or twice a month		225	18.23	208	16.81
Nearly every week or more		427	34.6	352	28.46
Mother is currently employed	1,236	626	50.6	543	44.0
Feel that neighborhood is a good place to raise children	1,230	1060	86.2	1,003	81.5
How safe do you feel your neighborhood is from crime?	1,237				
Very safe		374	30.23	342	27.55
Safe		737	59.58	725	58.43
Unsafe		106	8.57	135	10.86
Very unsafe		20	1.62	39	3.15
Know many people in neighborhood	1,237	0.55	0.50	0.50	0.50
Have relatives living in neighborhood	1,237	0.31	0.46	0.35	0.48

NOTE: The investigator asked about spouse or romantic partner only if the participant had a spouse or romantic partner.

Table 8.7. Household Questionnaire: Months in Neighborhood

	Unweighted		Weighted	
Characteristic	**Mean**	**SD**	**Mean**	**SD**
Total months lived in current neighborhood	54.24	70.35	51.33	69.48

NOTE: *N* = 1,222.

Child Abuse Potential Inventory

Background

The CAPI is used to determine a child's risk of being physically abused (Milner and Crouch, 2012).

Description

The CAPI is a screening tool consisting of 160 statements with which the respondent can agree or disagree. The CAPI contains a 77-item physical abuse scale, six domains of abuse (distress, rigidity, unhappiness, problems with child and self, problems with family, and problems from others), and three validity scales (lie, random response, and inconsistency) that form three response-distortion indexes (faking—good, faking—bad, and random responses) (Milner and Crouch, 2012). The validity scales are used to determine whether respondents might be exaggerating or distorting their answers. The CAPI also contains two special scales: ego-strength and loneliness. The sums of responses indicative of abuse, distress, rigidity, unhappiness, problems with family, problems with child and self, and problems with others are calculated for each scale, with some responses weighted more heavily than others, as indicated in the CAPI scoring manual (Milner, 1986). Scales indicative of ego strength and loneliness are also calculated. Binary cutoff scores indicate whether someone has elevated potential for each of the domains.

Administration

The CAPI is a self-administered instrument and was administered at the first clinic visit (CV1). Clinic staff provided the mother with a scannable form to record her responses.

Data Notes

Four respondents were missing this form: three for unknown reasons and one because the mother was not present to complete the form.

Data

Table 8.8 shows the score for each measure, with the cutoff for having an elevated score, as well as the summary scores for the CAPI.

Table 8.8. Child Abuse Potential Inventory

		Unweighted		Weighted	
Score	**Cutoff**	**Mean**	**SD**	**Mean**	**SD**
Abuse score	≥166	82.17	72.90	92.94	76.86
Distress score	≥152	38.96	51.17	44.17	54.76
Rigidity score	≥30	19.01	15.08	21.45	15.11
Unhappiness score	≥23	9.60	9.51	10.28	9.89
Lie scale score	≥7 or 8[a]	8.12	3.78	8.36	3.62
Random responding score	≥6	2.35	1.36	2.44	1.46
Inconsistency score	≥6	3.59	2.25	4.01	2.30
Problems with child and self	≥11	1.17	3.08	1.92	4.13
Problems with family	≥18	6.46	8.94	7.40	9.54
Problems with others	≥20	6.96	7.28	7.70	7.37
Ego strength[b]	—	33.05	7.73	32.39	8.08
Loneliness score[b]	—	3.38	3.50	3.64	3.53

NOTE: *N* = 1,128.
[a] The lie score cutoff varies by level of education.
[b] Cutoff scores for ego strength and loneliness scores were not available.

Parenting Stress Index Short Form

Background

The PSI Short Form (PSI/SF), which is a direct derivative of the full-length PSI (Abidin, 1990), was used to assess parental stress. The PSI/SF is an assessment of the parent–child relationship that identifies dysfunctional parenting and predicts the potential for parental behavior problems and child adjustment difficulties within the family system.

Description

The PSI/SF is a 36-item questionnaire composed of three subscales: parental distress (PD), parent–child dysfunctional interaction (P-CDI), and difficult child (DC) (Reitman, Currier, and Stickle, 2002). Each of the three subscales contains 12 items. The PD subscale assesses a parent's self-perception of child-rearing competence, conflict with partner, social support, and stresses related to the restriction on other roles as a result of being a parent (Reitman, Currier,

and Stickle, 2002). The P-CDI subscale reflects a parent's perception of whether the child does or does not meet the parent's expectations and whether parent–child interactions are reaffirming (Reitman, Currier, and Stickle, 2002). Lastly, the DC subscale assesses the parent's view of the child's temperament, defiance, noncompliance, and demandingness (Reitman, Currier, and Stickle, 2002). Higher scores on subscales and total scores on the PSI/SF indicate a greater level of stress. Percentile scores above the 85th percentile are considered clinically significant for each of the subscales and for the measure of total stress.

Administration

Members of the clinic staff administered the PSI/SF to mothers of infants in ten to 15 minutes at the first clinic visit (CV1). Staff members recorded responses onto a scannable form.

Data Notes

Three respondents were missing this form: two for unknown reasons and one because the mother was not present to complete the form.

Data

Table 8.9 displays the raw scores and percentage of CANDLE mothers with clinically significant stress scores. Nearly 15 percent of CANDLE mothers had total stress scores that were clinically significant.

Table 8.9. Parenting Stress Index

		Unweighted				Weighted			
		Raw Score		Clinically Significant		Raw Score		Clinically Significant	
Score	*N*	Mean	SD	*n*	%	Mean	SD	*n*	%
PD	1,129	23.24	8.24	164	14.53	23.98	8.41	201	17.76
P-CDI	1,127	16.65	5.63	82	7.26	17.42	6.45	134	11.86
DC	1,126	21.30	6.59	80	7.09	22.02	6.95	112	9.91
Total	1,125	61.10	17.29	124	10.98	63.31	18.52	166	14.65

Parent–Child Interaction Nursing Child Assessment Satellite Training Teaching Scales

Background

The NCAST PCI Teaching Scales assess how children who might be biologically or environmentally at risk for developmental problems (e.g., low intelligence quotient, language, or attention problems) interact with their parents (Pridham et al., 2010). Barnard et al., 1983, developed the NCAST observational system for children up to three years of age, based on an ecological model.

Description

The NCAST PCI Teaching Scales, currently referred to as NCAST PCI, is a 73-item yes/no observational measure. The NCAST PCI contains four parent or caregiver behavior subscales (sensitivity to cues, response to child's distress, social-emotional growth fostering, and cognitive growth fostering) and two child-specific subscales (clarity of cues and responsiveness to parent) (Oxford and Findlay, 2013). Additionally, the NCAST PCI assesses potential disengagement cues (e.g., back arching, choking, coughing, crawling away), length of teaching time, name of task, setting, presence of others, child's birth order, and child's state at beginning of teaching.

Total scores are obtained for the mother alone, child alone, and mother and child combined. Subscales for each of the domains and separate contingency scores (items representing responsiveness of interactions) are also calculated. Subscale, contingency scales, and total scores are the sum of the number of items with "yes" responses (Horodynski and Gibbons, 2004). The NCAST PCI has established clinically relevant cutoff scores that identify "worrisome" cases. The NCAST database was used to determine the 10th-percentile score distribution obtained by healthy full-term infants and their mothers. Scores higher than the 10th percentile are considered to fall within the normal range. Scores lower than the 10th percentile suggest increased risk for poor mother–child interaction, and dyads scoring below this level could be at risk for a variety of poor outcomes (Sumner and Spietz, 1994).

Administration

CANDLE administered the PCI scales during the first clinic visit (CV1). During a teaching session between the child and caregiver, a trained cognitive examiner carefully observed the interaction. Following the teaching session, the cognitive examiner followed through the 73-item checklist and marked "yes" or "no" for each item depending on whether the behavior was observed. The teaching session (involving a task, such as "scribbling on a piece of paper," "playing pat-a-cake," or "stacking blocks") lasted for one to six minutes (Oxford and Findlay, 2013). The cognitive examiner also identified potential disengagement cues, length of teaching time, name of task, setting, presence of others, child's birth order, and child's state at beginning

of teaching. The examiner also collected clinical notes. The cognitive examiner recorded the responses and hand-entered them into a database. The UTHSC team did not provide any other detail on this procedure.

Data Notes

Seven respondents were missing this form. Five were not administered, and two were missing for unknown reasons.

Data

Table 8.10 displays the summary scores from the NCAST PCI assessment.

Table 8.10. Nursing Child Assessment Satellite Training Parent–Child Interaction Teaching Scales

		Unweighted		Weighted	
Scale	***N***	**Mean**	**SD**	**Mean**	**SD**
Total scores					
Mother alone	1,125	37.67	6.07	36.36	6.41
Mother contingency	1,125	14.63	3.43	13.99	3.58
Child alone	1,124	18.15	3.09	18.09	3.12
Child contingency	1,124	8.46	2.15	8.41	2.20
Mother–child combined	1,125	55.80	7.05	54.45	7.40
Mother–child contingency	1,125	23.08	4.14	22.40	4.29
Parent subscales and contingency scales					
Sensitivity to cues subscale	1,125	8.56	1.52	8.41	1.52
Sensitivity to cues contingency	1,125	4.25	0.85	4.16	0.86
Response to child's distress subscale	1,123	9.27	1.74	9.01	1.89
Response to child's distress contingency	1,123	4.49	1.45	4.31	1.48
Social-emotional growth fostering subscale	1,125	8.36	1.76	8.03	1.93
Social-emotional growth fostering contingency	1,125	2.23	0.72	2.12	0.75
Cognitive growth fostering subscale	1,125	11.49	2.92	10.93	2.93
Cognitive growth fostering contingency	1,125	3.66	1.56	3.40	1.60
Child subscales	1,124				
Clarity of cues		9.06	1.05	9.06	1.03
Responsiveness to parent		9.09	2.37	9.03	2.41
Responsiveness to parent contingency		8.46	2.15	8.41	2.20

Child Care Information

Background

CANDLE investigators created the Child Care Arrangements Questionnaire to gather information about childcare arrangements for the CANDLE child.

Description

The Child Care Information Questionnaire includes such items as primary caregivers other than the mother or guardian, location of care, frequency and duration of care, age of child when outside care arrangements began, and the child-to-adult ratio in daycare or at home.

Administration

Clinic study staff administered the Child Care Arrangements Questionnaire and recorded responses onto a scannable form at the first clinic visit (CV1).

Data Notes

Roughly 10 percent of the sample do not have data for this form because it was added to the protocol after study visits had commenced (n = 114 were missing this form).

Data

Tables 8.11 through 8.13 summarize the CANDLE child's experience with regular childcare other than the mother or guardian. Approximately 69 percent of CANDLE children were regularly cared for by someone other than the parent or guardian.

Table 8.11. Child Care Arrangements: Overall

Child Care Other Than Mother or Guardian on a Regular Basis	Yes (n)	%
Unweighted	720	70.7
Weighted	695	68.3

NOTE: N = 1,018. Questions about childcare arrangements follow a skip pattern, so the administrator asks a question only if it applies (e.g., if someone other than the mother or guardian provides care on a regular basis in a particular setting).

Table 8.12. Child Care Arrangements: Unweighted

Characteristic	*N*	Yes (*n*)	%	Days per Week			Hours per Day			Number of Adults Present			Number of Children Present		
				N	Mean	SD	*N*	Mean	SD	*N*	Mean	SD	*N*	Mean	SD
Type of care															
Own home	687	189	27.5												
With relative	189	163	86.2	164	4.70	2.07	164	6.44	3.44	161	1.79	1.78	161	1.76	1.02
With nonrelative	163	18	11.0	17	3.18	1.59	17	6.94	2.99	17	1.65	0.79	17	1.71	1.10
Provider home	683	255	37.3												
With relative	261	170	65.1	170	3.57	1.66	170	9.62	6.40	169	1.97	1.01	169	2.00	2.22
With nonrelative	235	65	27.7	67	4.06	1.40	66	7.56	2.93	66	1.79	0.97	66	4.02	3.41
Family day care	666	58	8.7	58	4.69	0.71	58	7.71	1.27	60	2.22	1.08	58	7.14	4.15
Organized childcare facility	671	302	45.0	300	4.36	1.19	300	7.51	1.73	298	2.56	1.98	295	8.24	8.07

NOTE: Questions about childcare arrangements follow a skip pattern, so the administrator asks a question only if it applies (e.g., if someone other than the mother or guardian provides care on a regular basis in a particular setting).

Table 8.13. Child Care Arrangements: Weighted

Characteristic	Yes (*n*)	%	Days per Week		Hours per Day		Number of Adults present		Number of Children Present	
			Mean	SD	Mean	SD	Mean	SD	Mean	SD
Type of care										
Own home	166	24.1								
With relative	161	85.1	4.39	1.86	6.38	3.18	1.88	1.48	1.93	1.09
With nonrelative	17	10.5	3.46	1.41	7.16	2.44	1.67	0.64	1.69	0.84
Provider home	241	35.3								
With relative	184	70.4	4.31	1.87	9.49	6.23	1.90	0.92	1.92	1.60
With nonrelative	55	23.5	3.84	1.17	7.54	2.53	2.00	0.81	5.06	3.63
Family day care	49	7.4	4.74	0.59	7.80	1.01	2.21	0.87	7.21	3.35
Organized childcare facility	316	47.2	4.43	1.03	7.54	1.72	2.51	1.62	8.21	7.17

NOTE: Questions about childcare arrangements follow a skip pattern, so the administrator asks a question only if it applies (e.g., if someone other than the mother or guardian provides care on a regular basis in a particular setting).

Scales of Independent Behavior—Revised

Background

The SIB-R is a comprehensive assessment of a child's adaptive or maladaptive behavior, standardized using a representative sample from the general population (Bruininks et al., 1996; Tassé et al., 2012).

Description

The UCI CANDLE Study utilized the SIB-R short form. The SIB-R is administered to mothers via checklist. For each task, the respondent rates the frequency with which her child "does (or could do) a task (such as chewing soft foods, taking off socks, drinking from a glass without spilling) completely without help or supervision" (0: never or rarely, even if asked; 1: does, but not well, or about one-quarter of the time, and might need to be asked; 2: does fairly well, or about three-quarters of the time and might need to be asked; or 3: does very well, or always or almost always and without being asked) (Msall, 2005). Possible scores for the SIB-R range from 0 to 120. Scores for the SIB-R are categorized based on child's age and performance (Msall, 2005) and are categorized as limited, limited to age-appropriate, age-appropriate, age-appropriate to advanced, and advanced.

Administration

A trained cognitive examiner administered the SIB-R to mothers via checklist at the first clinic visit (CV1). For each task listed, the respondent must indicate whether her child "does (or could do) a task completely without help or supervision." Administering the SIB-R took approximately 15 to 20 minutes. Cognitive examiners hand-entered the results into a database. UTHSC analysts ran queries to check for possible errors and checked suspicious values against a hard copy of the form.

Data Notes

Three respondents were missing this form; two were for unknown reasons and one because the mother was not available to complete the form.

Data

Table 8.14 displays the average SIB-R raw score and distribution of skill levels. The majority (75 percent) of CANDLE children had age-appropriate scores.

Table 8.14. Scales of Independent Behavior—Revised: Raw Score

	Unweighted		Weighted	
Scale	**Mean**	**SD**	**Mean**	**SD**
Raw score	46.81	7.20	47.09	7.23

NOTE: *N* = 1,120.

Table 8.15. Scales of Independent Behavior—Revised: By Skill Level

	Unweighted		Weighted	
Level	***n***	**%**	***n***	**%**
Limited to age-appropriate	8	0.71	9	0.79
Age-appropriate	881	78.03	857	76.06
Age-appropriate to advanced	222	19.66	243	21.6
Advanced	18	1.59	17	1.55

NOTE: *N* = 1,129.

Brief Infant Toddler Social Emotional Assessment

Background

BITSEA was designed to screen infants or toddlers at risk for or currently experiencing social-emotional or behavioral problems (Briggs-Gowan and Carter, 2006; Karabekiroglu et al., 2010).

Description

The 42-item BITSEA is designed to assess children ages 12 months to 36 months. For each of the 42 items, the mother provides a response that best describes her infant's or toddler's behavior in the past month. BITSEA consists of two multi-item scales: the problem total scale (31 items) and the competence total scale (11 items). The problem total scale consists of three subscales: externalizing problems (six items identifying overactivity, aggression, and defiance), internalizing problems (eight items identifying anxiety and depression), and dysregulation (eight items identifying negative emotionality and eating and sleeping problems) (Community–University Partnership for the Study of Children, Youth, and Families, 2011). The competence scale assesses social-emotional abilities, such as empathy, prosocial behaviors, and compliance (Briggs-Gowan and Carter, 2008).

Administration

BITSEA is a self-administered questionnaire that clinic study staff provides to mothers at the first clinic visit (CV1). The respondent filled out a paper form, which a cognitive examiner reviewed, and the examiner entered data into the database. UTHSC analysts ran queries to check for possible errors and checked suspicious values against a hard copy of the form.

Scoring

To score BITSEA, we obtain the sum of item responses (coded 0, 1, or 2) for each scale. On the problem total scale, a higher score indicates more behavioral problems; on the competence scale, a higher score indicates more social skills (Briggs-Gowan and Carter, 2008). UTHSC CANDLE analysts transformed the scores so that a lower percentile is suggestive of more problems for both the total problem scale and total competence scale.

The cut point for the problem total scale is the 25th percentile (identified by the possible problem variable), which means that the child's problem total score is higher than the score obtained by 75 percent of children of the same age and sex in the normative sample. The cutoff point for the competence total score is the 15th percentile (identified by the possible delay variable), which means that the child's competence total score is lower than the score obtained by 85 percent of children of the same age and sex in the normative sample (Briggs-Gowan and Carter, 2008). The externalizing, internalizing, dysregulation, and autism spectrum disorder scales do not have established cut points.

Data Notes

Three respondents were missing this form. One was not administered, and two were missing for unknown reasons.

Data

Tables 8.16 and 8.17 display the summary scores for BITSEA at one year. More than 30 percent met the cut point for behavior problems, and 23 percent met the cut point for competence delays.

Table 8.16. Brief Infant Toddler Social Emotional Assessment Scale: Specific Scales

		Unweighted		Weighted	
Scale	***N***	**Mean**	**SD**	**Mean**	**SD**
Problem total scale	1,127	9.71	5.85	10.88	6.42
Externalizing problems subscale	1,128	2.46	2.09	2.80	2.33
Internalizing problems subscale	1,128	2.02	1.65	2.34	1.81
Dysregulation subscale	1,128	3.34	2.42	3.71	2.56
Competence scale	1,128	15.10	3.13	15.05	3.21
Autism spectrum disorder	1,128	6.01	3.10	6.30	3.32
Social skills component		4.40	2.55	4.48	2.58
Behavioral problems component		1.60	1.69	1.83	1.84

Table 8.17. Brief Infant Toddler Social Emotional Assessment Scale: Percentage Who Met Criteria for Problems or Delays

		Unweighted		Weighted	
Problem or Delay	***N***	***n***	**%**	***n***	**%**
For behavior problems	1,127	279	24.8	354	31.4
For competence delays	1,128	244	21.6	261	23.1

Chapter Nine. Implications and Potential Benefits for the CANDLE Study

The UCI CANDLE Study offers an opportunity to examine early drivers and markers of healthy early-childhood development and the influences of genetics, biology, family, and community environment. This report is intended to outline the study design and sample and provide basic descriptions of the sample through the first clinic visit one year after the child's birth. By outlining the measures used, the report should be of use to a range of researchers interested in further analyzing the data and to local practitioners and policymakers interested in what the UCI CANDLE Study can offer in terms of insights.

Several features of CANDLE make it an interesting and useful study. First, its sample offers insights into the experience of stress, family, and neighborhood exposures in a larger black and low-income sample than other national surveys. The sample size is adequate for understanding these processes and has a mix of low- and moderate-income members, allowing for comparison by both race and ethnicity and income.

We briefly describe the biosample data, in terms of methods only, in the appendix. These biosample data will yield some biomarker information on predictors of disease development and life course that researchers will be able to use as objective, physiological measures of domains (such as stress) and compare those with self-report data on similar domains.

The data on prenatal, postpartum, and early-infancy exposures can be explored in relation to the development or decline of cognitive growth and social development into early childhood. There might be opportunities for researchers to link the CANDLE data with future data related to schooling, allowing researchers to analyze growth or decline that can extend well past three- or five-year age milestones.

The CANDLE approach offers more-frequent sampling of life experience at continuous intervals, which should aid in picking up signals or early indicators of health and well-being, particularly when combining clinic and home visit data. Given rapid changes in this time period, having these many data points allows for sensitivity in life course analyses.

Analyses of social and emotional development will benefit from the availability of both child data and parent data, allowing for a more robust understanding of the child context and what could contribute to healthy development in the early years.

Finally, the CANDLE multiple data points and multiple types of data will allow researchers to triangulate objective (e.g., biospecimen) and self-report (e.g., survey) data. Although weighting increases the generalizability of the sample, it is important to note that the sample deliberately excluded unhealthy women and babies. As a result, these data might not be able to inform the outcomes or trajectories of children at heightened risk caused by poor maternal health.

Appendix. Biological Samples

In addition to the forms described in the chapters above, the UCI CANDLE Study collected a range of biological data. Although they were not a focus of this descriptive baseline report, we note the types of data available for potential inclusion in future analyses. Note, however, that use of the biospecimens will be limited to highest-priority projects that most closely align with the UCI's mission. Additional information about the availability of data and specimens is available from the UCI CANDLE team upon request.

Biologic Measures

As part of the UCI CANDLE Study, the CANDLE team collected, processed, stored, and documented more than 125,000 blood, placenta, urine, and other biological samples at the first, second, and third maternal visits (M1, M2, and M3, respectively). The UCI CANDLE Study has collected maternal blood (24 mL) and urine samples (20 mL) at each of the second-trimester, third-trimester, and birth study visits. CANDLE has also collected cord blood (30–60 mL) and placental tissue (3–4 g) at birth. These and other child biospecimens, including buccal swabs and hair samples, collected at subsequent visits are being stored for scientific research purposes.

The specimens and data from the biorepository are available to investigators to use in combination with the extensive database records to study relationships among environmental factors, maternal stressors, and infections during and after pregnancy that are relevant for a child's development. Blood and cord-blood samples can be used to assess environmental exposures, genotype, deoxyribonucleic acid (DNA) methylation status, and differences in ribonucleic acid expression to provide clues into developmental trajectories and possible risk factors. Variation in methylation could predict how the environment changes gene expression (e.g., "turns genes on or off"). Unusual patterns of deoxyribonucleic acid methylation have been linked with such diseases as cancer and lupus and even to behavioral differences.

Biological Lead Substudy

A subsample of 96 UCI CANDLE Study participants were enrolled at the first maternal visit (M1) into the Biological Lead Substudy to test for risk of exposure to lead. This substudy assessed the blood lead concentration (micrograms per deciliter) in biological mothers at enrollment (M1), in their third trimesters (M2), and at delivery (M3), and it assessed the blood lead concentration in their children at their one-year, two-year, and three-year clinic visits. Blood samples were collected using butterfly needles.

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